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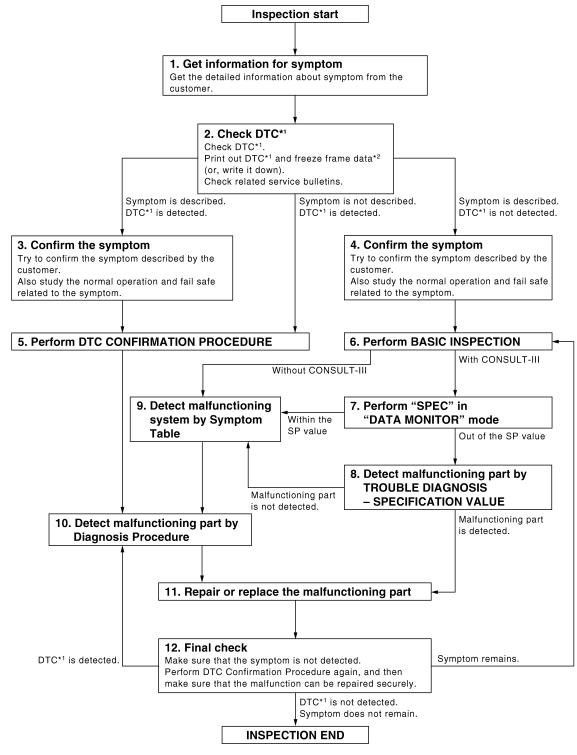
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# **BASIC INSPECTION**

# DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

### **OVERALL SEQUENCE**



<sup>\*1:</sup> Include 1st trip DTC.

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<sup>\*2:</sup> Include 1st trip freeze frame data.

### DIAGNOSIS AND REPAIR WORK FLOW

[HR16DE] < BASIC INSPECTION >

# $1.\mathsf{GET}$ 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-25, "Diagnostic Work Sheet".)

EC

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>> 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 "How to Erase DTC and 1st Trip DTC" in EC-90, "Diagnosis Description".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-487, "Symptom Table".)
- Check related service bulletins for information.

### Is any symptom described and is any DTC detected?

Symptom is described. DTC is detected>>GO TO 3.

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

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

### 3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).

Also study the normal operation and fail safe related to the symptom. Refer to EC-491, "Description" and EC-472, "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-491, "Description" and EC-472. "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.

# ${f 5}$ .PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.

If two or more DTCs are detected, refer to EC-474, "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 CONFIR-MATION PROCEDURE.

### Is DTC detected?

YES >> GO TO 10.

NO >> Check Intermittent Incident according to EC-120, "Diagnosis Procedure".

### **6.**PERFORM BASIC INSPECTION

Perform EC-26, "BASIC INSPECTION: Special Repair Requirement".

Do you have CONSULT-III?

**EC-23** 

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### **DIAGNOSIS AND REPAIR WORK FLOW**

< BASIC INSPECTION > [HR16DE]

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

7. PERFORM SPEC IN DATA MONITOR MODE

### With CONSULT-III

Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL" and "A/F ALPHA-B1" are within the SP value using "SPEC" of "DATA MONITOR" mode with CONSULT-III. Refer to EC-112, "Component Function Check".

### 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-113, "Diagnosis Procedure".

### Is malfunctioning part detected?

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

# 9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to <u>EC-487</u>, "Symptom Table" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

>> GO TO 10.

# 10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.

### NOTE:

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to "Circuit Inspection" in GI-25. "How to Perform Efficient Diagnosis for an Electrical Incident".

### Is malfunctioning part detected?

YES >> GO TO 11.

NO >> Monitor input data from related sensors or check the voltage of related ECM terminals using CON-SULT-III. Refer to EC-461, "Reference Value".

# 11. REPAIR OR REPLACE THE MALFUNCTIONING PART

- 1. Repair or replace the malfunctioning part.
- Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
- Check DTC. If DTC is displayed, erase it. Refer to "How to Erase DTC and 1st Trip DTC" in <u>EC-90, "Diagnosis Description"</u>.

>> GO TO 12.

# 12. FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been repaired securely.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

### Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.

YES-2 >> Symptom remains: GO TO 6.

- >> 1. Before returning the vehicle to the customer, make sure to erase unnecessary DTC in ECM (Refer to "How to Erase DTC and 1st Trip DTC" in <a href="EC-90">EC-90</a>, "Diagnosis Description"</a>.) and TCM (Refer to <a href="AT-39">AT-39</a>, "OBD-II Diagnostic Trouble Code (DTC)"</a>.).
  - 2. If the completion of SRT is needed, drive vehicle under the specific "DRIVING PATTERN" in <u>EC-478</u>, "How to Set SRT Code".
  - 3. INSPECTION END

### **DIAGNOSIS AND REPAIR WORK FLOW**

< BASIC INSPECTION > [HR16DE]

# **Diagnostic Work Sheet**

INFOID:0000000004779988

### 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 one on the WORKSHEET SAMPLE 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 na	me 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		
	☐ 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 ☐ H☐ Others [		
eyp.ce	☐ Driveability		☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Ust after stopping ☐ While loading		
Incident occu	ırrence	☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night [	☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes		
Weather con-	ditions	☐ Not affected		
	Weather	☐ Fine ☐ Raining ☐ Snowing	Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐	Cold ☐ Humid °F	
		☐ Cold ☐ During warm-up ☐	After warm-up	
Engine condi	tions	Engine speed0 2,000	4,000 6,000 8,000 rpm	
Road condition	ons	☐ In town ☐ In suburbs ☐ Hig	ghway 🔲 Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ While accelerating ☐ While cruis ☐ While decelerating ☐ While turni	•	
Vehicle speed		30 40 50 60 MPH		
Malfunction in	ndicator lamp	☐ Turned on ☐ Not turned on		

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# < BASIC INSPECTION >

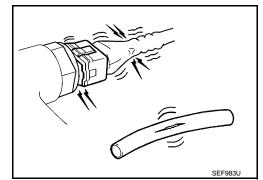
# INSPECTION AND ADJUSTMENT BASIC INSPECTION

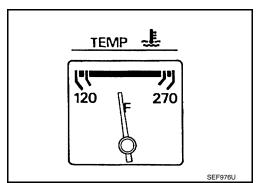
# BASIC INSPECTION: Special Repair Requirement

### INFOID:0000000004779989

# 1. INSPECTION START

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

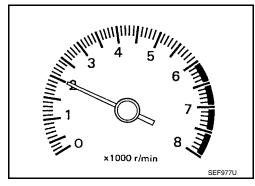




- 5. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 6. Make sure that no DTC is displayed with CONSULT-III or GST.

### Is any DTC detected?

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



# 2. REPAIR OR REPLACE

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

>> GO TO 3

# 3. CHECK IDLE SPEED

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

[HR16DE] < BASIC INSPECTION >

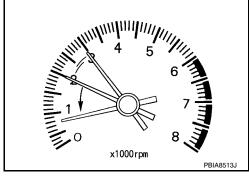
Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.

Check idle speed.

For procedure, refer to EC-30, "IDLE SPEED: Special Repair Requirement". For specification, refer to EC-504, "Idle Speed".

### Is the inspection result normal?

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



# f 4.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- 2. Perform EC-31, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 5.

### ${f 5}$ .PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".

>> GO TO 6.

### **6.**PERFORM IDLE AIR VOLUME LEARNING

Perform EC-32, "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

- Start engine and warm it up to normal operating temperature.
- 2. Check idle speed.

For procedure, refer to EC-30, "IDLE SPEED: Special Repair Requirement".

For specification, refer to EC-504, "Idle Speed".

### Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 8.

# 8.DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-268</u>, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-263, "DTC Logic".

### Is the inspection result normal?

YES >> GO TO 9.

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

### 9. CHECK ECM FUNCTION

- Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is rare.)
- 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249, "ECM Re-communicating Function".

>> GO TO 4.

# 10. CHECK IGNITION TIMING

Run engine at idle.

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### [HR16DE]

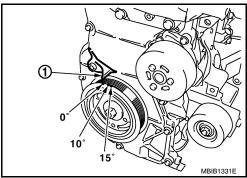
### < BASIC INSPECTION >

Check ignition timing with a timing light.
 For procedure, refer to <u>EC-30</u>, "IGNITION TIMING: Special Repair Requirement". For specification, refer to <u>EC-504</u>, "Ignition Timing".

1 : Timing indicator

### Is the inspection result normal?

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



# 11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- 2. Perform <u>EC-31</u>, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 12.

# 12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".

>> GO TO 13.

# 13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-32, "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 <u>EC-30, "IDLE SPEED: Special Repair Requirement"</u>. For specification, refer to <u>EC-504, "Idle Speed"</u>.

### Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 17.

# 15. CHECK IGNITION TIMING AGAIN

- 1. Run engine at idle.
- Check ignition timing with a timing light.
   For procedure, refer to <u>EC-30</u>, "IGNITION TIMING: Special <u>Repair Requirement"</u>. For specification, refer to <u>EC-504</u>, "Ignition Timing".

1 : Timing indicator

### Is the inspection result normal?

YES >> GO TO 19.

NO >> GO TO 16.

# 10° 15° MRIB1331E

# 16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-161, "Removal and Installation".

### Is the inspection result normal?

YES >> GO TO 17.

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

[HR16DE] < BASIC INSPECTION > 17. DETECT MALFUNCTIONING PART Check the following. Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-268</u>, "DTC Logic". Check crankshaft position sensor (POS) and circuit. Refer to EC-263. "DTC Logic". EC Is the inspection result normal? YES >> GO TO 18. NO >> Repair or replace. Then GO TO 4. 18. CHECK ECM FUNCTION Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is rare.) D 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement". Е >> GO TO 4. 19. INSPECTION END If ECM is replaced during this BASIC INSPECTION procedure, perform EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement". >> INSPECTION END ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT Н ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Description When replacing ECM, this procedure must be performed. ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement INFOID:0000000004779991 J 1.perform initialization of nats system and registration of all nats ignition key ids Refer to BL-249, "ECM Re-communicating Function". K >> GO TO 2. 2.PERFORM VIN REGISTRATION L Refer to EC-31, "VIN REGISTRATION: Special Repair Requirement". M >> GO TO 3. 3.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING Refer to EC-31, "ACCELERATOR PEDAL RELEASED POSITION LEARNING; Special Repair Requirement". Ν >> GO TO 4. 0 f 4.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement". Р >> GO TO 5. 5.PERFORM IDLE AIR VOLUME LEARNING Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

< BASIC INSPECTION > [HR16DE]

### **IDLE SPEED**

IDLE SPEED: Description

This describes how to shock the idle aread. For the actual procedure, follow the instructions in "DASIC

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

IDLE SPEED: Special Repair Requirement

INFOID:0000000004779993

INFOID:0000000004779992

# 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** 

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

INSPECTION".

# IGNITION TIMING: Special Repair Requirement

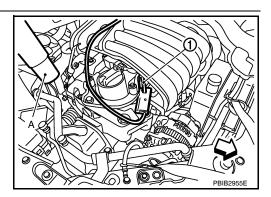
INFOID:0000000004779995

INFOID:0000000004779994

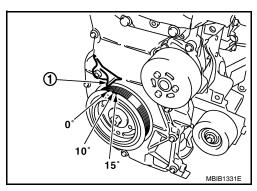
# 1. CHECK IGNITION TIMING

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

2 : Timing light : Vehicle front



- 2. Check ignition timing.
  - 1 : Timing indicator
  - >> INSPECTION END



### VIN REGISTRATION

VIN REGISTRATION: Description

INFOID:0000000004779996

VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced. **NOTE:** 

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

< BASIC INSPECTION > [HR16DE]	
VIN REGISTRATION : Special Repair Requirement	
1.CHECK VIN	Α
Check the VIN of the vehicle and note it. Refer to GI-43, "Model Variation".	EC
>> GO TO 2.	
2.PERFORM VIN REGISTRATION	С
With CONSULT-III	
<ol> <li>Turn ignition switch ON and engine stopped.</li> <li>Select "VIN REGISTRATION" in "WORK SUPPORT" mode.</li> <li>Follow the instruction of CONSULT-III display.</li> </ol>	D
>> END	Е
ACCELERATOR PEDAL RELEASED POSITION LEARNING	
ACCELERATOR PEDAL RELEASED POSITION LEARNING: Description INFOID.000000004779998	F
Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.	
ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Re-	
quirement	Н
1.START	
<ol> <li>Make sure that accelerator pedal is fully released.</li> <li>Turn ignition switch ON and wait at least 2 seconds.</li> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> <li>Turn ignition switch ON and wait at least 2 seconds.</li> </ol>	l
5. Turn ignition switch OFF and wait at least 10 seconds.	J
>> END	K
THROTTLE VALVE CLOSED POSITION LEARNING	1
THROTTLE VALVE CLOSED POSITION LEARNING: Description INFOID:000000004780000	L
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	
1.START	N
<ol> <li>Make sure that accelerator pedal is fully released.</li> <li>Turn ignition switch ON.</li> <li>Turn ignition switch OFF and wait at least 10 seconds.         Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.     </li> </ol>	O P
>> END IDLE AIR VOLUME LEARNING	ľ
IDLE AIR VOLUME LEARNING : Description	

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps each engine idle speed within the specific range. It must be performed under any of the following conditions:

< BASIC INSPECTION > [HR16DE]

- 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:0000000004780003

# 1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.

Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 100°C (158 212°F)
- Selector lever: P or N (A/T), Neutral (M/T)
- · 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
- A/T models
- With CONSULT-III: Drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "TRANSMISSION" system indicates less than 0.9 V.
- Without CONSULT-III: Drive vehicle for 10 minutes.
- M/T models
- · Drive vehicle for 10 minutes.

### Do you have CONSULT-III?

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

# 2. IDLE AIR VOLUME LEARNING

### With CONSULT-III

- Perform Accelerator Pedal Released Position Learning. Refer to <u>EC-31, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement"</u>.
- Perform Throttle Valve Closed Position Learning. Refer to <u>EC-31</u>, "THROTTLE VALVE CLOSED POSI-TION LEARNING: Special Repair Requirement".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 5. Touch "START" and wait 20 seconds.

### Is "CMPLT" displayed on CONSULT-III screen?

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

# 3.IDLE AIR VOLUME LEARNING

### Without CONSULT-III

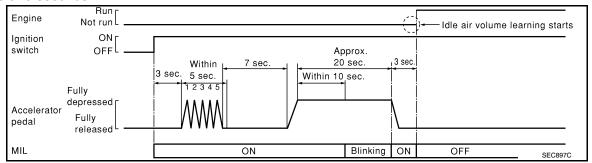
### NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- 1. Perform Accelerator Pedal Released Position Learning. Refer to <a href="EC-31">EC-31</a>, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".
- 2. Perform Throttle Valve Closed Position Learning. Refer to <u>EC-31</u>, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 6. Repeat the following procedure quickly five times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
- 8. Fully release the accelerator pedal within 3 seconds after the MIL turned ON.

[HR16DE] < BASIC INSPECTION >

### Start engine and let it idle.

### 10. Wait 20 seconds.



>> GO TO 4.

### 4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	A/T: 700 $\pm$ 50 rpm (in P or N position) M/T: 650 $\pm$ 50 rpm (in Neutral position)
Ignition timing	A/T: $6 \pm 5^{\circ}$ BTDC (in P or N position) M/T: $6 \pm 5^{\circ}$ BTDC (in Neutral position)

### Is the inspection result normal?

YES >> INSPECTION END

# 5. DETECT MALFUNCTIONING PART

### Check the following

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

### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace malfunctioning part.

### 6.DETECT MALFUNCTIONING PART

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

It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to EC-112, "Description". If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:

- · Engine stalls.
- · Erroneous idle.

### >> INSPECTION END

### MIXTURE RATIO SELF-LEARNING VALUE CLEAR

### MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Description

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:0000000004780005

INFOID:0000000004780004

# $\mathbf{1}.\mathsf{START}$

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[HR16DE] < BASIC INSPECTION >

### With CONSULT-III

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

### With GST

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

>> END

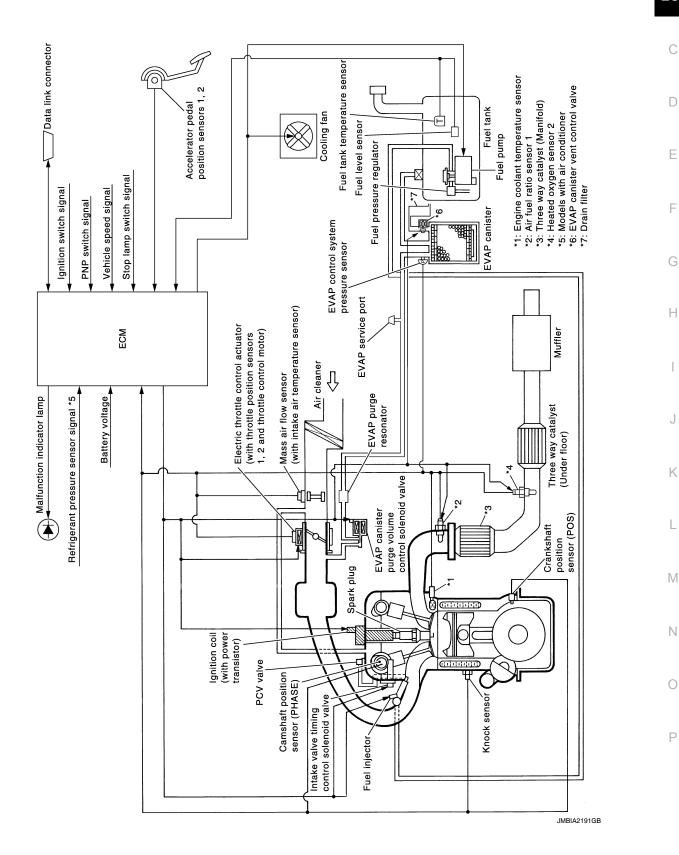
# **FUNCTION DIAGNOSIS**

# **ENGINE CONTROL SYSTEM**

System Diagram

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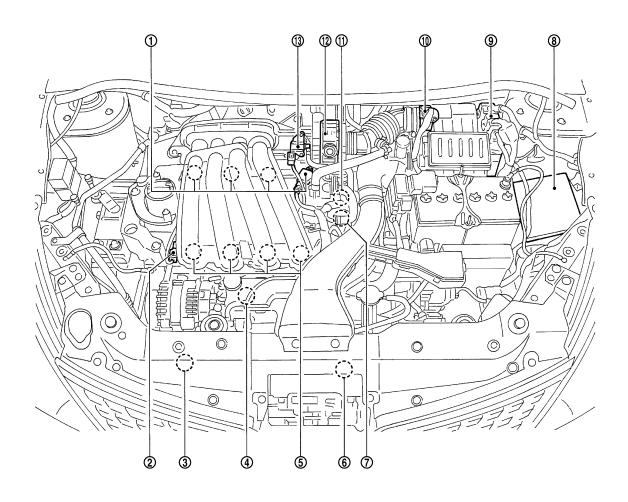
# System Description

INFOID:0000000004780007

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

# Component Parts Location

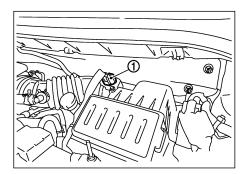
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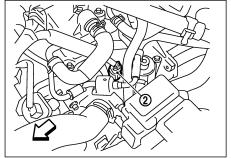
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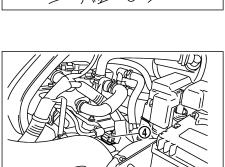
- Ignition coil (with power transistor) and spark plug
- 4. Knock sensor
- 7. Camshaft position sensor (PHASE) 8.
- Mass air flow sensor (with intake air temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- . Intake valve timing control solenoid 3. valve
- 5. Fuel injector
-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

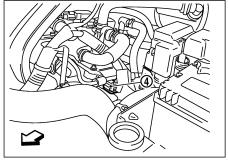
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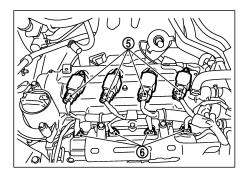


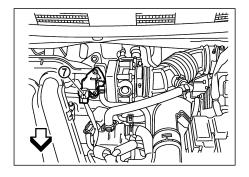
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PBIB2940E

- Mass air flow sensor 1. (with intake air temperature sensor)
- Camshaft position sensor (PHASE) 5.
- EVAP canister purge volume control solenoid valve
- Vehicle front

- Engine coolant temperature sensor 2.
  - Ignition coil (with power transistor)
- 3. Electric throttle control actuator
  - Fuel injector

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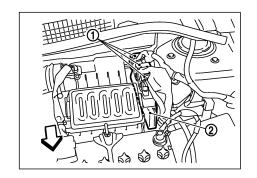
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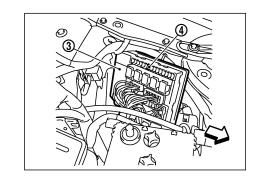
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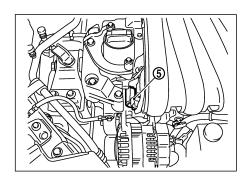
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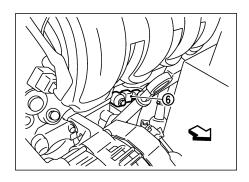
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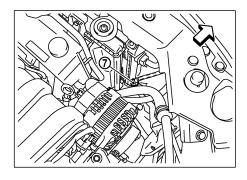
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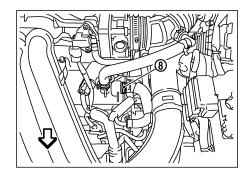












PBIB2941E

- 1. ECM harness connectors
- 4. Fuel pump fuse (15A)
- 7. Refrigerant pressure sensor
- Vehicle front

- 2. ECM
- 5. Intake valve timing control solenoid 6. valve
- PCV valve

3. IPDM E/R

Knock sensor

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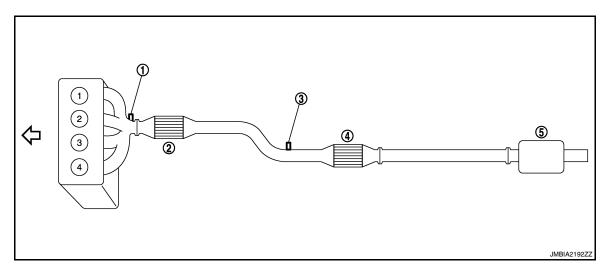
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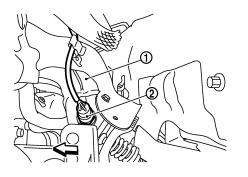
Three way catalyst (Manifold)

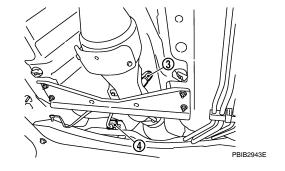
- 1. Air fuel ratio (A/F) sensor 1
- 4. Three way catalyst (Under flloor)
- 5. Muffler

2.

3. Heated oxygen sensor 2

Vehicle front



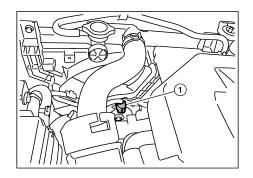


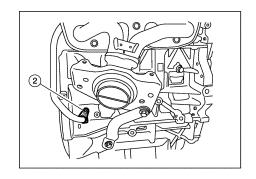
- 1. Exhaust manifold
- 4. Heated oxygen sensor 2 harness connector
- Vehicle front

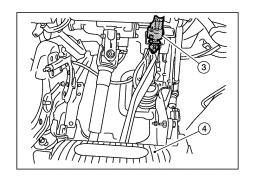
- 2. Air fuel ratio (A/F) sensor 1
- 3. Heated oxygen sensor 2

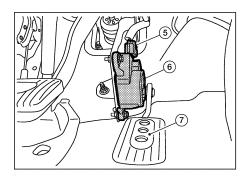
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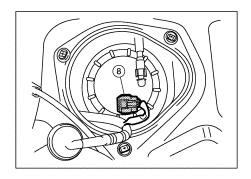
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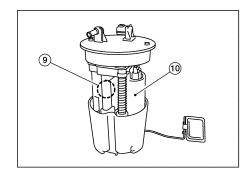












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- 1. Cooling fan motor harness connector 2. tor
- 4. Brake pedal
- 7. Accelerator pedal

- 2. Crankshaft position sensor
- 5. Accelerator pedal position sensor harness connector
- Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)
- 3. Stop lamp switch
- 6. Accelerator pedal position sensor
  - Fuel pressure regulator

10. Fuel pump

# Component Description

INFOID:0000000004780009

Component	Reference
A/F sensor 1	EC-182, "Description"
A/F sensor 1 heater	EC-136, "Description"
Accelerator pedal position sensor	EC-399, "Description"
Camshaft position sensor (PHASE)	EC-268, "Description"

## **ENGINE CONTROL SYSTEM**

## < FUNCTION DIAGNOSIS >

[HR16DE]

Component	Reference	
Crankshaft position sensor (POS)	EC-263, "Description"	
Cooling fan motor	EC-66. "System Description"	
Electric throttle control actuator	EC-397. "Description"	
Engine coolant temperature sensor	EC-167. "Description"	
EVAP canister purge volume control solenoid valve	EC-291, "Description"	
EVAP canister vent control valve	EC-301. "Description"	
EVAP control system pressure sensor	EC-312, "Description"	
Fuel injector	EC-430, "Description"	
Fuel level sensor	EC-342, "Description"	
Fuel pump	EC-434. "Description"	
Fuel tank temperature sensor	EC-240. "Description"	
Heated oxygen sensor 2	EC-204, "Description"	
Heated oxygen sensor 2 heater	EC-140. "Description"	
Ignition signal	EC-439. "Description"	
Intake air temperature sensor	EC-162, "Description"	
Intake valve timing control solenoid valve	EC-84, "System Description"	
Knock sensor	EC-259. "Description"	
Mass air flow sensor	EC-148. "Description"	
Park/neutral position switch	EC-362, "Description"	
PCV valve	EC-456. "Description"	
Refrigerant pressure sensor	EC-457, "Description"	
Stop lamp switch	EC-380, "Description"	
Throttle control motor	EC-393, "Description"	
Throttle control motor relay	EC-384. "Description"	
Throttle position sensor	EC-171, "Description"	

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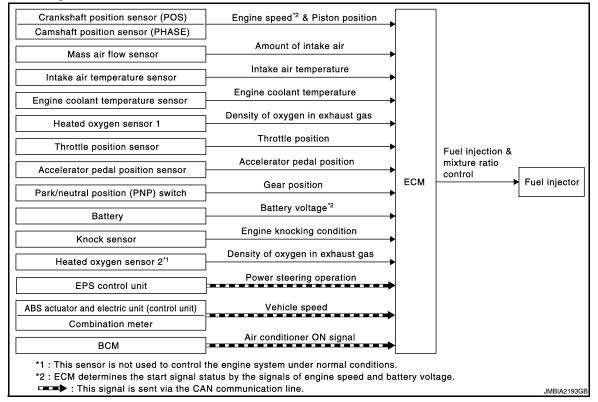
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# MULTIPORT FUEL INJECTION SYSTEM

System Diagram

INFOID:0000000004780010



# **System Description**

INFOID:0000000004780011

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position	Fuel injection  & mixture ratio   Fuel injector   control	Fuel injector
Park/neutral position (PNP) switch	Gear position		i dei injectoi
Battery	Battery voltage*3		
Knock sensor	Engine knocking condition		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
EPS control unit	Power steering operation*2		
ABS actuator and electric unit (control unit)	Val: -1 d+2		
Combination meter	─ Vehicle speed* <sup>2</sup>		
BCM	Air conditioner ON signal* <sup>2</sup>		

<sup>\*1:</sup> This sensor is not used to control the engine system under normal conditions.

<sup>\*2:</sup> This signal is sent to the ECM via the CAN communication line.

[HR16DE] < FUNCTION DIAGNOSIS >

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

### SYSTEM DESCRIPTION

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

### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

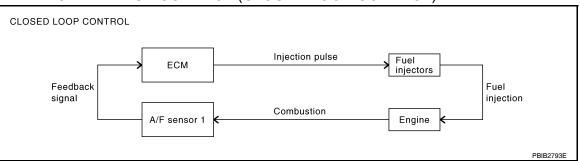
#### <Fuel increase>

- · During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D (A/T models)
- · High-load, high-speed operation

#### <Fuel decrease>

- During deceleration
- During high engine speed operation

### MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for 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-182, "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 (A/T models)
- When starting the engine

### MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally

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### < FUNCTION DIAGNOSIS >

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.

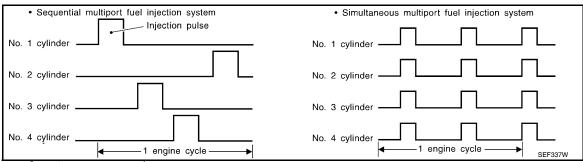
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"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 four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The four injectors will then receive the signals two times for each engine cycle.

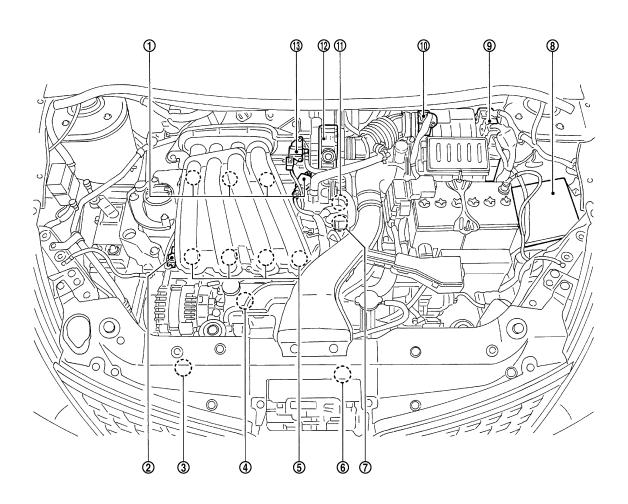
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

#### **FUEL SHUT-OFF**

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

Component Parts Location

INFOID:0000000004780012



PBIB2939E

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

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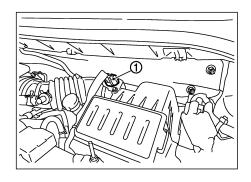
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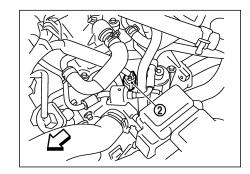
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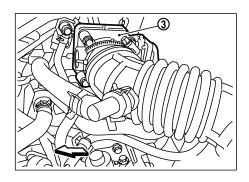
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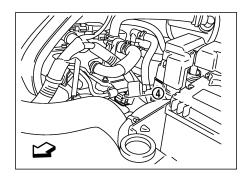
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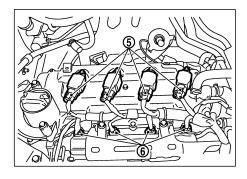
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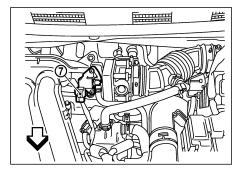












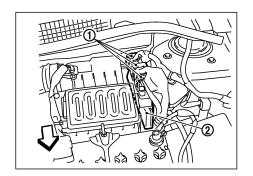
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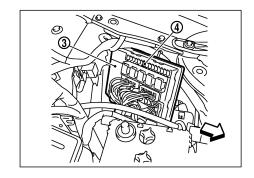
- Mass air flow sensor (with intake air temperature sensor)
- 4. Camshaft position sensor (PHASE) 5.
- 7. EVAP canister purge volume control solenoid valve
- Vehicle front

- Engine coolant temperature sensor 3.
- Ignition coil (with power transistor) 6.
- 3. Electric throttle control actuator
- 6. Fuel injector

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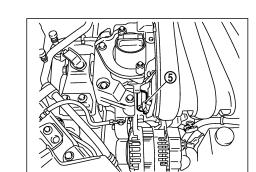


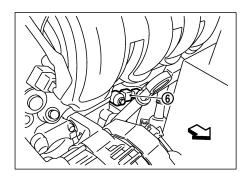
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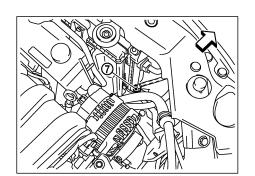
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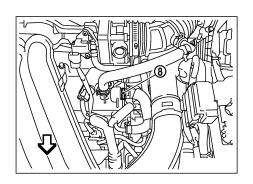
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1. ECM harness connectors

4. Fuel pump fuse (15A)

7. Refrigerant pressure sensor

Vehicle front

2. ECM

 Intake valve timing control solenoid 6. valve

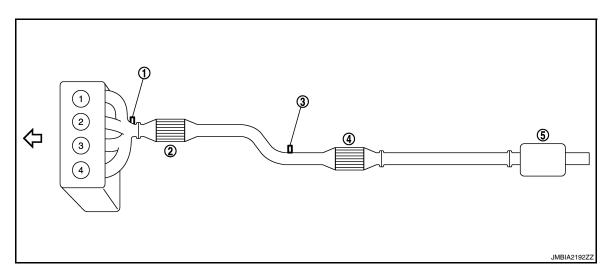
8. PCV valve

3. IPDM E/R

Knock sensor

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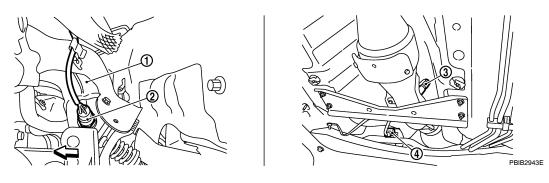
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- 1. Air fuel ratio (A/F) sensor 1
- 4. Three way catalyst (Under flloor)
- Vehicle front

- 2. Three way catalyst (Manifold)
- 5. Muffler

3. Heated oxygen sensor 2



- 1. Exhaust manifold
- 4. Heated oxygen sensor 2 harness connector
- Vehicle front

- 2. Air fuel ratio (A/F) sensor 1
- 3. Heated oxygen sensor 2

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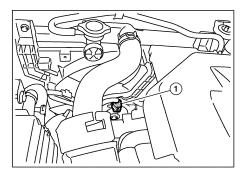
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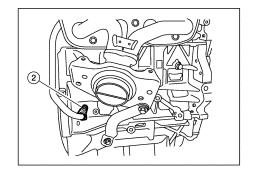
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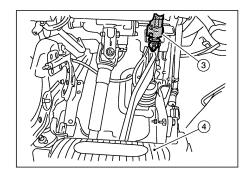
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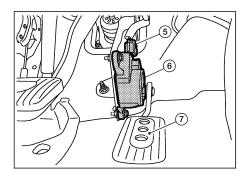
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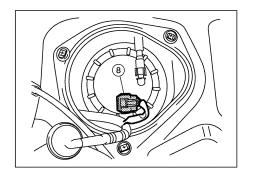
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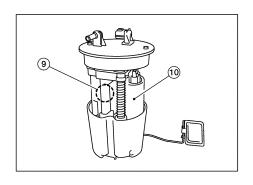












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- Cooling fan motor harness connector
- 4. Brake pedal
- 7. Accelerator pedal

- 2. Crankshaft position sensor
- 5. Accelerator pedal position sensor harness connector
- 8. Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)
- 3. Stop lamp switch
- 6. Accelerator pedal position sensor
  - Fuel pressure regulator

10. Fuel pump

# **Component Description**

INFOID:0000000004780013

Component	Reference
A/F sensor 1	EC-182, "Description"
Accelerator pedal position sensor	EC-399, "Description"
Camshaft position sensor (PHASE)	EC-268, "Description"
Crankshaft position sensor (POS)	EC-263. "Description"

## **MULTIPORT FUEL INJECTION SYSTEM**

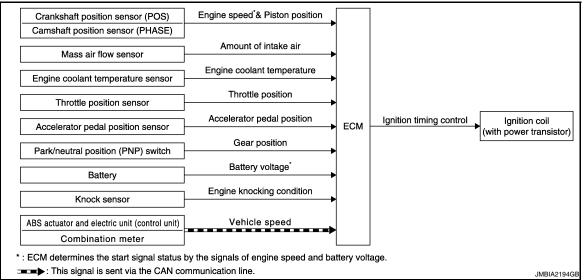
## < FUNCTION DIAGNOSIS >

[HR16DE]

Component	Reference
Engine coolant temperature sensor	EC-167, "Description"
Fuel injector	EC-430. "Description"
Heated oxygen sensor 2	EC-204, "Description"
Intake air temperature sensor	EC-162, "Description"
Knock sensor	EC-259, "Description"
Mass air flow sensor	EC-148, "Description"
Park/neutral position switch	EC-362, "Description"
Throttle position sensor	EC-171, "Description"

### **ELECTRIC IGNITION SYSTEM**

System Diagram



# System Description

INFOID:0000000004780015

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#### INPUT/OUTPUT SIGNAL CHART

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

<sup>\*1:</sup> This signal is sent to the ECM via the CAN communication line.

#### SYSTEM DESCRIPTION

Ignition order: 1 - 3 - 4 - 2

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

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

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

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

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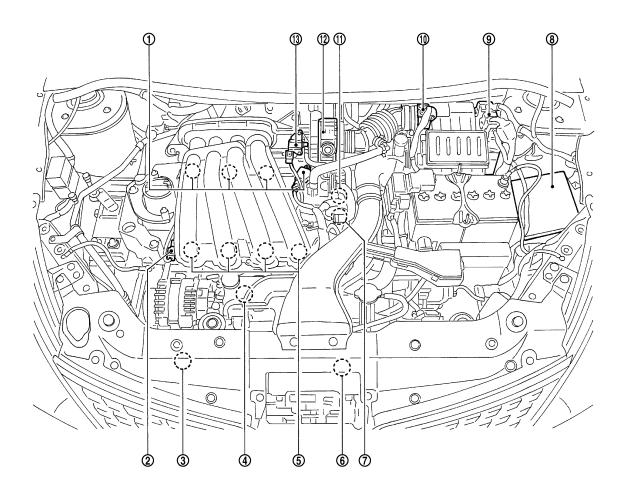
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<sup>\*2:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

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

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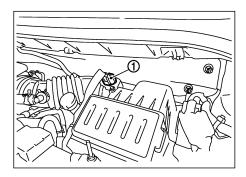


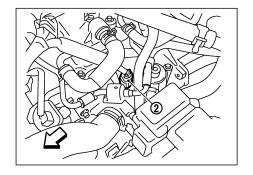
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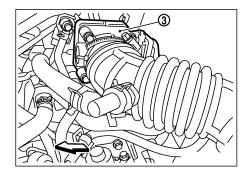
- Ignition coil (with power transistor) and spark plug
- Knock sensor 4.
- Camshaft position sensor (PHASE)
- 10. Mass air flow sensor (with intake air 11. Engine coolant temperature sensor temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- Intake valve timing control solenoid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

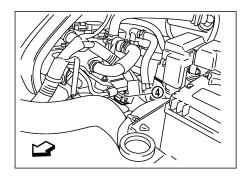
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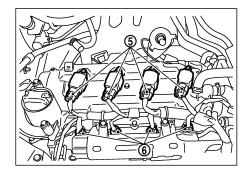
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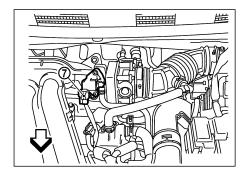












PBIB2940E

- Mass air flow sensor
   (with intake air temperature sensor)
- 4. Camshaft position sensor (PHASE) 5.
- 7. EVAP canister purge volume control solenoid valve
- Vehicle front

- 2. Engine coolant temperature sensor
  - Ignition coil (with power transistor)
- 3. Electric throttle control actuator
  - Fuel injector

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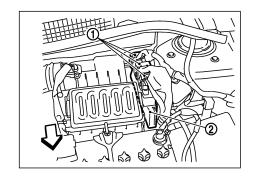
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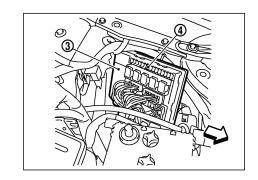
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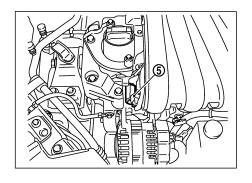
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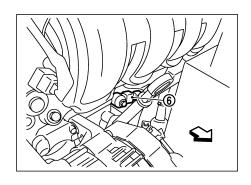
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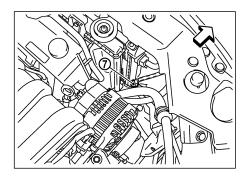
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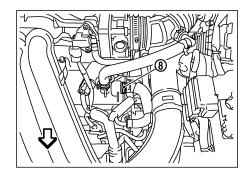












PBIB2941E

- 1. ECM harness connectors
- 4. Fuel pump fuse (15A)
- 7. Refrigerant pressure sensor
- Vehicle front

- 2. ECM
- 5. Intake valve timing control solenoid 6. valve
- PCV valve

- 3. IPDM E/R
- 6. Knock sensor

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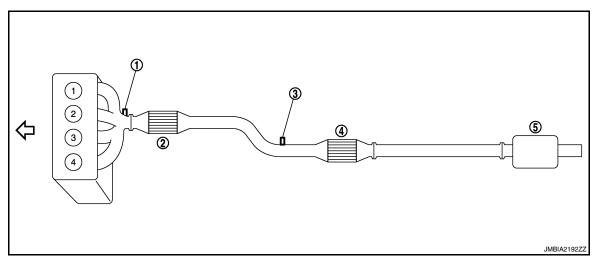
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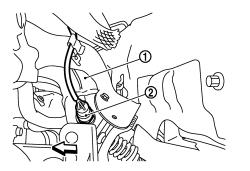


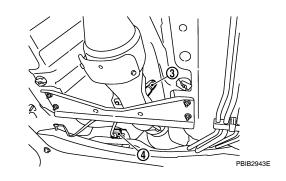
Air fuel ratio (A/F) sensor 1

Vehicle front

- Three way catalyst (Under flloor)
- 2. Three way catalyst (Manifold)
- Muffler

3. Heated oxygen sensor 2



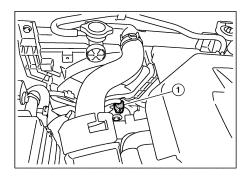


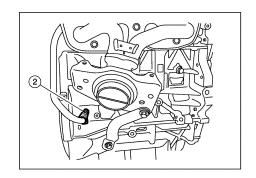
- 1. Exhaust manifold
- Heated oxygen sensor 2 harness connector
- Vehicle front

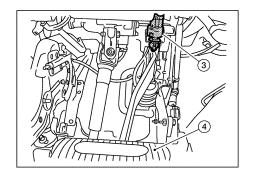
- Air fuel ratio (A/F) sensor 1
- Heated oxygen sensor 2

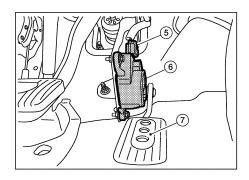
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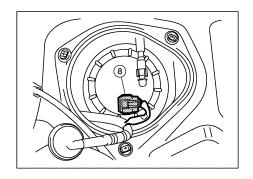
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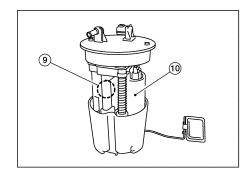












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- 1. Cooling fan motor harness connector 2. tor
- 4. Brake pedal
- 7. Accelerator pedal

- 2. Crankshaft position sensor
- Accelerator pedal position sensor harness connector
- Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)
- 3. Stop lamp switch
- 6. Accelerator pedal position sensor
  - Fuel pressure regulator

10. Fuel pump

# Component Description

INFOID:0000000004780017

Component	Reference
Accelerator pedal position sensor	EC-399, "Description"
Camshaft position sensor (PHASE)	EC-268, "Description"
Crankshaft position sensor (POS)	EC-263, "Description"
Engine coolant temperature sensor	EC-167, "Description"

# **ELECTRIC IGNITION SYSTEM**

## < FUNCTION DIAGNOSIS >

[HR16DE]
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Component	Reference
Ignition signal	EC-439, "Description"
Knock sensor	EC-259, "Description"
Mass air flow sensor	EC-148. "Description"
Park/neutral position switch	EC-362, "Description"
Throttle position sensor	EC-171, "Description"
Vehicle speed sensor	EC-347, "Description"

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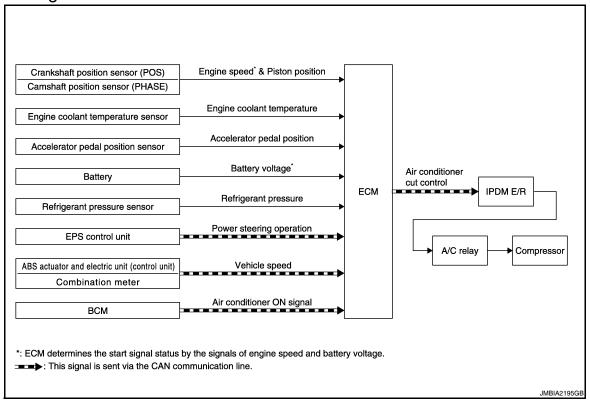
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# < FUNCTION DIAGNOSIS >

# AIR CONDITIONING CUT CONTROL

System Diagram INFOID:0000000004780018



## **System Description**

INFOID:0000000004780019

[HR16DE]

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch*1	Air conditioner ON signal		
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		IPDM E/R
Battery	Battery voltage*2	Air conditioner cut control	↓     Air conditioner relay
Refrigerant pressure sensor	Refrigerant pressure	Cut Control	Compressor
EPS control unit	Power steering operation		Compressor
ABS actuator and electric unit (control unit)			
Combination meter	Vehicle speed*1		
BCM	Air conditioner ON signal*1		

<sup>\*1:</sup> This signal is sent to the ECM via the CAN communication line.

#### SYSTEM DESCRIPTION

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

- When the accelerator pedal is fully depressed.
- · When cranking the engine.
- · At high engine speeds.
- When the engine coolant temperature becomes excessively high.

<sup>\*2:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

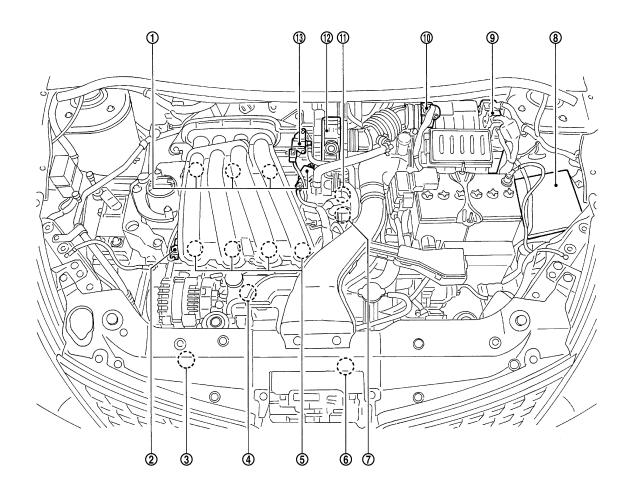
[HR16DE]

- · 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:0000000004780020

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PBIB2939E

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

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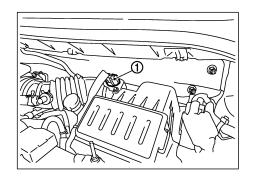
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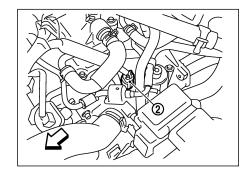
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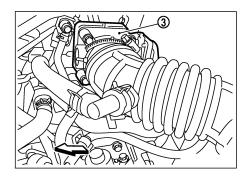
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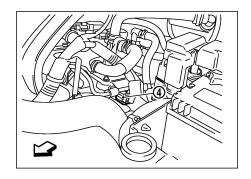
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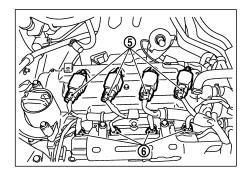
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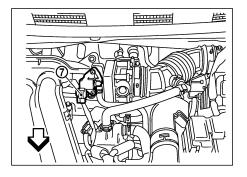












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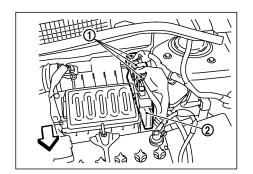
- Mass air flow sensor (with intake air temperature sensor)
- 4. Camshaft position sensor (PHASE) 5.
- 7. EVAP canister purge volume control solenoid valve
- Vehicle front

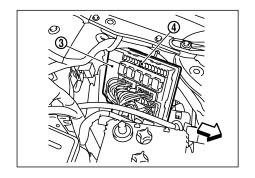
- Engine coolant temperature sensor 3.
- Ignition coil (with power transistor) 6.
- 3. Electric throttle control actuator
- 6. Fuel injector

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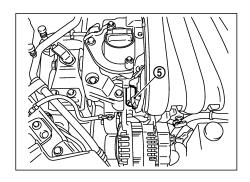


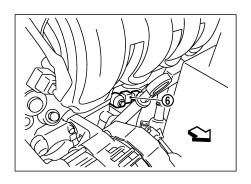




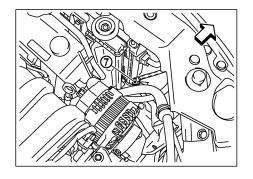
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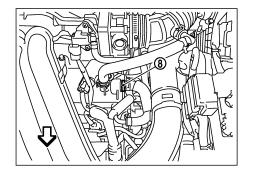
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PBIB2941E

- 1. ECM harness connectors
- 4. Fuel pump fuse (15A)
- 7. Refrigerant pressure sensor
- Vehicle front

- 2. ECM
- Intake valve timing control solenoid 6. valve
- 8. PCV valve

- 3. IPDM E/R
  - Knock sensor

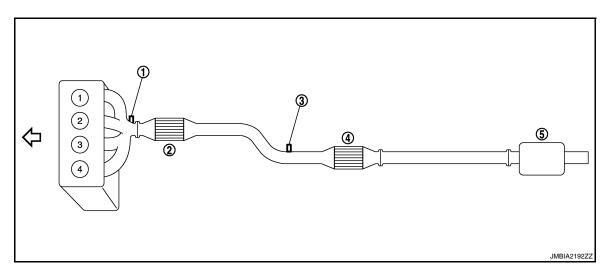
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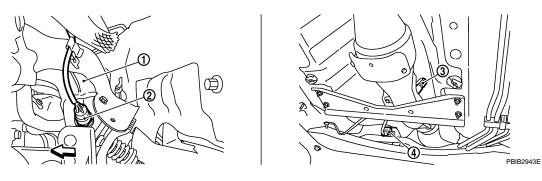
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- 1. Air fuel ratio (A/F) sensor 1
- 4. Three way catalyst (Under flloor)
- Vehicle front

- 2. Three way catalyst (Manifold)
- 5. Muffler

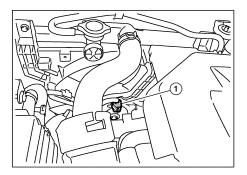
3. Heated oxygen sensor 2

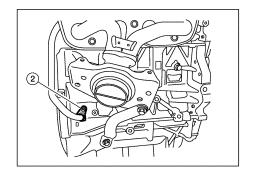


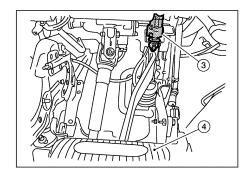
- Exhaust manifold
- 4. Heated oxygen sensor 2 harness connector
- Vehicle front

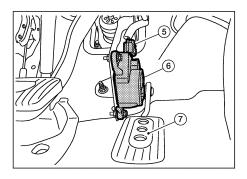
- 2. Air fuel ratio (A/F) sensor 1
- 3. Heated oxygen sensor 2

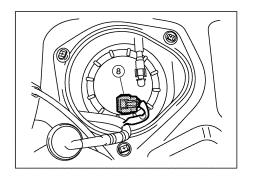
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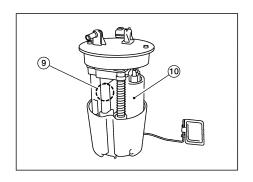












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- Cooling fan motor harness connector
- 4. Brake pedal
- 7. Accelerator pedal
- 2. Crankshaft position sensor
- 5. Accelerator pedal position sensor harness connector
- 8. Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)
- 3. Stop lamp switch
- 6. Accelerator pedal position sensor
  - Fuel pressure regulator

10. Fuel pump

# **Component Description**

INFOID:0000000004780021

Component	Reference
Accelerator pedal position sensor	EC-399, "Description"
Camshaft position sensor (PHASE)	EC-268. "Description"
Crankshaft position sensor (POS)	EC-263, "Description"

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## AIR CONDITIONING CUT CONTROL

### < FUNCTION DIAGNOSIS >

[HR16DE]

Component	Reference
Engine coolant temperature sensor	EC-167, "Description"
Refrigerant pressure sensor	EC-457, "Description"

### **CAN COMMUNICATION**

< FUNCTION DIAGNOSIS >

[HR16DE]

## **CAN COMMUNICATION**

# **System Description**

INFOID:0000000004780026

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-26, "CAN Communication Signal Chart", about CAN communication for detail..

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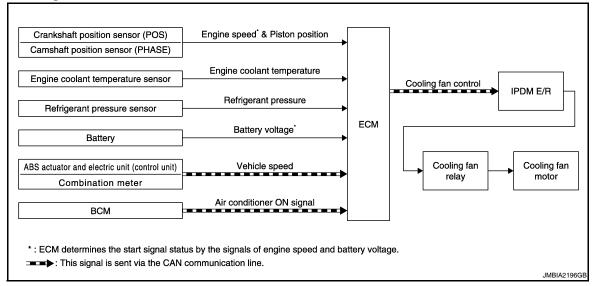
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[HR16DE]

### **COOLING FAN CONTROL**

System Diagram

INFOID:0000000004780027



## System Description

INFOID:0000000004780028

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1		
Battery	Battery voltage*1	Cooling fan control  IPDM E/R  Cooling fan relay  Cooling fan motor	IPDM E/R
ABS actuator and electric unit (control unit)	V-bi-la		↓
Combination meter	Vehicle speed* <sup>2</sup>		
Engine coolant temperature sensor	Engine coolant temperature		
BCM	Air conditioner ON signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

<sup>\*1:</sup> The ECM determines the start signal status by the signals of engine speed and battery voltage.

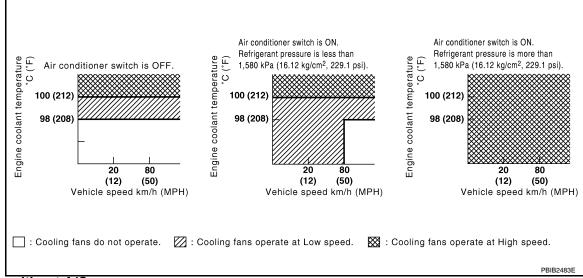
#### SYSTEM DESCRIPTION

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

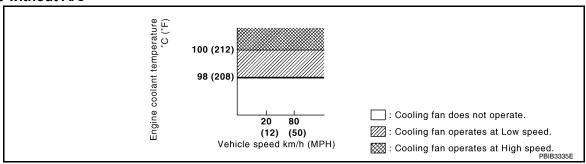
Cooling Fan Operation

<sup>\*2:</sup> This signal is sent to ECM via the CAN communication line.

### Models with A/C



Models without A/C



Cooling Fan Relay Operation

The ECM controls cooling fan relays via the CAN communication line.

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

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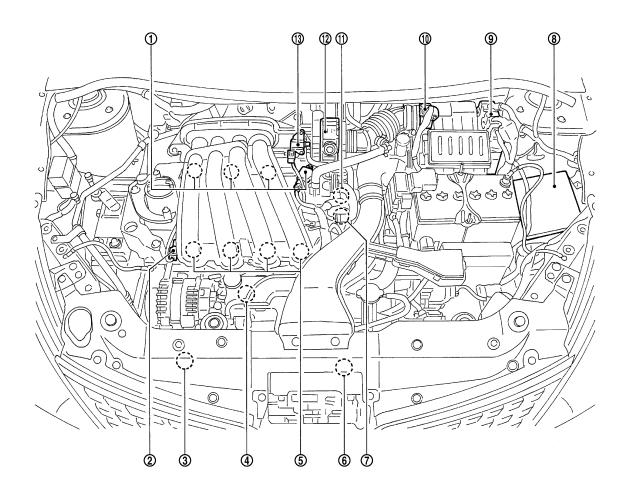
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## Component Parts Location

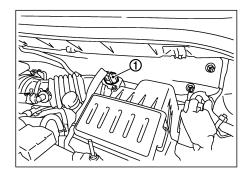
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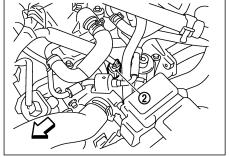


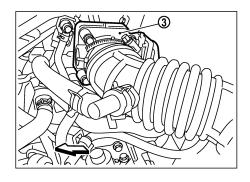
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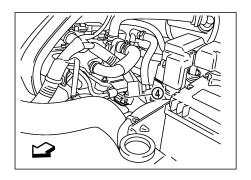
- Ignition coil (with power transistor) and spark plug
- 4. Knock sensor
- Camshaft position sensor (PHASE)
- 10. Mass air flow sensor (with intake air 11. Engine coolant temperature sensor temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- Intake valve timing control solenoid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

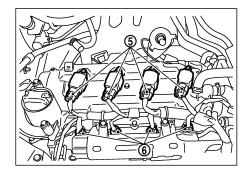
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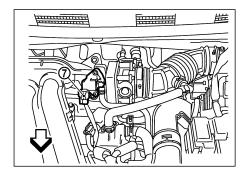












PBIB2940E

- Mass air flow sensor 1. (with intake air temperature sensor)
- Camshaft position sensor (PHASE) 5.
- EVAP canister purge volume control solenoid valve
- Vehicle front

- Engine coolant temperature sensor 2.
  - Ignition coil (with power transistor)
- 3. Electric throttle control actuator
  - Fuel injector

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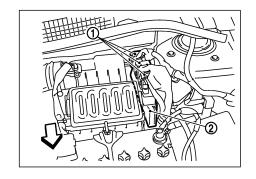
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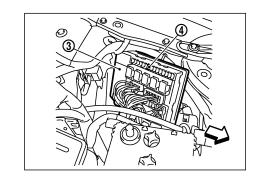
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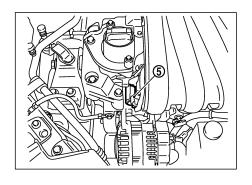
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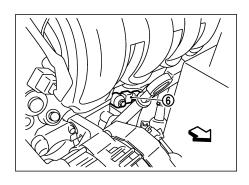
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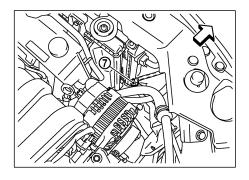
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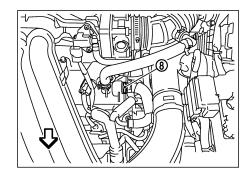












PBIB2941E

- 1. ECM harness connectors
- 4. Fuel pump fuse (15A)
- 7. Refrigerant pressure sensor
- Vehicle front

- 2. ECM
- 5. Intake valve timing control solenoid 6. valve
- 8. PCV valve

- 3. IPDM E/R
- Knock sensor

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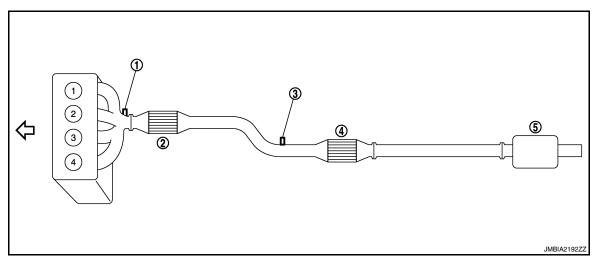
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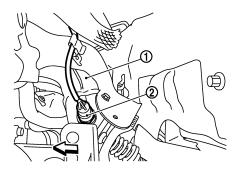
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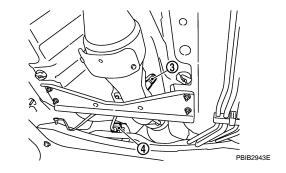
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- Air fuel ratio (A/F) sensor 1
- Three way catalyst (Under flloor)
- 2. Three way catalyst (Manifold) Muffler
- 3. Heated oxygen sensor 2

Vehicle front





- 1. Exhaust manifold
- Heated oxygen sensor 2 harness connector
- Vehicle front

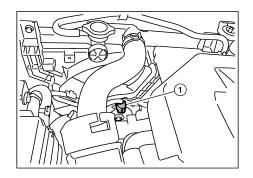
- Air fuel ratio (A/F) sensor 1
- Heated oxygen sensor 2

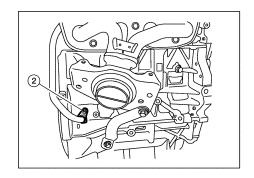
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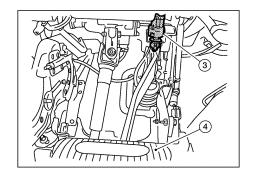
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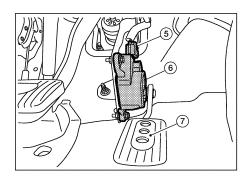
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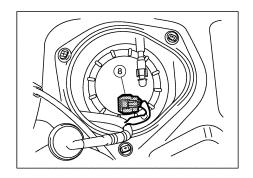
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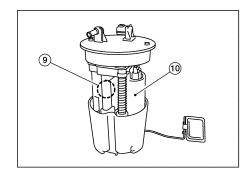












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- 1. Cooling fan motor harness connector 2. tor
- 4. Brake pedal
- 7. Accelerator pedal

- 2. Crankshaft position sensor
- Accelerator pedal position sensor harness connector
- Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)
- 3. Stop lamp switch
- 6. Accelerator pedal position sensor
  - Fuel pressure regulator

10. Fuel pump

# **Component Description**

INFOID:0000000004780030

Component	Reference
Camshaft position sensor (PHASE)	EC-268, "Description"
Crankshaft position sensor (POS)	EC-263, "Description"
Cooling fan motor	EC-66, "System Description"

# **COOLING FAN CONTROL**

# < FUNCTION DIAGNOSIS >

[HR16DE]

Component	Reference		
Engine coolant temperature sensor	EC-167, "Description"		
Refrigerant pressure sensor	EC-457. "Description"		

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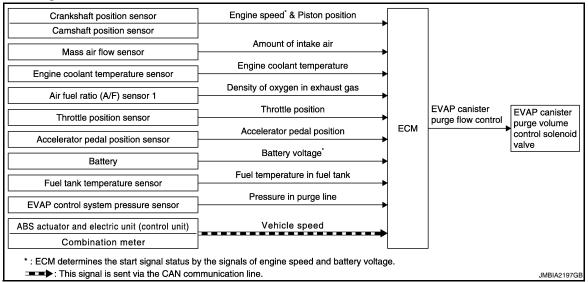
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# **EVAPORATIVE EMISSION SYSTEM**

# System Diagram

INFOID:0000000004780031



# **System Description**

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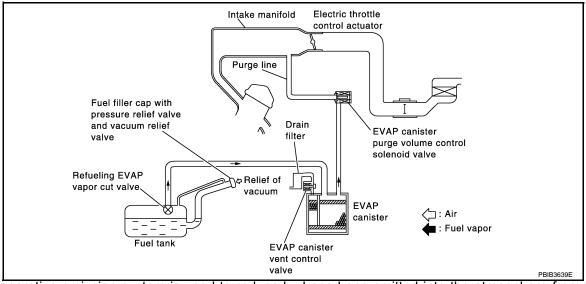
## INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position	EVAD assistan	E) (A D and international
Accelerator pedal position sensor	Accelerator pedal position	EVAP canister purge flow control	EVAP canister purge vol- ume control solenoid valve
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		
ABS actuator and electric unit (control unit)	Vehicle speed*2		
Combination meter	verlicie speed -		

<sup>\*1:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

<sup>\*2:</sup> 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**

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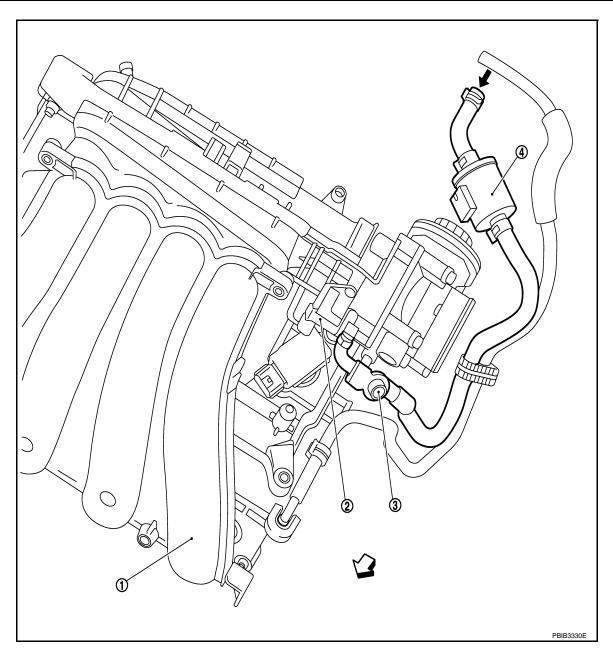
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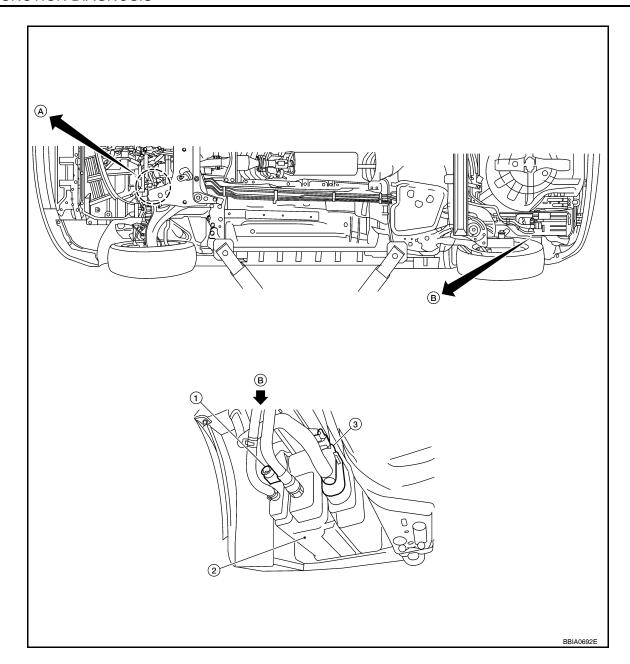
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- 1. Intake manifold collector
- 4. EVAP purge resonator
- Vehicle front

- 2. EVAP canister purge volume control 3. EVAP service port solenoid valve
- From next figure



- 1. EVAP control system pressure sensor 2. EVAP canister
- 3. EVAP canister vent control valve
- A. To previous figure

#### NOTE:

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

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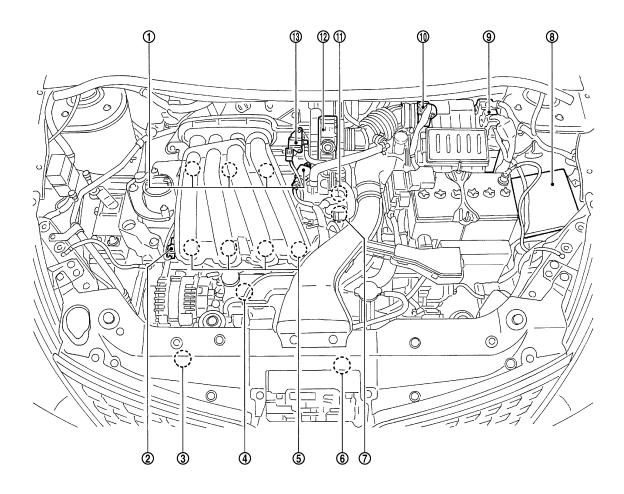
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# Component Parts Location

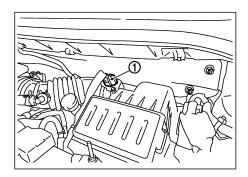
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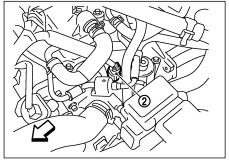


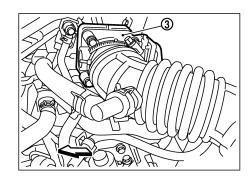
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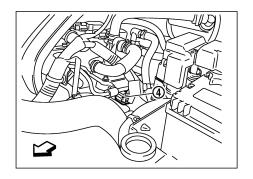
- Ignition coil (with power transistor) and spark plug
- 4. Knock sensor
- Camshaft position sensor (PHASE)
- 10. Mass air flow sensor (with intake air 11. Engine coolant temperature sensor temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- Intake valve timing control solenoid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

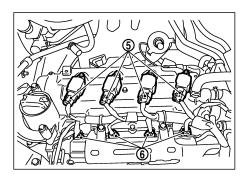
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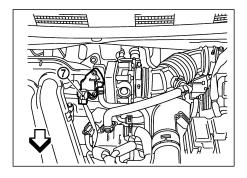








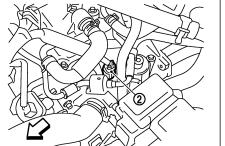




PBIB2940E

- Mass air flow sensor 1. (with intake air temperature sensor)
- Camshaft position sensor (PHASE) 5.
- EVAP canister purge volume control solenoid valve
- Vehicle front

- Engine coolant temperature sensor 2.
  - Ignition coil (with power transistor)
- 3. Electric throttle control actuator
  - Fuel injector



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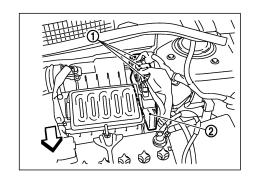
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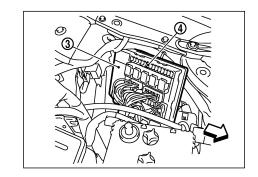
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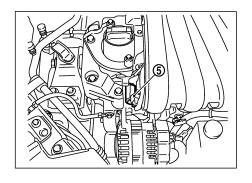
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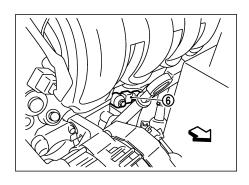
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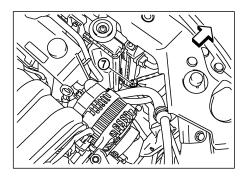
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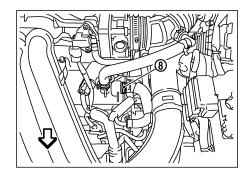












PBIB2941E

- 1. ECM harness connectors
- 4. Fuel pump fuse (15A)
- 7. Refrigerant pressure sensor
- Vehicle front

- 2. ECM
- 5. Intake valve timing control solenoid 6. valve
- 8. PCV valve

- 3. IPDM E/R
- 6. Knock sensor

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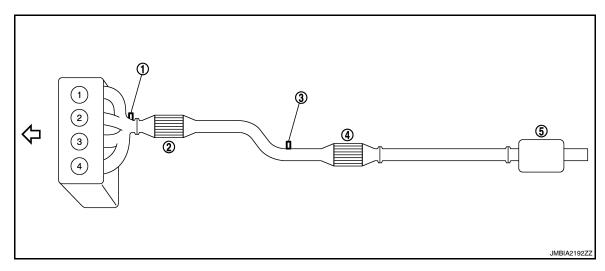
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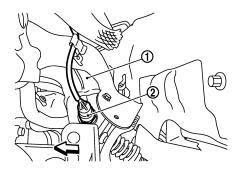
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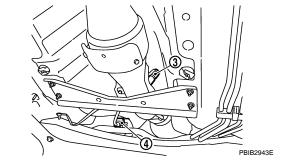
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- Air fuel ratio (A/F) sensor 1
- Three way catalyst (Under flloor)
- 2. Three way catalyst (Manifold) Muffler
- 3. Heated oxygen sensor 2

Vehicle front





- 1. Exhaust manifold
- Heated oxygen sensor 2 harness connector
- Vehicle front

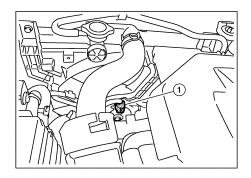
- Air fuel ratio (A/F) sensor 1
- Heated oxygen sensor 2

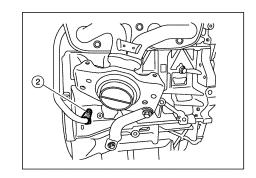
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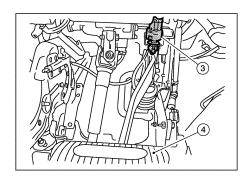
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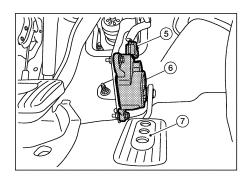
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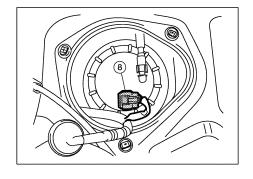
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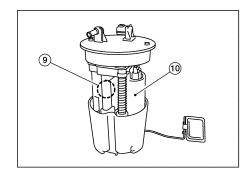












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- Cooling fan motor harness connector
- 4. Brake pedal
- 7. Accelerator pedal

- 2. Crankshaft position sensor
- Accelerator pedal position sensor harness connector
- Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)
- 3. Stop lamp switch
- 6. Accelerator pedal position sensor
  - Fuel pressure regulator

10. Fuel pump

# Component Description

INFOID:0000000004780034

Component	Reference		
A/F sensor 1	EC-182, "Description"		
Accelerator pedal position sensor	EC-399, "Description"		
Camshaft position sensor (PHASE)	EC-268, "Description"		
Crankshaft position sensor (POS)	EC-263, "Description"		

# **EVAPORATIVE EMISSION SYSTEM**

# < FUNCTION DIAGNOSIS >

[HR16DE]

Component	Reference
Engine coolant temperature sensor	EC-167, "Description"
EVAP canister purge volume control solenoid valve	EC-291, "Description"
EVAP control system pressure sensor	EC-312, "Description"
Fuel tank temperature sensor	EC-240. "Description"
Mass air flow sensor	EC-148, "Description"
Throttle position sensor	EC-171, "Description"

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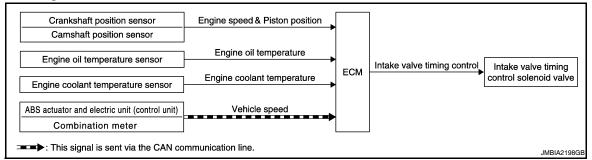
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## INTAKE VALVE TIMING CONTROL

# System Diagram

INFOID:0000000004780035



# System Description

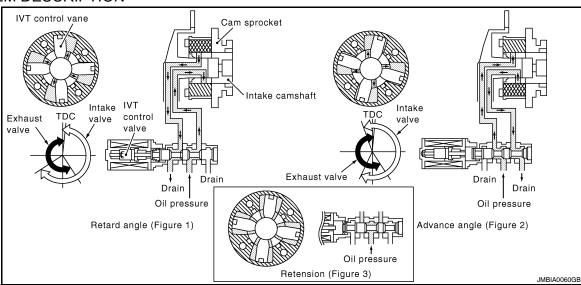
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#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	Engine speed and piston position			
Camshaft position sensor (PHASE)	Engine speed and piston position	Intake valve timing control	Intake valve timing control solenoid valve	
Engine coolant temperature sensor	Engine coolant temperature			
ABS actuator and electric unit (control unit)	Vehicle speed*	g	COLOTICIA VALVO	
Combination meter	verlicie speed			

<sup>\*:</sup> This signal is sent to the ECM via the CAN communication line

#### SYSTEM DESCRIPTION

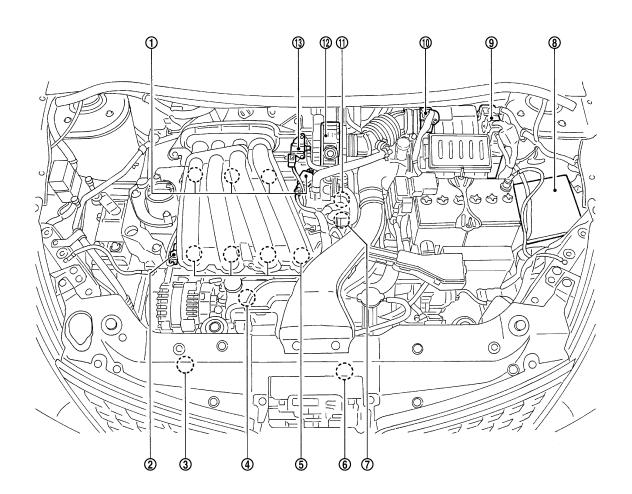


This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

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:0000000004780037



PBIB2939E

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

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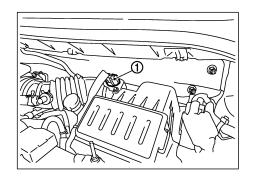
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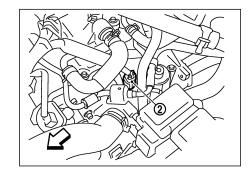
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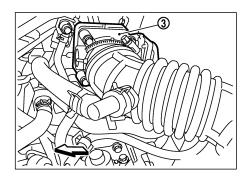
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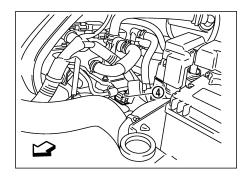
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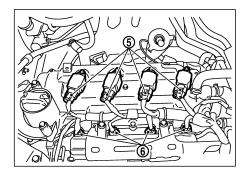
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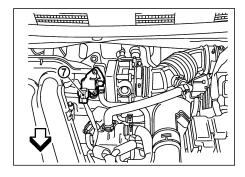












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- Mass air flow sensor (with intake air temperature sensor)
- 4. Camshaft position sensor (PHASE) 5.
- 7. EVAP canister purge volume control solenoid valve
- Vehicle front

- Engine coolant temperature sensor 3.
  - Ignition coil (with power transistor) 6.
- 3. Electric throttle control actuator
- 6. Fuel injector

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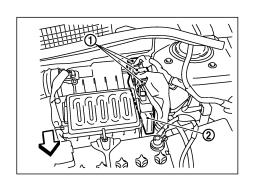
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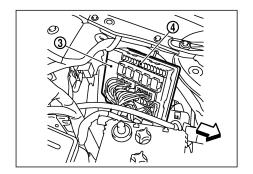
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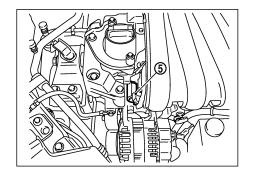
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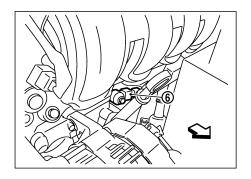
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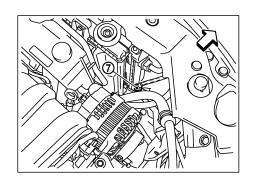
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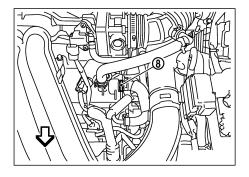










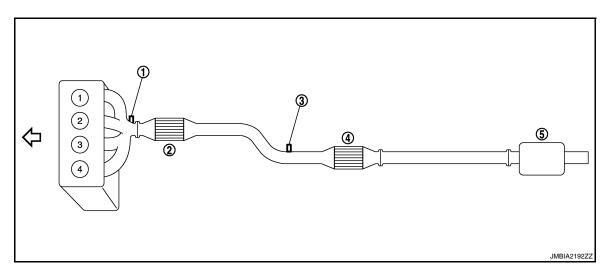


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- 1. ECM harness connectors
- 4. Fuel pump fuse (15A)
- 7. Refrigerant pressure sensor
- Vehicle front

- 2. ECM
- Intake valve timing control solenoid 6. valve
- 8. PCV valve

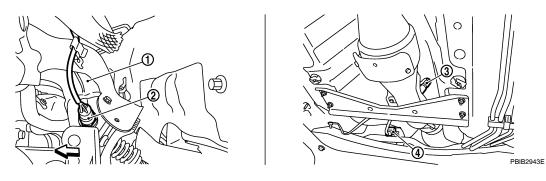
- 3. IPDM E/R
  - Knock sensor



- 1. Air fuel ratio (A/F) sensor 1
- 4. Three way catalyst (Under flloor)
- Vehicle front

- 2. Three way catalyst (Manifold)
- 5. Muffler

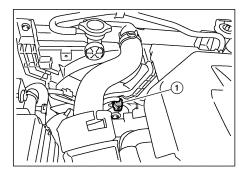
3. Heated oxygen sensor 2

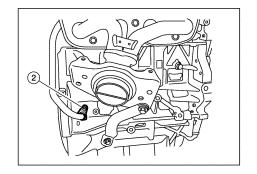


- Exhaust manifold
- 4. Heated oxygen sensor 2 harness connector
- Vehicle front

- 2. Air fuel ratio (A/F) sensor 1
- 3. Heated oxygen sensor 2

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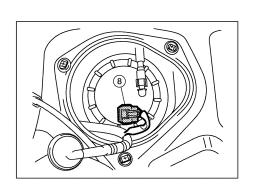
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Cooling fan motor harness connector.

. Crankshaft position sensor

3. Stop lamp switch

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4. Brake pedal

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- 5. Accelerator pedal position sensor harness connector
- Accelerator pedal position sensor
- Fuel pressure regulator

- 7. Accelerator pedal
- 8. Fuel level sensor unit and fuel pump 9. harness connector (view with inspection hole cover removed)

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10. Fuel pump

# **Component Description**

INFOID:0000000004780038

Component	Reference		
Camshaft position sensor (PHASE)	EC-268, "Description"		
Crankshaft position sensor (POS)	EC-263, "Description"		
Engine coolant temperature sensor	EC-167, "Description"		
Intake valve timing control solenoid valve	EC-84, "System Description"		

# **Diagnosis Description**

#### INFOID:0000000004780039

#### 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	×	×*	_	_	_	×	_

<sup>\*:</sup> 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 lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to <a href="EC-472">EC-472</a>. <a href="Fail Safe"</a>.)

#### 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 light up at this stage. <1st trip>

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

x: Applicable —: Not applicable

	MIL				DTC		1st trip DTC	
Items	1st trip		2nd trip		4-44	0 - 11 - 1	4-112-	0 11:
	Blinking	Lighting up	Blinking	Lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	_	_	_	_	_	×	_
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	_	_	×	_	_	×	_	_
One trip detection diagnoses (Refer to EC-475, "DTC Index".)	_	×	_	_	×	_	_	_
Except above	_	_	_	×	_	×	×	_

#### DTC AND FREEZE FRAME DATA

DTC and 1st Trip DTC

[HR16DE]

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 stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

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-475, "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 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-22, "Work Flow". Then perform DTC CONFIR-MATION 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 - P0304 Fuel Injection System Function — DTC: P0171, P0172		
2		Except the above items (Includes A/T related items)		
3	1st trip freeze frame da	ata		

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

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.

**EC-91** 

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[HR16DE]

# < FUNCTION DIAGNOSIS >

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.

#### NOTE:

- 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. Therefore, using CONSULT-III (if available) is recommended.

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 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 (<u>EC-475, "DTC Index"</u>), skip step 1.
- 1. Erase DTC in TCM. Refer to AT-39, "OBD-II Diagnostic Trouble Code (DTC)".
- 2. Select "ENGINE" with CONSULT-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.

- 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".

[HR16DE]

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
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
		Heated oxygen sensor 2	P0137
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139

<sup>\*:</sup> 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.

				Example		
Self-diagn	osis result	Diagnosis $ \begin{array}{c} \text{Ignition cycle} \\ \leftarrow \text{ON} \rightarrow \text{ OFF } \leftarrow \text{ON} \rightarrow \text{ OFF } \leftarrow \text{ON} \rightarrow \text{ OFF } \leftarrow \text{ON} \\ \end{array} $			F ← 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"

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< FUNCTION DIAGNOSIS >

[HR16DE]

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.

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

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

If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT".  $\rightarrow$  Case 3 above

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

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

#### NOTE:

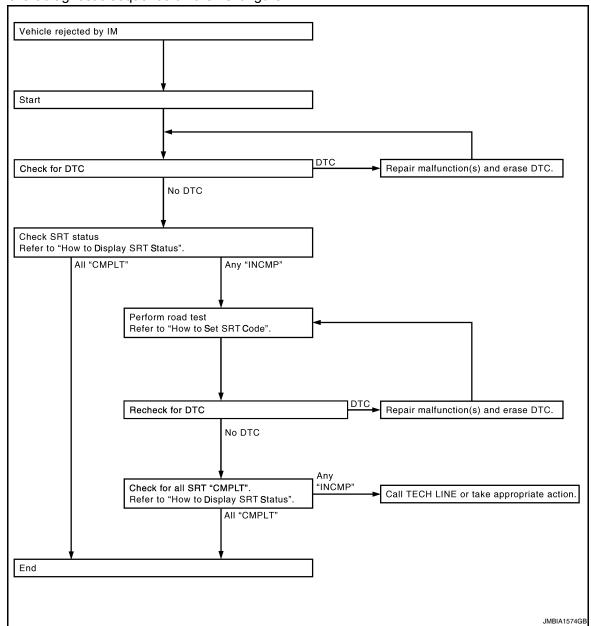
SRT can be set as "CMPLT" together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates "CMPLT".

SRT Service Procedure

<sup>-:</sup> Self-diagnosis is not carried out.

[HR16DE] < FUNCTION DIAGNOSIS >

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, a "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 can not be displayed while only SRT status can be.

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

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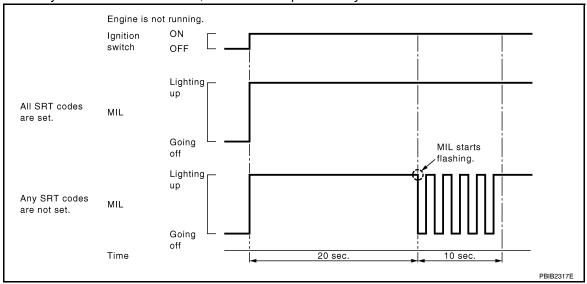
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· When any SRT codes are not set, MIL will flash periodically for 10 seconds.

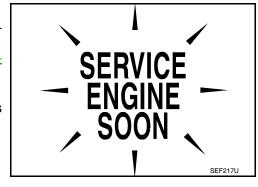


## MALFUNCTION INDICATOR LAMP (MIL)

## Description

The MIL is located on the instrument panel.

- The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, refer to <u>EC-446</u>, "Component Function Check".
- 2. When the engine is started, the MIL should go off. If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



On Board Diagnostic System Function

The on board diagnostic system has the following three functions.

< FUNCTION DIAGNOSIS >

[HR16DE]

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position	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 stopped		
	Engine running	MALFUNCTION WARNING	When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up 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 the bulb. Refer to <u>EC-446</u>, "Description".

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-

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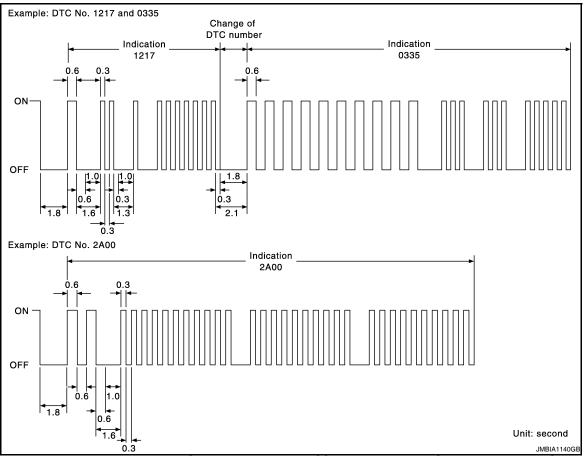
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tified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



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

Number	0	1	2	3	4	5	6	7	8	9	Α	В	С	D	Е	F
Flashes	10	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16

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

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle. A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

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

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See <u>EC-475</u>, "<u>DTC Index"</u>)

How to Switch Diagnostic Test Mode

## NOTE:

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

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

- 1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 2. Repeat the following procedure quickly five times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.

#### NOTE:

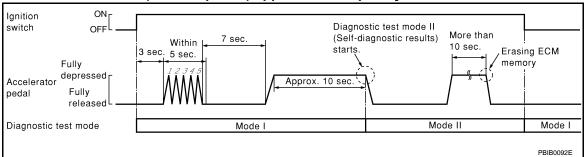
Do not release the accelerator pedal for 10 seconds if MIL start blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

< FUNCTION DIAGNOSIS >

Fully release the accelerator pedal.

ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).

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)

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

## **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 go off after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF DIAGNOSTIC RESULT" mode of CON-SULT-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 (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

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

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

\*1: Clear timing is at the moment OK is detected.

\*2: Clear timing is when the same malfunction is detected in the 2nd trip.

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

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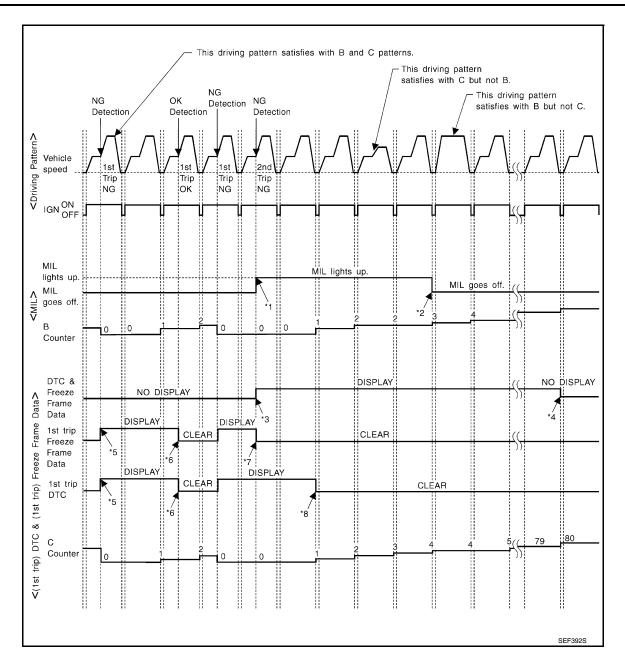
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- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*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.
- \*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the 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.

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.

< FUNCTION DIAGNOSIS > [HR16DE]

• 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 go off when the B counter reaches 3. (\*2 in "OBD SYSTEM OPERATION CHART")

<Driving Pattern C>

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

The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data)  $\pm$  375 rpm

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

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

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

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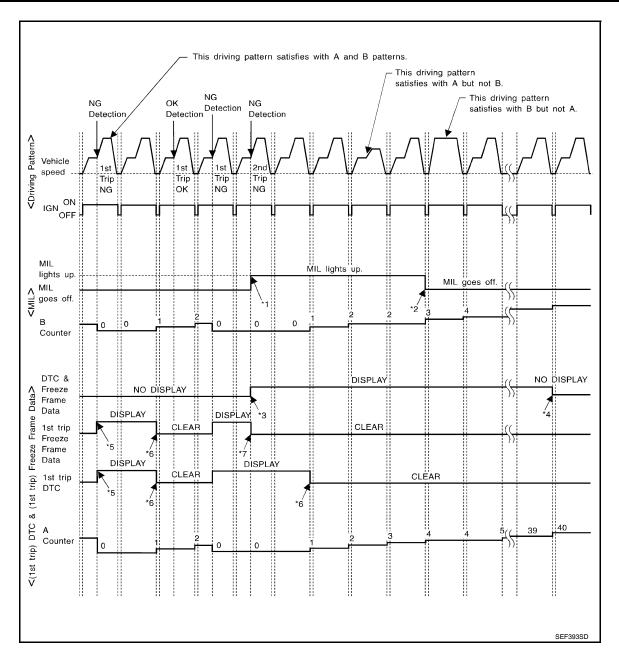
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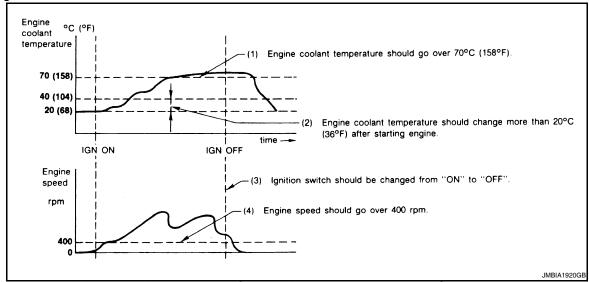
- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*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.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the 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.

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

< FUNCTION DIAGNOSIS > [HR16DE]

<Driving Pattern A>



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

<Driving Pattern B>

Driving pattern B means the vehicle operation as 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 go off when the B counter reaches 3 (\*2 in OBD SYSTEM OPERATION CHART).

# **CONSULT-III Function**

INFOID:0000000004780040

#### **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 screen.
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.
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 their vehicle condition 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

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_					DIAGNOS	STIC TEST	MODE		
				Self Diagr	nostic Result			DTC 8	
		Item	Work Support	DTC*1	FREEZE FRAME DATA*2	Data Monitor	Active Test	SRT STA- TUS	DTC WORK SUP- PORT
		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		×		×		×	×
S		Vehicle speed signal		×	×	×			
ART		Accelerator pedal position sensor		×		×			
T P.		Throttle position sensor		×	×	×			
Ä		Fuel tank temperature sensor		×		×	×		
PO		EVAP control system pressure sensor		×		×			
Š	INPUT	Intake air temperature sensor		×	×	×			
2	Ξ	Knock sensor		×					
IR		Refrigerant pressure sensor				×			
ENGINE CONTROL COMPONENT PARTS		Closed throttle position switch (accelerator pedal position sensor signal)				×			
<u>5</u>		Air conditioner ON signal				×			
Ш		Park/neutral position (PNP) switch		×		×			
		Stop lamp switch		×		×			
		Power steering operation signal				×			
		Battery voltage				×			
		Load signal				×			
		Primary speed sensor		×		×			
		Fuel level sensor signal		×		×			
_		Fuel injector				×	×		
		Power transistor (Ignition timing)				×	×		
XTS		Throttle control motor relay		×		×			
PAF		Throttle control motor		×					
ENGINE CONTROL COMPONENT PARTS		EVAP canister purge volume control solenoid valve		×		×	×		×
ИРО	_	Air conditioner relay				×			
Ö	OUTPUT	Fuel pump relay	×			×	×		
5	OG.	Cooling fan relay		×		×	×		
NTR		Air fuel ratio (A/F) sensor 1 heater		×		×		×*3	
E CO		Heated oxygen sensor 2 heater		×		×		×*3	
S S S		EVAP canister vent control valve	×	×		×	×		
Ž		Intake valve timing control solenoid valve		×		×	×		
		Calculated load value			×	×			

X: Applicable

# < FUNCTION DIAGNOSIS >

\*1: This item includes 1st trip DTCs.

\*3: Always "CMPLT" is displayed.

## **WORK SUPPORT MODE**

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING.     CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT.	When clearing mixture ratio self- learning value
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-II 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 vapor leak point of EVAP system
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

<sup>\*:</sup> 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-475. "DTC Index".)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to EC-475, "DTC_Index".)
FUEL SYS-B1	"Fuel injection system status" at the moment a malfunction is detected is displayed.     One mode in the following is displayed.     Mode2: Open loop due to detected system malfunction     Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment)     Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control     Mode5: Open loop - has not yet satisfied condition to go to closed loop

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<sup>\*2:</sup> 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-90, "Diagnosis Description".

## < FUNCTION DIAGNOSIS >

Freeze frame data item*	Description
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 [%]	<ul> <li>"Long-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.</li> </ul>
S-FUEL TRM-B1 [%]	<ul> <li>"Short-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.</li> </ul>
ENGINE SPEED [rpm]	The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH·P/S [%]	The throttle valve opening angle at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	The intake air temperature at the moment a malfunction is detected is displayed.
FUEL SYS-B2	
L-FUEL TRM-B2 [%]	
S-FUEL TRM-B2 [%]	These items displayed but are not applicable to this model.
INT MANI PRES [kPa]	alepta, as and not approach to the model.
COMBUST CONDI- TION	

<sup>\*:</sup> 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).	<ul> <li>Accuracy becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul>
MAS A/F SE-B1	V	The signal voltage of the mass air flow sensor is displayed.	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>When engine is running specification range is indicated in "SPEC".</li> </ul>
B/FUEL SCHDL	ms	"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	When engine is running specification range is indicated in "SPEC".
A/F ALPHA-B1	%	The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>This data also includes the data for the air-fuel ratio learning control.</li> <li>When engine is running specification range is indicated in "SPEC".</li> </ul>
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 en- gine 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.	

# < FUNCTION DIAGNOSIS >

[HR16DE]

Monitored item	Unit	Description	Remarks
HO2S2 (B1)	V	The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR(B1)	RICH/ LEAN	Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large.	When the engine is stopped, a certain value is indicated.
VHCL SPEED SE	km/h or mph	The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
BATTERY VOLT	V	The power supply voltage of ECM is displayed.	
ACCEL SEN 1	V	The accelerator pedal position sensor signal voltage is displayed.	ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from
ACCEL SEN 2		displayed.	ECM terminal voltage signal.
TP SEN 1-B1	V	The throttle position sensor signal voltage is dis-	TP SEN 2-B1 signal is converted by  ECM internally. Thus, it differs from
TP SEN 2-B1	V	played.	ECM internally. Thus, it differs from ECM terminal voltage signal.
FUEL T/TMP SE	°C or °F	The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
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.	<ul> <li>After starting the engine, [OFF] is dis- played regardless of the starter sig- nal.</li> </ul>
CLSD THL POS	ON/OFF	<ul> <li>Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor sig- nal.</li> </ul>	
AIR COND SIG	ON/OFF	Indicates [ON/OFF] condition of the air conditioner switch determined by the air conditioner ON signal.	
P/N POSI SW	ON/OFF	Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL	ON/OFF	[ON/OFF] condition of the power steering system (de- termined by the signal sent from EPS control unit) is indicated.	
LOAD SIGNAL	ON/OFF	Indicates [ON/OFF] condition from the electrical load signal.     ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position.     OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW	ON/OFF	Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1	msec	Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	When the engine is stopped, a certain computed value is indicated.
IGN TIMING	BTDC	Indicates the ignition timing computed by ECM according to the input signals.	When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	"Calculated load value" indicates the value of the cur- rent air flow divided by peak air flow.	

## < FUNCTION DIAGNOSIS >

[HR16DE]

Monitored item	Unit	Description	Remarks
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	%	<ul> <li>Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
INT/V TIM(B1)	°CA	Indicates [°CA] of intake camshaft advance angle.	
INT/V SOL(B1)	%	<ul> <li>The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated.</li> <li>The advance angle becomes larger as the value increases.</li> </ul>	
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.	
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.	
COOLING FAN	HI/LOW/ OFF	Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI: High speed operation LOW: Low speed operation OFF: Stop	
HO2S2 HTR (B1)	ON/OFF	<ul> <li>Indicates [ON/OFF] condition of heated oxygen sen- sor 2 heater determined by ECM according to the in- put signals.</li> </ul>	
I/P PULLY SPD	rpm	Indicates the engine speed computed from the primary sped 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/CM- PLT	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.	
A/F S1 HTR(B1)	%	<ul> <li>Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals.</li> <li>The current flow to the heater becomes larger as the value increases.</li> </ul>	
AC PRESS SEN	V	The signal voltage from the refrigerant pressure sensor is displayed.	
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.	

## NOTE:

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

## **ACTIVE TEST MODE**

# ON BOARD DIAGNOSTIC (OBD) SYSTEM

## < FUNCTION DIAGNOSIS >

[HR16DE]

Test Item

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)	Α
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	EC
IGNITION TIMING	<ul> <li>Engine: Return to the original trouble condition</li> <li>Timing light: Set</li> <li>Retard the ignition timing using CONSULT-III.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learning.	C
POWER BALANCE	<ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch OFF</li> <li>Selector lever: P or N position (A/T), Neutral position (M/T)</li> <li>Cut off each fuel injector signal one at a time using CONSULT-III.</li> </ul>	Engine runs rough or dies.	Harness and connectors     Compression     Fuel injector     Power transistor     Spark plug     Ignition coil	E
COOLING FAN*	Ignition switch: ON     Turn the cooling fan "LOW", "HI" and "OFF" using CONSULT-III.	Cooling fan moves and stops.	Harness and connectors     IPDM E/R (Cooling fan relay)     Cooling fan motor	G
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	Н
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	1
PURG VOL CONT/V	<ul> <li>Engine: After warming up, run engine at 1,500 rpm.</li> <li>Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.</li> </ul>	Engine speed changes according to the opening percent.	Harness and connectors     Solenoid valve	K
FUEL/T TEMP SEN	Change the fuel tank temperature	e using CONSULT-III.		ı
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	M
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	N

<sup>\*:</sup> 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-90, "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
	EVP SML LEAK P0442/P1442*	P0442	EC-284
EVAPORATIVE SYSTEM	LVF SWILLLAN FUHHZIF 1442	P0455	EC-329
	EVP V/S LEAK P0456/P1456*	P0456	EC-335
A/F SEN1	A/F SEN1 (B1) P1278/P1279	P0133	<u>EC-198</u>
AVF SEINT	A/F SEN1 (B1) P1276	P0130	EC-182
	HO2S2 (B1) P1146	P0138	EC-212
HO2S2	HO2S2 (B1) P1147	P0137	EC-204
	HO2S2 (B1) P139	P0139	<u>EC-221</u>

<sup>\*:</sup> DTC P1442 and P1456 does not apply to C11 models but appears in DTC Work Support Mode screens.

# Diagnosis Tool Function

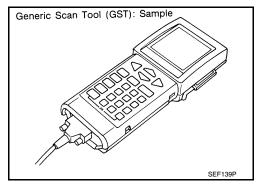
INFOID:0000000004780041

# **DESCRIPTION**

Generic Scan Tool (OBD II scan tool) complying with SAE J1978 has several functions explained below.

ISO15765-4 is used as the protocol.

The name "GST" or "Generic Scan Tool" is used in this service manual.



## **FUNCTION**

Dia	agnostic 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-475, "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.

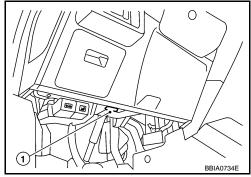
# ON BOARD DIAGNOSTIC (OBD) SYSTEM

< FUNCTION DIAGNOSIS > [HR16DE]

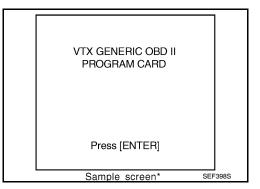
Diagnostic Service		Function
Service \$08	_	This diagnostic service can close EVAP system in ignition switch ON position (Engine stopped). When this diagnostic service is performed, EVAP canister vent control valve can be closed.  In the following conditions, this diagnostic service cannot function.  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.
- 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.

OBD II FUNCTIONS	
F0: DATA LIST	
F1: FREEZE DATA	
F2: DTCs	
F3: SNAPSHOT	
F4: CLEAR DIAG INFO	
F5: O2 TEST RESULTS	
<b>F6: READINESS TESTS</b>	
F7: ON BOARD TESTS	
F8: EXPAND DIAG PROT	
F9: UNIT CONVERSION	
Sample screen*	SEF416S

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# COMPONENT DIAGNOSIS

# TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description INFOID:000000004780042

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

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MII

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

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

# Component Function Check

INFOID:0000000004780043

# 1.START

Make sure that all of the following conditions are satisfied.

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (1.003 1.064 kg/cm<sup>2</sup>, 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
- A/T models: After the engine is warmed up to normal operating temperature, drive vehicle until "FLUID TEMP SE" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- M/T models: After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- · Engine speed: Idle

>> GO TO 2.

# 2.PERFORM "SPEC" OF "DATA MONITOR" MODE

### With CONSULT-III

#### NOTE:

Perform "SPEC" in "DATA MONITOR" mode in maximum scale display.

- 1. Perform EC-26, "BASIC INSPECTION: Special Repair Requirement".
- Select "B/FUEL SCHDL", "A/F ALPHA-B1" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that monitor items are within the SP value.

### Is the inspection result normal?

YES >> END

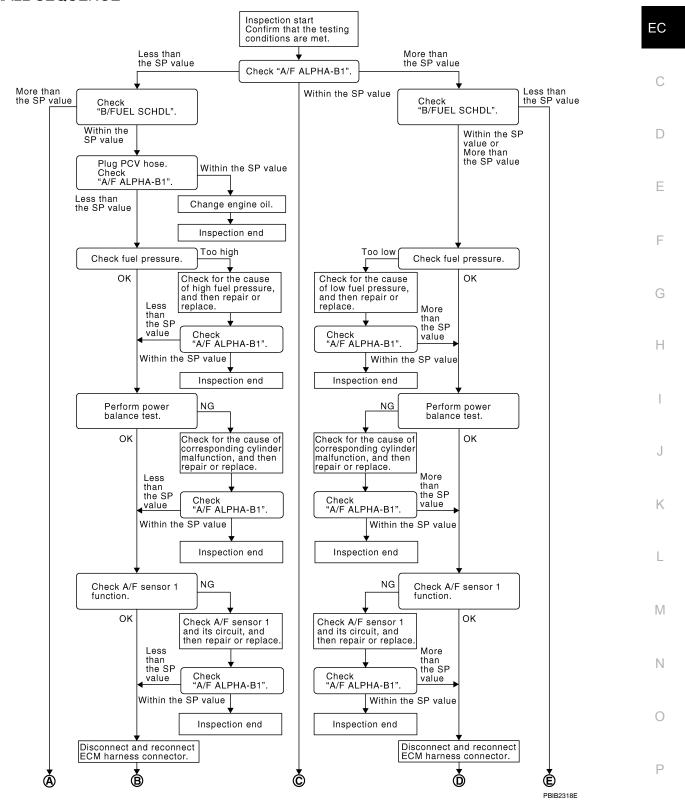
NO >> Go to EC-113, "Diagnosis Procedure".

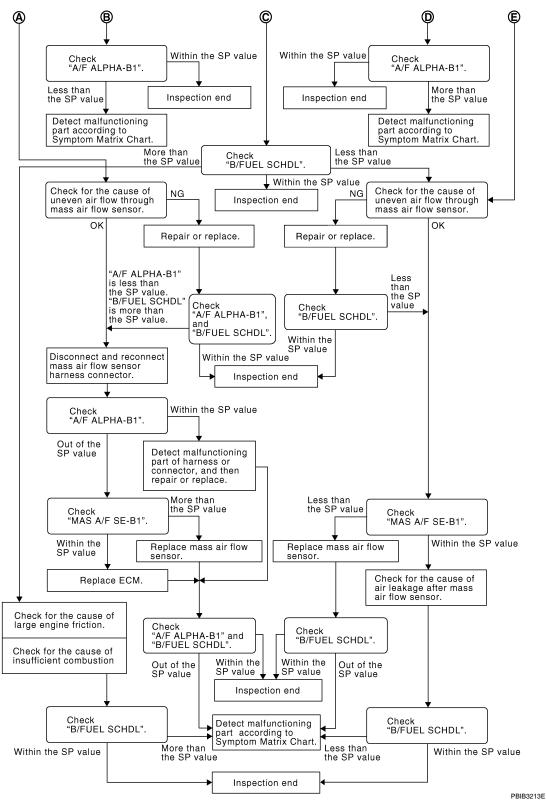
# Diagnosis Procedure

INFOID:0000000004780044

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## **OVERALL SEQUENCE**





### **DETAILED PROCEDURE**

1.CHECK "A/F ALPHA-B1"

#### With CONSULT-III

- Start engine.
- 2. Confirm that the testing conditions are met. Refer to <a>EC-112</a>, <a>"Component Function Check"</a>.
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE [HR16DE] < COMPONENT DIAGNOSIS > NOTE: Check "A/F ALPHA-B1" for approximately 1 minute because it may fluctuate. It is NG if the indication is out of the SP value even a little. Is the measurement value within the SP value? >> GO TO 17. YES EC NO-1 >> Less than the SP value: GO TO 2. NO-2 >> More than the SP value: GO TO 3. 2.CHECK "B/FUEL SCHDL" Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. D Is the measurement value within the SP value? YES >> GO TO 4. NO >> More than the SP value: GO TO 19. Е 3.CHECK "B/FUEL SCHDL" Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. F 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" Stop the engine. Disconnect PCV hose, and then plug it. 2. Start engine. 3. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. Is the measurement value within the SP value? YES >> GO TO 5. NO >> GO TO 6. CHANGE ENGINE OIL Stop the engine. Change engine oil. NOTE: This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving condition. M >> INSPECTION END  $\mathbf{6}.$ CHECK FUEL PRESSURE Ν Check fuel pressure. (Refer to EC-498, "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.

## .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.

## $oldsymbol{8}.$ CHECK "A/F ALPHA-B1"

**EC-115** 

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## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

# < COMPONENT DIAGNOSIS >

[HR16DE]

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

### Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 9.

# 9.PERFORM POWER BALANCE TEST

- Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- 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.

- Ignition coil and its circuit (Refer to EC-439, "Component Function Check".)
- Fuel injector and its circuit (Refer to EC-430, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to EM-23, "Inspection".)

### Is the inspection result normal?

YES >> Replace fuel injector and then GO TO 11.

NO >> Repair or replace malfunctioning part and then GO TO 11.

# 11.CHECK "A/F ALPHA-B1"

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

#### Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 12.

# 12.CHECK A/F SENSOR 1 FUNCTION

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

- For DTC P0130, refer to <u>EC-182, "DTC Logic"</u>.
  For DTC P0131, refer to <u>EC-188, "DTC Logic"</u>.
- For DTC P0132, refer to <u>EC-193, "DTC Logic"</u>.
- For DTC P0133, refer to EC-198, "DTC Logic".
- For DTC P2A00, refer to <u>EC-417, "DTC Logic"</u>

### Is any DTC detected?

YES >> GO TO 15.

>> GO TO 13. NO

# 13. CHECK A/F SENSOR 1 CIRCUIT

Perform DIAGNOSTIC PROCEDURE according to corresponding DTC.

>> GO TO 14.

# 14. CHECK "A/F ALPHA-B1"

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

#### Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 15.

# 15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

Stop the engine.

# TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< COMPONENT DIAGNOSIS > [HR16DE]

- 2. Disconnect ECM harness connector.
- 3. Check pin terminal and connector for damage, and then reconnect it.

>> GO TO 16.

# 16.CHECK "A/F ALPHA-B1"

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to <a href="EC-487">EC-487</a>, "Symptom Table".

17. CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO-1 >> More than the SP value: GO TO 18.

NO-2 >> Less than the SP value: GO TO 25.

# 18. DETECT MALFUNCTIONING PART

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

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

# 19. CHECK INTAKE SYSTEM

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

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

Is the inspection result normal?

YES >> GO TO 21.

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

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> "B/FUEL SCHDL" is more, "A/F ALPHA-B1" is less than the SP value: GO TO 21.

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

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

>> GO TO 22.

# **22.**CHECK "A/F ALPHA-B1"

< COMPONENT DIAGNOSIS >

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

## Is the measurement value within the SP value?

>> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-148, "DTC Logic". Then GO TO 29.

NO >> GO TO 23.

23.CHECK "MAS A/F SE-B1"

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

### Is the measurement value within the SP value?

YES >> GO TO 24.

NO >> More than the SP value: Replace mass air flow sensor, and then GO TO 29.

# 24.REPLACE ECM

- Replace ECM.
- Perform EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement".

>> GO TO 29.

# 25. CHECK INTAKE SYSTEM

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

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

## Is the inspection result normal?

YES >> GO TO 27.

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

# 26.CHECK "B/FUEL SCHDL"

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

## Is the measurement value within the SP value?

YFS >> INSPECTION END

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

# 27.CHECK "MAS A/F SE-B1"

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

### Is the measurement value within the SP value?

YES >> GO TO 28.

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

# 28. CHECK INTAKE SYSTEM

Check for the cause of air leak after the mass air flow sensor. Refer to the following.

- · Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- · Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks of PCV valve
- Disconnection or cracks of EVAP purge hose, open stuck of EVAP canister purge volume control solenoid
- Malfunctioning seal of rocker cover gasket
- · Disconnection, looseness, or cracks of hoses, such as vacuum hose, connecting to intake air system parts

# TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< COMPONENT DIAGNOSIS >

[HR16DE]

· Malfunctioning seal of intake air system, etc.

>> GO TO 30.

 $29.\mathsf{CHECK}$  "A/F ALPHA-B1" AND "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to <a href="EC-487">EC-487</a>, "Symptom Table".

30. CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to <a href="EC-487">EC-487</a>, "Symptom Table".

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# TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description INFOID:000000004784170

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:0000000004784171

# 1. INSPECTION START

Erase (1st trip) DTCs.

Refer to <u>EC-90, "Diagnosis Description"</u>, "DTC AND FREEZE FRAME DATA", "How to Erase DTC and 1st Trip DTC".

>> GO TO 2.

# 2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.

Refer to EC-125, "Ground Inspection".

### OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning part.

# $3.\mathsf{search}$ for electrical incident

Perform GI-25, "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-22, "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 connector.

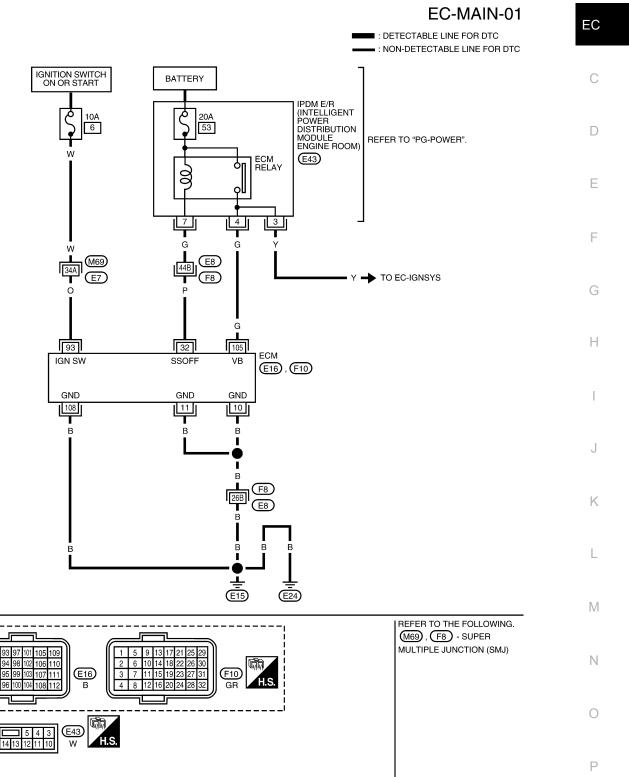
BBWA2625E

INFOID:0000000004780045

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# POWER SUPPLY AND GROUND CIRCUIT

Wiring Diagram



Diagnosis Procedure

1. INSPECTION START

Start engine.

## < COMPONENT DIAGNOSIS >

## Is engine running?

YES >> GO TO 8.

NO >> GO TO 2.

# 2.CHECK ECM POWER SUPPLY CIRCUIT-I

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

EC	CM	Ground	Voltage
Connector Terminal		Ground	vollage
E16	93	Ground	Battery voltage

## Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# 3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M69, E7
- 10A fuse (No. 6)
- · Harness for open or short between ECM and fuse

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

# 4. CHECK GROUND CONNECTION-I

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

## Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace ground connection.

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

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

Е	СМ	Ground	Continuity
Connector Terminal		Oround	Continuity
F10	10		
FIU	11	Ground	Existed
E16	108		

3. Also check harness for short to power.

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

# **6.**DETECT MALFUNCTIONING PART

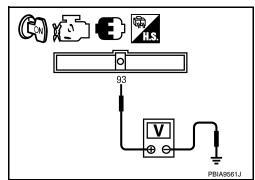
# Check the following.

- · Harness connectors F8, E8
- · 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

Reconnect ECM harness connectors.



# POWER SUPPLY AND GROUND CIRCUIT

# < COMPONENT DIAGNOSIS >

Turn ignition switch ON.

Check the voltage between IPDM E/R harness connector and ground.

IPDN	/I E/R	Ground	Voltage
Connector Terminal		Oround	Voltage
E43	3	Ground	Battery voltage

## Is the inspection result normal?

>> Go to EC-441, "Diagnosis Procedure". YES

NO >> GO TO 8.

# 8. CHECK ECM POWER SUPPLY CIRCUIT-III

Turn ignition switch OFF and wait at least 10 seconds.

2. Check the voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal	Giodila	voltage
E16	105	Ground	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop approximately 0 V.

### Is the inspection result normal?

>> GO TO 14. YES

NO-1 >> Battery voltage does not exist: GO TO 9.

NO-2 >> Battery voltage exists for more than a few seconds: GO TO 11.

# 9. CHECK ECM POWER SUPPLY CIRCUIT-IV

Turn ignition switch OFF and wait at least 10 seconds.

2. Check the voltage between ECM harness connector and ground.

E	CM	Ground	Voltage	
Connector Terminal		Oround	voltage	
F10	32	Ground	Battery voltage	

## Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 11.

# 10. CHECK ECM POWER SUPPLY CIRCUIT-V

- Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E43.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

Е	ECM		IPDM E/R	
Connector	Terminal	Connector Terminal		Continuity
E16	105	E43	4	Existed

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

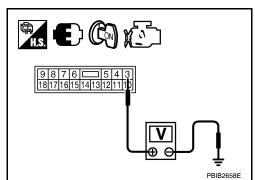
### Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 11. CHECK ECM POWER SUPPLY CIRCUIT-VI

Disconnect ECM harness connector.



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**EC-123** 

Disconnect IPDM E/R harness connector E43.

Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM IPDM		M E/R	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F10	32	E43	7	Existed

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

## Is the inspection result normal?

< COMPONENT DIAGNOSIS >

YES >> GO TO 13.

NO >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

## Check the following.

- · Harness connectors E8, F8
- Harness for open or short between ECM and IPDM E/R

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

# 13. CHECK FUSE

- Disconnect 20 A fuse (No. 53) from IPDM E/R.
- Check 20 A fuse.

## Is the inspection result normal?

YFS >> GO TO 17.

NO >> Replace 20 A fuse.

# 14. CHECK GROUND CONNECTION-II

- Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

## Is the inspection result normal?

YES >> GO TO 15.

NO >> Repair or replace ground connection.

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

- Disconnect ECM harness connector.
- Check the continuity between ECM harness connector and ground.

ECM		Ground	Continuity
Connector	Terminal	Oround	Continuity
F10	10		
1 10	11	Ground	Existed
E16	108		

3. Also check harness for short to power.

### Is the inspection result normal?

YES >> GO TO 17.

>> GO TO 16. NO

# 16. DETECT MALFUNCTIONING PART

## Check the following.

- · Harness connectors E8, F8
- · Harness for open or short between ECM and ground

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

# 17. CHECK INTERMITTENT INCIDENT

**EC-124** 

# POWER SUPPLY AND GROUND CIRCUIT

### < COMPONENT DIAGNOSIS >

[HR16DE]

Refer to EC-120, "Diagnosis Procedure".

#### Is the inspection result normal?

>> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R". YES

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

# Ground Inspection

NO

INFOID:0000000004784172

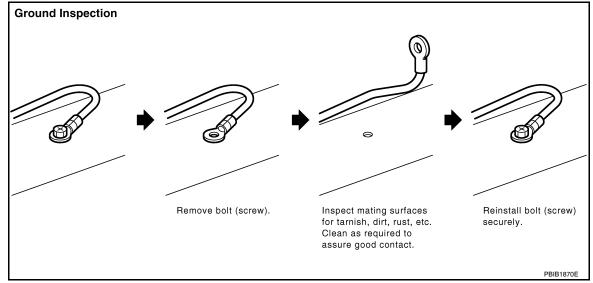
Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

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.

For detailed ground distribution information, refer to PG-29, "Ground Distribution".



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# U0101 CAN COMM CIRCUIT

Description INFOID:0000000004780046

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:0000000004780047

## DTC DETECTION LOGIC

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

## DTC CONFIRMATION PROCEDURE

# 1. PERFORM DTC CONFIRMATION PROCEDURE

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

## Is DTC detected?

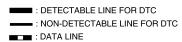
YES >> EC-127, "Diagnosis Procedure".

>> INSPECTION END NO

Wiring Diagram

INFOID:0000000004780557

# EC-CAN-01



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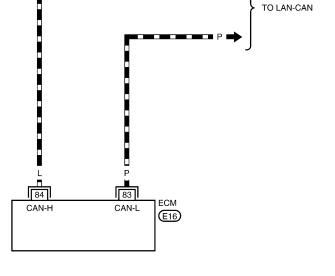
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INFOID:0000000004780048

# Diagnosis Procedure

Go to LAN-17, "Trouble Diagnosis Flow Chart".



# U0140 CAN COMM CIRCUIT

Description INFOID:000000004780049

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

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0140	Lost communication with BCM	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with BCM for 2 seconds or more.	CAN communication line between BCM and ECM (CAN communication line is open or shorted)

## DTC CONFIRMATION PROCEDURE

# 1. PERFORM DTC CONFIRMATION PROCEDURE

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

## Is DTC detected?

YES >> EC-129, "Diagnosis Procedure".

NO >> INSPECTION END

Wiring Diagram

# EC-CAN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE

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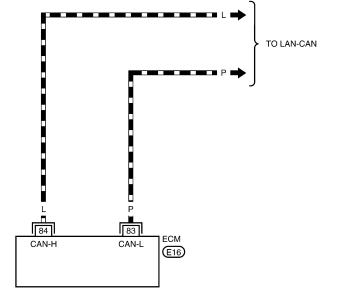
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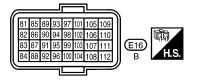
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INFOID:0000000004780051

# Diagnosis Procedure

Go to LAN-17, "Trouble Diagnosis Flow Chart".





# **U1001 CAN COMM CIRCUIT**

Description INFOID:000000004780052

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

## DTC DETECTION LOGIC

DTC No.	lo. 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-131, "Diagnosis Procedure".

NO >> INSPECTION END

Wiring Diagram

# EC-CAN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE

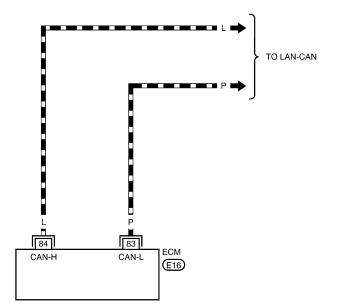
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# Diagnosis Procedure

Go to LAN-17, "Trouble Diagnosis Flow Chart".

# P0011 IVT CONTROL

DTC Logic

### DTC DETECTION LOGIC

#### NOTE:

If DTC P0011 is displayed with DTC P0075, first perform the trouble diagnosis for EC-358, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	<ul> <li>Crankshaft position sensor (POS)</li> <li>Camshaft position sensor (PHASE)</li> <li>Intake valve control solenoid valve</li> <li>Accumulation of debris to the signal pick-up portion of the camshaft</li> <li>Timing chain installation</li> <li>Foreign matter caught in the oil groove for intake valve timing control</li> </ul>

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is between 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 normal operating temperature.
- Maintain the following conditions for at least 6 consecutive seconds. Hold the accelerator pedal as steady as possible.

ENG SPEED	500 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 4.2 msec
Selector lever	P or N position (A/T) Neutral position (M/T)

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

## With GST

Follow the procedure "With CONSULT-III" above.

### Is 1st trip DTC detected?

YES >> Go to EC-133, "Diagnosis Procedure"

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

## With CONSULT-III

Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,500 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (221°F)

## **P0011 IVT CONTROL**

### < COMPONENT DIAGNOSIS >

[HR16DE]

Selector lever	1st or 2nd position
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

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### **CAUTION:**

Always drive at a safe speed.

Check 1st trip DTC.

### With GST

Follow the procedure "With CONSULT-III" above.

## Is 1st trip DTC detected?

YES >> Go to EC-133, "Diagnosis Procedure"

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004780056

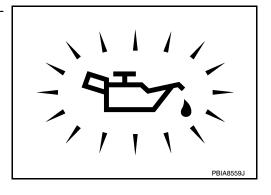
# 1. CHECK OIL PRESSURE WARNING LAMP

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

## Is oil pressure warning lamp illuminated?

YES >> Go to <u>LU-7</u>, "Inspection".

NO >> GO TO 2.



# 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-134, "Component Inspection".

# Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace intake valve timing control solenoid valve.

# 3.check crankshaft position sensor (pos)

Refer to EC-267, "Component Inspection".

## Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS).

# 4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-272, "Component Inspection".

# Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace camshaft position sensor (PHASE).

# 5.CHECK CAMSHAFT (INTAKE)

Check the following.

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## < COMPONENT DIAGNOSIS >

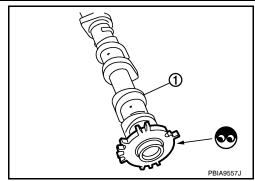
- · Accumulation of debris to the signal plate of camshaft (1) rear end
- · Chipping signal plate of camshaft rear end

## Is the inspection result normal?

YES >> GO TO 6.

NO

>> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



# 6. CHECK TIMING CHAIN INSTALLATION

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

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

YES >> Check timing chain installation. Refer to EM-49, "Removal and Installation".

NO >> GO TO 7.

# 7.CHECK LUBRICATION CIRCUIT

Refer to EM-70, "Inspection", "INSPECTION AFTER INSTALATION".

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

# 8. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

### >> INSPECTION END

# Component Inspection

INFOID:0000000004780057

# 1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

- Turn ignition switch OFF.
- 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	6.7 - 7.7 Ω [at 20°C (68°F)]	
1 or 2 and ground	$\stackrel{\infty}{\Omega}$ (Continuity should not exist)	

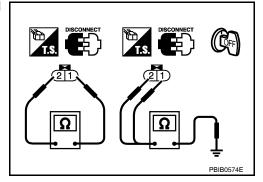
### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace intake valve timing control solenoid valve.

# 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.



# **P0011 IVT CONTROL**

## < COMPONENT DIAGNOSIS >

[HR16DE]

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

## **CAUTION:**

Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

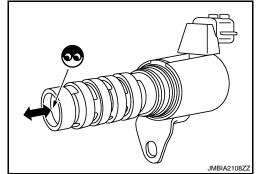
### NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

# Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake valve timing control solenoid valve.



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# P0031, P0032 A/F SENSOR 1 HEATER

Description INFOID:000000004780058

## 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	Air fuel ratio (A/F) sensor 1 heater
Mass air flow sensor	Amount of intake air	neater control	neater

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

DTC Logic

## DTC DETECTION LOGIC

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

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

## **TESTING CONDITION:**

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 10 seconds.
- Check 1st trip DTC.

# Is 1st trip DTC detected?

YES >> Go to EC-137, "Diagnosis Procedure".

NO >> INSPECTION END

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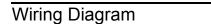
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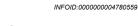
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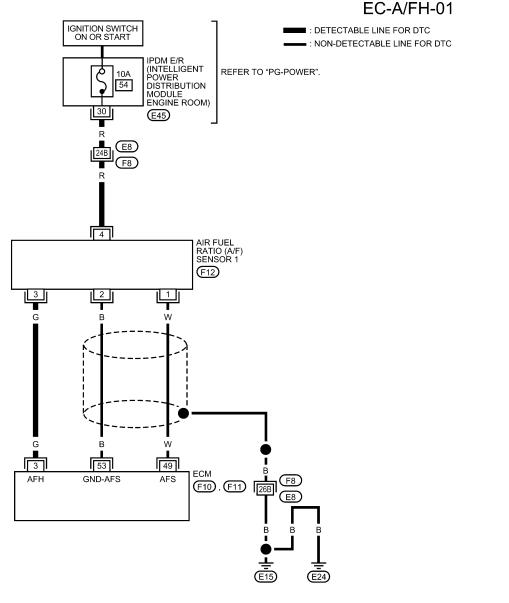
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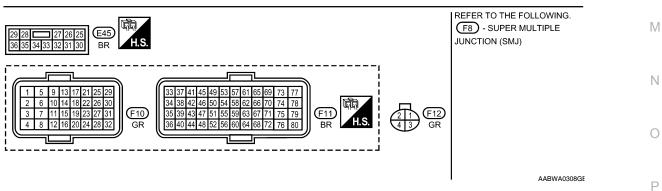
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INFOID:0000000004780060









# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

Is the inspection result normal?

# < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

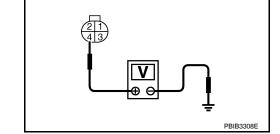
# 2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

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

A/F sensor 1		Ground	Voltage
Connector	Terminal	Oround	voltage
F12	4	Ground	Battery voltage

# Is the inspection result normal?

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



ED CONT

# ${f 3}.$ DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- IPDM E/R harness connector E45
- 10 A fuse (No. 54)
- · 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.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F12	3	F10	3	Existed

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

## Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5.CHECK A/F SENSOR 1 HEATER

Refer to EC-139, "Component Inspection".

### Is the inspection result normal?

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

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

Replace air fuel ratio (A/F) sensor 1.

### **CAUTION:**

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

>> INSPECTION END

# P0031, P0032 A/F SENSOR 1 HEATER

< COMPONENT DIAGNOSIS >

[HR16DE]

# 7. CHECK INTERMITTENT INCIDENT

Perform EC-120, "Diagnosis Procedure".

>> Repair or replace.

# Component Inspection

INFOID:0000000004780061

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

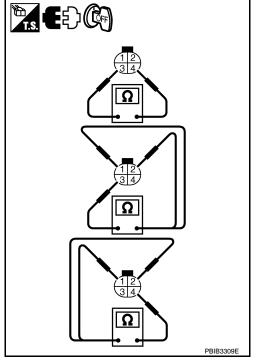
- 1. Turn ignition switch OFF.
- 2. Disconnect A/F sensor 1 harness connector.
- 3. Check resistance between A/F sensor 1 terminals as per the following.

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

## Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.



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

Replace air fuel ratio (A/F) sensor 1.

### **CAUTION:**

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

>> INSPECTION END

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# P0037, P0038 HO2S2 HEATER

Description INFOID:000000004780062

### SYSTEM DESCRIPTION

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

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037	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
P0038	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

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

### **TESTING CONDITION:**

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

### With CONSULT-III

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

# With GST

Follow the procedure "With CONSULT-III" above.

## Is 1st trip DTC detected?

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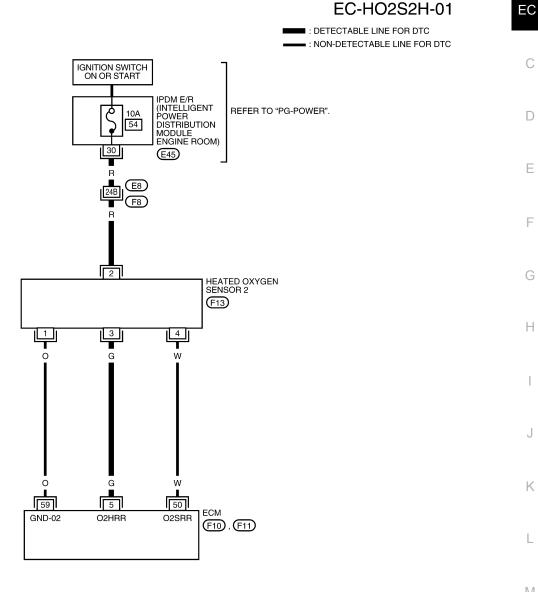
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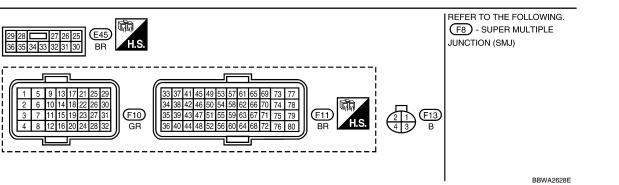
YES >> Go to EC-141, "Diagnosis Procedure".

NO >> INSPECTION END

Wiring Diagram

INFOID:0000000004780636





# Diagnosis Procedure

1. CHECK GROUND CONNECTION

**EC-141** 

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INFOID:0000000004780064

## < COMPONENT DIAGNOSIS >

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

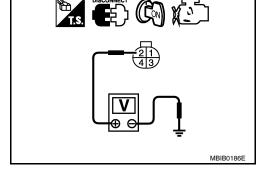
# 2. CHECK HO2S2 POWER SUPPLY CIRCUIT

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

HO2S2		Ground	Voltage
Connector	Terminal	Oround	voltage
F13	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 E8, F8
- IPDM E/R connector E45
- 10 A fuse (No. 54)
- Harness for open or short between heated oxygen sensor 2 and fuse
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

НС	HO2S2		ECM	
Connector	Terminal	Connector	Terminal	Continuity
F13	3	F10	5	Existed

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

## Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-143. "Component Inspection".

## Is the inspection result normal?

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

## $\mathsf{6}.\mathsf{REPLACE}$ HEATED OXYGEN SENSOR 2

## Replace heated oxygen sensor 2.

### **CAUTION:**

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

INFOID:0000000004780065

>> INSPECTION END

# 7. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

# 1. CHECK HEATED OXYGEN SENSOR 2 HEATER

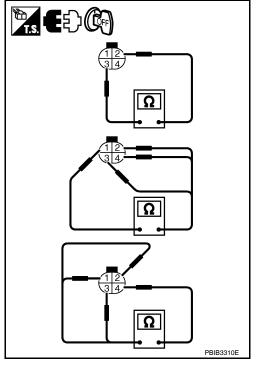
- 1. Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Check resistance between HO2S2 terminals as per the following.

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

# Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.



# 2. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

## **CAUTION:**

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

>> INSPECTION END

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# P0075 IVT CONTROL SOLENOID VALVE

Description INFOID:000000004780066

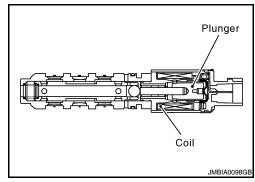
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



DTC Logic

INFOID:0000000004780067

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	Harness or connectors     (Intake valve timing control solenoid valve circuit is open or shorted.)     Intake valve timing control solenoid valve

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

>> GO TO2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

## Is 1st trip DTC detected?

YES >> Go to EC-145, "Diagnosis Procedure".

NO >> INSPECTION END

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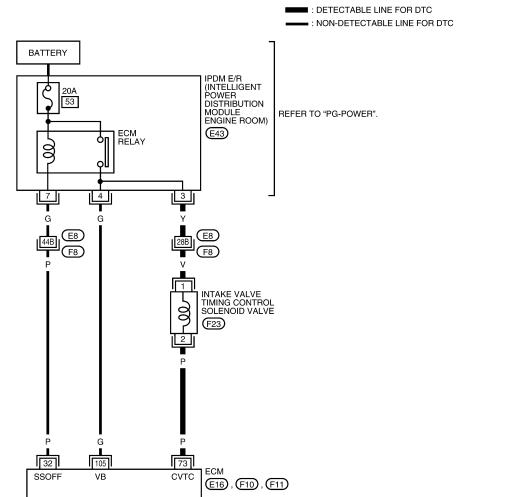
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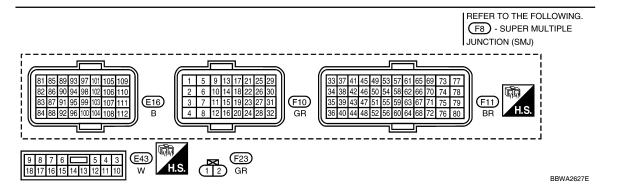
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Wiring Diagram

INFOID:0000000004780637







# Diagnosis Procedure

INFOID:0000000004780068

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

- 1. Turn ignition switch OFF.
- 2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
- 3. Turn ignition switch ON.

#### P0075 IVT CONTROL SOLENOID VALVE

#### < COMPONENT DIAGNOSIS >

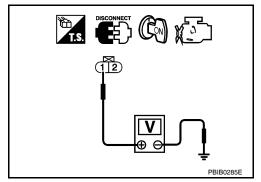
[HR16DE]

 Check the voltage between intake valve timing control solenoid valve harness connector and ground.

IVT control s	olenoid valve	Ground	Voltage	
Connector	Terminal	Oround	voltage	
F23	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 E8, F8
- IPDM E/R connector E43
- · Harness for open or short between IVT control solenoid valve and IPDM E/R
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

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

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

IVT control solenoid valve		E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
F23	2	F11	73	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-146, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace intake valve timing control solenoid valve.

# 5. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004780069

# 1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

#### P0075 IVT CONTROL SOLENOID VALVE

#### < COMPONENT DIAGNOSIS >

[HR16DE]

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

Terminals	Resistance
1 and 2	6.7 - 7.7 Ω [at 20°C (68°F)]
1 or 2 and ground	$\stackrel{\scriptstyle \infty}{}_{\Omega}$ (Continuity should not exist)

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace intake valve timing control solenoid valve.

# 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

Remove intake valve timing control solenoid valve.

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

#### **CAUTION:**

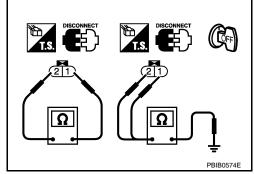
Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve. NOTE:

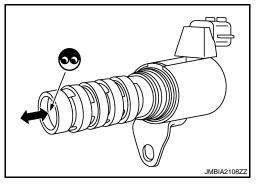
Always replace O-ring when intake valve timing control solenoid valve is removed.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake valve timing control solenoid valve.





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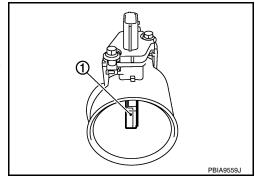
INFOID:0000000004780071

#### P0101 MAF SENSOR

Description INFOID:000000004780070

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



## **DTC** Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
		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
P0101	Mass air flow sensor cir- cuit range/performance	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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.
- Run engine for at least 10 seconds at idle speed.
- 3. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-151, "Diagnosis Procedure".

NO-1 >> With CONSULT-III: GO TO 3.

NO-2 >> Without CONSULT-III: GO TO 5.

# 3.check mass air flow sensor function

- 1. Turn ignition switch ON.
- Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to <u>EC-151</u>, "<u>Diagnosis Procedure</u>".

#### **P0101 MAF SENSOR**

#### < COMPONENT DIAGNOSIS >

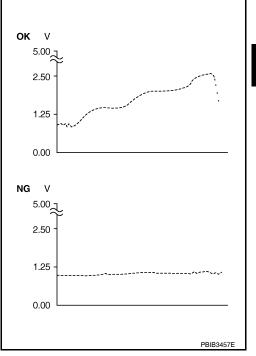
[HR16DE]

- 3. Select "DATA MONITOR" mode with CONSULT-III.
- 4. Check the voltage of "MAS A/F SE-B1" with "DATA MONITOR".
- Increases engine speed to about 4,000 rpm.
- 6. Monitor the linear voltage rise in response to engine speed increases.

#### Is the inspection result normal?

YES >> GO TO 4.

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



# 4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
TP SEN 1-B1	More than 1.5 V
TP SEN 2-B1	More than 1.5 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-151, "Diagnosis Procedure".

NO >> INSPECTION END

# ${f 5}$ Perform component function check for malfunction ${f B}$

Perform component function check. Refer to EC-149, "Component Function Check".

#### NOTE:

Use component function check to check the overall function of the mass air flow sensor circuit. During this check, a DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

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

#### Component Function Check

# 1.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

#### With GST

- 1. Start engine and warm it up to normal operating temperature.
- Select Service \$01 with GST.

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#### **P0101 MAF SENSOR**

#### < COMPONENT DIAGNOSIS >

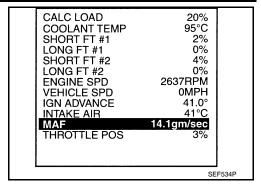
[HR16DE]

- 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 about 4,000 rpm in engine speed.

#### Is the inspection result normal?

YES >> INSPECTION END

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

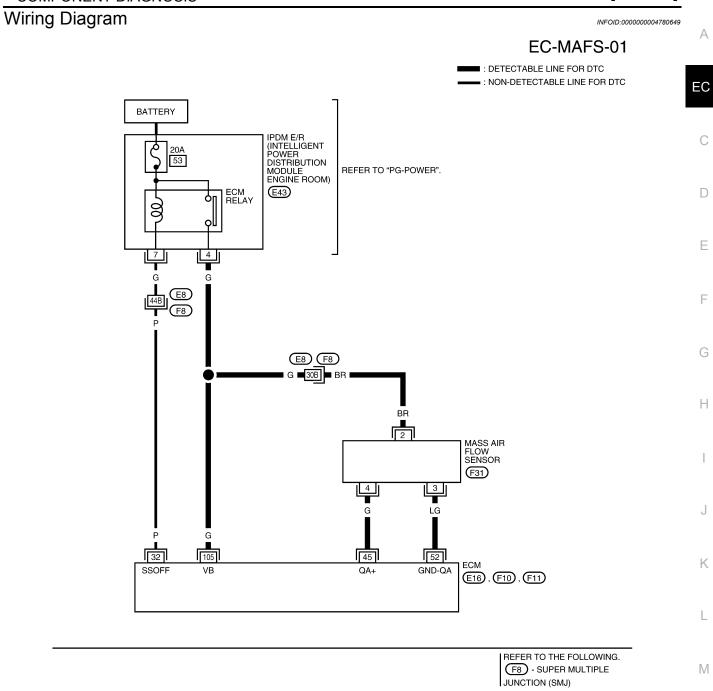


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# Diagnosis Procedure

# 1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to <u>EC-148</u>, "<u>DTC Logic</u>". 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 E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace ground connection.

# 4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

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

MAF	sensor	Ground	Voltage	
Connector	Connector Terminal		voltage	
F31	2	Ground	Battery voltage	

# Is the inspection result normal?

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

# 5. DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness connectors E8, F8
- 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 the continuity between MAF sensor harness connector and ECM harness connector.

MAF	sensor	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F31	3	F11	52	Existed

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

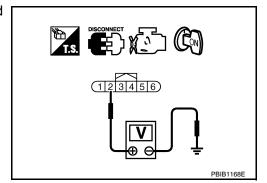
#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

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

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



MAF sensor	EC	CM	Continuit		/-
Connector Terminal	Connector	Terminal	- Continuity		
F31 4	F11	45	Existed		E
. Also check harness	for short to grou	nd and short	to power.		
s the inspection result n	<u>ormal?</u>				
YES >> GO TO 8. NO >> Repair oper	circuit or short t	o around or s	short to nower in h	narness or connectors.	(
CHECK INTAKE AIR		_	onore to power in r	idified of conficutors.	
Check intake air tempera					<del></del> [
Refer to <u>EC-164, "Comp</u>	onent Inspection	<u>ı"</u> .			
s the inspection result n	ormal?				E
YES >> GO TO 9. NO >> Replace ma	ss air flow sensc	or (with intake	e air temperature s	sensor).	
CHECK EVAP CONT		-			_
Refer to EC-314, "Comp					F
s the inspection result n	•	<u>.</u> .			
YES >> GO TO 10.					(
	AP control system	•	ensor.		
0.CHECK MASS AIR					
Refer to <u>EC-153, "Comp</u>	•	<u>ı"</u> .			
s the inspection result n YES >> GO TO 11.	<u>ormai?</u>				
	ss air flow senso	or.			
11.check intermit	TENT INCIDENT	Γ			
Refer to <u>EC-120, "Diagn</u>	osis Procedure".				
>> INCDECTIO	NI END				
>> INSPECTIO					-
Component Inspec	ilon			INFOID:0000000047	′80074
CHECK MASS AIR F	LOW SENSOR-	I			ļ
With CONSULT-III					
<ul><li>Turn ignition switch</li><li>Reconnect all harne</li></ul>		econnected			ľ
<ul><li>Start engine and wa</li></ul>			emperature.		ľ
. Connect CONSULT					
		indication			
Select "MAS A/F SE		indication.			I
	-B1" and check	indication.		MAS A/F SE-B1	I

Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
MAS A/F SE-B1	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
	Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

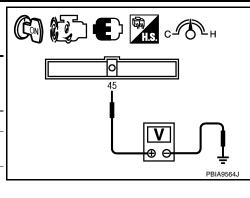
<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

- Without CONSULT-III

  1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- Start engine and warm it up to normal operating temperature.

 Check the voltage between ECM harness connector and ground.

ECM				Voltage
Con- nector	Termi- nal	Ground Condition		
		45	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	45 (MAF		Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
F11 (MAF sensor signal)	nsor Ground	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V	
	,		Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*



<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# 3.check mass air flow sensor-ii $\,$

#### With CONSULT-III

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

Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
MAS AN SE-BI	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
	Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Without CONSULT-III

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

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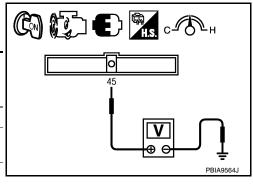
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Check the voltage between ECM harness connector and ground.

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
			Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	45 (MAF		Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
F11 (MAF sensor signal)	ensor Ground	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V	
	g,		Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*



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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK MASS AIR FLOW SENSOR-III

#### With CONSULT-III

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

Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
MAS A/F SE-B1	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
	Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Without CONSULT-III

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

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
			Ignition switch ON (Engine stopped.)	Approx. 0.4 V	
F11	45 (MAF sensor signal)		Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V	
		sensor	Ground	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
				Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

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

#### Is the inspection result normal?

YES >> INSPECTION END

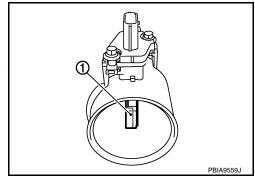
NO >> Clean or replace mass air flow sensor.

# P0102, P0103 MAF SENSOR

Description INFOID:000000004780075

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



## **DTC** Logic

#### INFOID:0000000004780076

#### DTC DETECTION LOGIC

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

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### Which DTC is detected?

P0102 >> GO TO 2.

P0103 >> GO TO 3.

# 2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

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

#### Is DTC detected?

YES >> Go to EC-157, "Diagnosis Procedure".

NO >> INSPECTION END

# 3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-I

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

#### Is DTC detected?

YES >> Go to EC-157, "Diagnosis Procedure".

NO >> GO TO 4.

# 4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-II

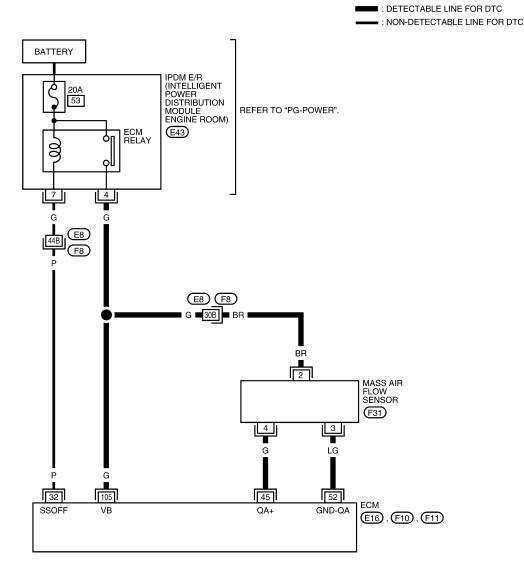
- 1. Start engine and wait at least 5 seconds.
- 2. Check DTC.

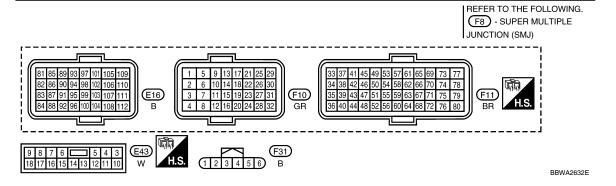
#### Is DTC detected?

YES >> Go to EC-157, "Diagnosis Procedure".

NO >> INSPECTION END







# Diagnosis Procedure

1.INSPECTION START

Confirm the detected DTC. Which DTC is detected?

**EC-157** 

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

# 2.CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Reconnect the parts.

# 3.check ground connection

- Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace ground connection.

# f 4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

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

MAF	sensor	Ground	Voltage
Connector	Terminal	Giodila	voltage
F31	2	Ground	Battery voltage

# Is the inspection result normal?

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

# 5. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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

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

MAF	sensor	E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
F31	3	F11	52	Existed

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

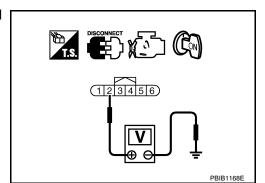
#### Is the inspection result normal?

YES >> GO TO 7.

>> 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

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



MAF	sensor	E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
F31	4	F11	45	Existed

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

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# **8.**CHECK MASS AIR FLOW SENSOR

Refer to EC-159, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace mass air flow sensor.

# 9. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

#### Component Inspection

1. CHECK MASS AIR FLOW SENSOR-I

#### With CONSULT-III

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

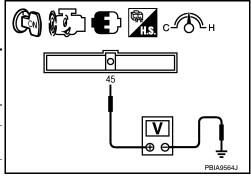
Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
	Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Without CONSULT-III

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

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
		45	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	(MAF		Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
		Ground	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
				Idle to about 4,000 rpm



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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.CHECK MASS AIR FLOW SENSOR-II

#### With CONSULT-III

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

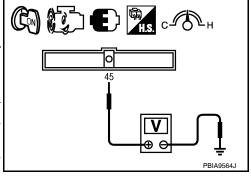
Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
	Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Without CONSULT-III

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

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
F11 (MAF sensor signal)			Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	(MAF sensor Ground		Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
		Ground	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
		s.g.idi)		Idle to about 4,000 rpm



<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK MASS AIR FLOW SENSOR-III

#### With CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Disconnect mass air flow sensor harness connector and reconnect it again.
- Start engine and warm it up to normal operating temperature.

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- 4. Connect CONSULT-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and check indication.

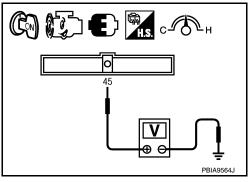
Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V
WAS A/F SE-B1	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
	Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Without CONSULT-III

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

ECM						
Con- nector	Termi- nal	Ground	Condition	Voltage		
			Ignition switch ON (Engine stopped.)	Approx. 0.4 V		
	(MAF		Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.3 V		
		sensor	sensor	sensor Ground 2,500 rpm (Engine is war	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9 V
				Idle to about 4,000 rpm	0.9 - 1.3 V to Approx. 2.4 V*	



<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace mass air flow sensor.

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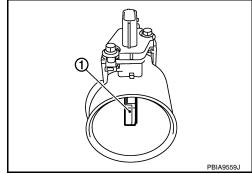
# P0112, P0113 IAT SENSOR

< COMPONENT DIAGNOSIS >

Description INFOID:0000000004780079

The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



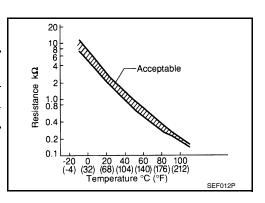
#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 46 (Intake air temperature sensor) and ground.

#### **CAUTION:**

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



**DTC Logic** INFOID:0000000004780080

#### DTC DETECTION LOGIC

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

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

YES >> Go to EC-163, "Diagnosis Procedure".

>> INSPECTION END NO

Wiring Diagram

INFOID:0000000004780650

#### EC-IATS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

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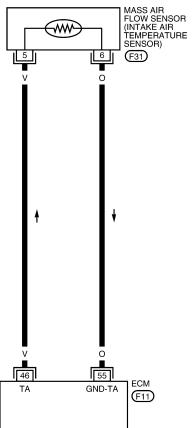
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INFOID:0000000004780081

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

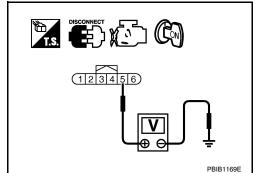
- 1. Disconnect mass air flow sensor (with intake air temperature sensor) harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between mass air flow sensor harness connector and ground.

MAF sensor		Ground	Voltage	
Connector Terminal		Oround	voitage	
F31	5	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



# 3.check intake air temperature sensor ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.

MAF	MAF sensor		ECM	
Connector	Terminal	Connector Terminal		Continuity
F31	6	F11	55	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-164, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

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

# 5. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004780082

# 1. CHECK INTAKE AIR TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- Disconnect mass air flow sensor harness connector.
- Check resistance between mass air flow sensor terminals as per the following.

Terminals	Condition		Resistance (kΩ)
1 and 2	Intake air 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).

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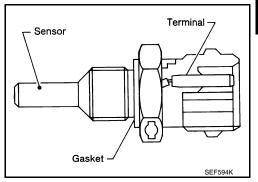
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#### P0116 ECT SENSOR

Description INFOID:0000000004780447

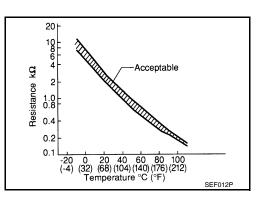
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



#### CALITION:

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

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to <a href="EC-167">EC-167</a>, "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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to normal operating temperature.
- 2. Rev engine up to 2,000 rpm for more than 10 minutes.
- 3. Move the vehicle to a cool place, then stop engine and turn ignition switch OFF.
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals 4 and 5.

Soak the vehicle until the resistance between "fuel level sensor unit and fuel pump" terminals 4 and 5 becomes  $0.5 \text{ k}\Omega$  higher than the value measured before soaking.

#### **CAUTION:**

Never turn ignition switch ON during the soaking time.

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 >> EC-166, "Diagnosis Procedure".

NO >> INSPECTION END

#### Diagnosis Procedure

INFOID:0000000004780085

# CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- 2. Check ground connections E15, 24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-166, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine coolant temperature sensor.

# 3.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

INFOID:0000000004780446

# 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

- 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.

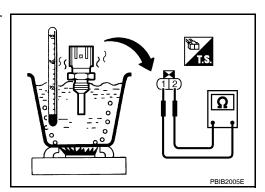
Terminals	Condition		Resistance
		20 (68)	2.37 - 2.63 kΩ
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ
		·	

# Is the inspection result normal?

>> INSPECTION END

YES

NO >> Replace engine coolant temperature sensor.



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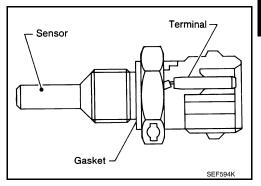
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# P0117, P0118 ECT SENSOR

Description INFOID:0000000004780087

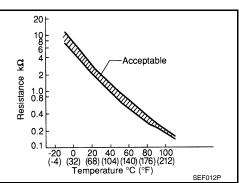
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



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

**DTC Logic** INFOID:0000000004780088

#### 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.)
P0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Engine coolant temperature sensor

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YES >> Go to EC-168, "Diagnosis Procedure".

>> INSPECTION END NO

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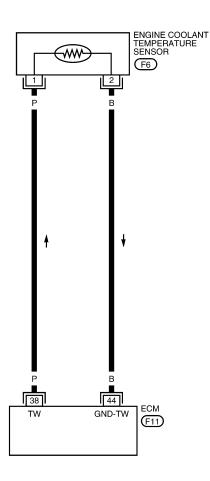
**EC-167** 

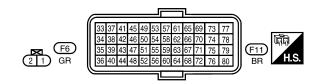
Wiring Diagram

INFOID:0000000004780651

#### EC-ECTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2634E

# Diagnosis Procedure

INFOID:0000000004780089

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### **P0117, P0118 ECT SENSOR**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

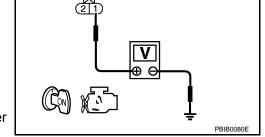
- Disconnect engine coolant temperature (ECT) sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between ECT sensor harness connector and around.

ECT sensor		Ground	Voltage	
Connector	Terminal	Oround	voltage	
F6	1	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



# ${f 3.}$ CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between ECT sensor harness connector and ECM harness connector.

ECT	ECT sensor		ECM	
Connector	Terminal	Connector Terminal		Continuity
F6	2	F11	44	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-169, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace engine coolant temperature sensor.

#### 5. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

# 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

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INFOID:0000000004780090

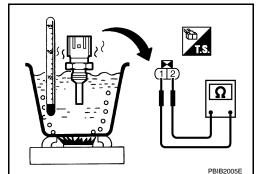
# **P0117, P0118 ECT SENSOR**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

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

Terminals	Condition		Resistance
		20 (68)	2.37 - 2.63 kΩ
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.

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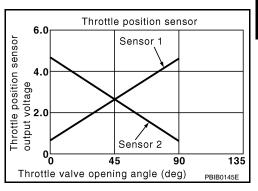
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# P0122, P0123 TP SENSOR

Description INFOID:000000004780091

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

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



DTC Logic

#### DTC DETECTION LOGIC

NOTE:

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-358, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	Harness or connectors     (TP sensor 2 circuit is open or shorted.)
P0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	Electric throttle control actuator (TP sensor 2)

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### **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 let it idle for 1 second.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-172, "Diagnosis Procedure".

NO >> INSPECTION END

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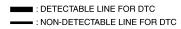
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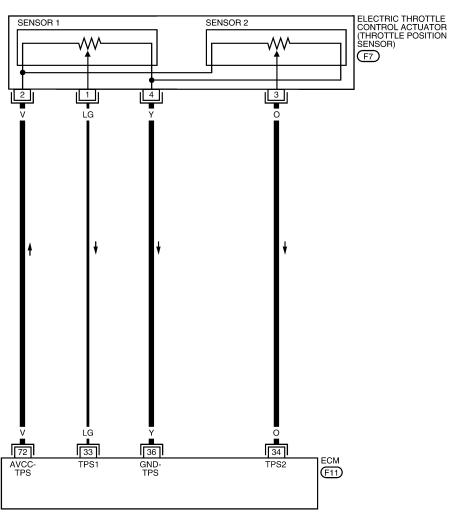
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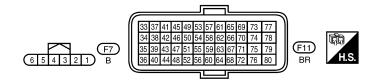
Wiring Diagram

INFOID:0000000004780677

#### EC-TPS2-01







BBWA2656E

# Diagnosis Procedure

#### INFOID:0000000004780093

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.check throttle position sensor 2 power supply circuit

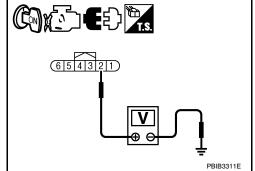
- Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle	Electric throttle control actuator		Voltage	
Connector Terminal		Ground	voltage	
F7	2	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



# 3.check throttle position sensor 2 ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		E	ECM	
Connector	Terminal	Connector	Terminal	Continuity
F7	4	F11	36	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# $oldsymbol{4}.$ CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle	control actuator	E	ECM	
Connector	Terminal	Connector	Terminal	Continuity
F7	3	F11	34	Existed

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-174, "Component Inspection".

#### Is the inspection result normal?

>> GO TO 7. YES

NO >> GO TO 6.

# **6.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace electric throttle control actuator.
- Perform <u>EC-174</u>, "Special Repair Requirement".

>> INSPECTION END

[HR16DE]

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# 7.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

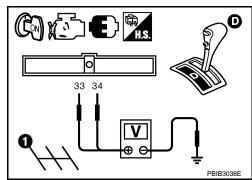
# Component Inspection

INFOID:0000000004780094

# 1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Perform EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set selector lever to D (A/T) or 1st (M/T) position.
- 6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Cor	ndition	Voltage	
Connector	Terminal	Oround Com		idition	voitage	
	33 (TP sensor	Ground	Ground Accelerator pedal	Fully released	More than 0.36V	
F11 34 (TP ser	1 signal)			Fully de- pressed	Less than 4.75V	
				Fully released	Less than 4.75V	
	(TP sensor 2 signal)		Fully de- pressed	More than 0.36V		



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.replace electric throttle control actuator

- 1. Replace electric throttle control actuator.
- 2. Perform EC-174, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004780095

# 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# 2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

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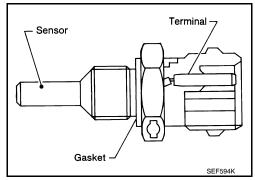
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#### P0125 ECT SENSOR

Description

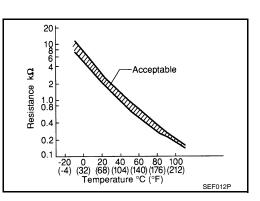
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



#### **CAUTION:**

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

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P0125 is displayed with P0116, first perform the trouble diagnosis for DTC P0116. Refer to <u>EC-165</u>, "DTC Logic".
- If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to <u>EC-167</u>, "<u>DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125	Insufficient engine coolant temperature for closed loop fuel control	<ul> <li>Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.</li> <li>Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul>	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

# 2.CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

#### With CONSULT-III

1. Turn ignition switch ON.

EC-175

- Select "DATA MONITOR" mode with CONSULT-III.
- Check that "COOLAN TEMP/S" is above 5°C (41°F).

#### With GST

Follow the procedure "With CONSULT-III" above.

#### Is it above 5°C (41°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.
- Check 1st tip DTC.

If "COOLAN TEMP/S" indication increases to more than 5°C (41°F) within 65 minutes, stop engine because the test result will be OK.

#### **CAUTION:**

Be careful not to overheat engine.

#### With GST

Follow the procedure "With CONSULT-III" above.

#### Is 1st trip DTC detected?

YES >> EC-176, "Diagnosis Procedure"

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004780098

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-176, "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 the engine coolant does not flow.

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace thermostat. Refer to CO-22, "Removal and Installation".

#### 4.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004780099

# 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

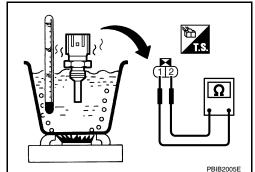
#### **P0125 ECT SENSOR**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

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

Terminals	Condition		Resistance
		20 (68)	2.37 - 2.63 kΩ
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.

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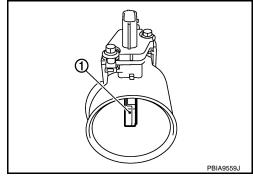
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# P0127 IAT SENSOR

Description INFOID:000000004780100

The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



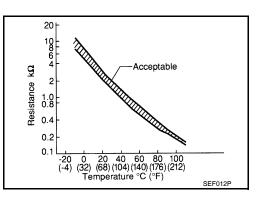
#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 46 (Intake air temperature sensor) and ground.

#### **CAUTION:**

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



DTC Logic

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

#### **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.

# **P0127 IAT SENSOR**

< COMPONENT DIAGNOSIS >	[HR16DE]	
<b>NOTE:</b> Perform the following steps before engine coolant temperature is above 96°C (205°F).		/-
<ol> <li>Turn ignition switch ON.</li> <li>Select "DATA MONITOR" mode with CONSULT-III.</li> </ol>		
4. Start engine.		ΕŒ
<ol><li>Hold vehicle speed at more than 70 km/h (43 MPH) for 95 consecutive seconds.</li></ol>		_`
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 <u>EC-179, "Diagnosis Procedure"</u> . NO >> INSPECTION END		
Diagnosis Procedure	INFOID:0000000004780102	E
1. CHECK GROUND CONNECTION		
1. Turn ignition switch OFF.		1
2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".  Is the inspection result normal?		
YES >> G0 TO 2.		
NO >> Repair or replace ground connection.		
2.CHECK INTAKE AIR TEMPERATURE SENSOR		
Refer to EC-179, "Component Inspection".		
Is the inspection result normal? YES >> GO TO 3.		
NO >> Replace mass air flow sensor (with intake air temperature sensor).		
3.CHECK INTERMITTENT INCIDENT		
Refer to EC-120, "Diagnosis Procedure".		
>> INSPECTION END		
Component Inspection	INFOID:0000000004780103	
1.CHECK INTAKE AIR TEMPERATURE SENSOR		
Turn ignition switch OFF.  1. Turn ignition switch OFF.		
2. Disconnect mass air flow sensor harness connector.		
3. Check resistance between mass air flow sensor terminals as per the following.		
Terminals Condition Resistance ( $k\Omega$ )		
1 and 2 Intake air temperature [°C (°F)] 25 (77) 1.800 - 2.200		
s the inspection result normal?		
YES >> INSPECTION END		
NO >> Replace mass air flow sensor (with intake air temperature sensor).		

#### P0128 THERMOSTAT FUNCTION

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303 or P0304, first perform the trouble diagnosis for DTC P0300, P0301, P0302, P0303, P0304. Refer to <a href="EC-253">EC-253</a>, "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 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.	<ul><li>Thermostat</li><li>Leakage from sealing portion of thermostat</li><li>Engine coolant temperature sensor</li></ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

- 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 fill with the 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 following 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.
- 7. Drive vehicle for 10 consecutive minutes under the following conditions.

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

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### NOTE:

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

Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

#### Is 1st trip DTC detected?

YES >> Go to EC-180, "Diagnosis Procedure".

NO >> INSPECTION END

#### Diagnosis Procedure

INFOID:0000000004780105

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-181, "Component Inspection".

## **P0128 THERMOSTAT FUNCTION**

## < COMPONENT DIAGNOSIS >

[HR16DE]

INFOID:0000000004780106

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor.

# 2. CHECK THERMOSTAT

## Refer to CO-23, "Inspection".

## Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace thermostat.

# Component Inspection

# $1. \\ \text{check engine coolant temperature sensor}$

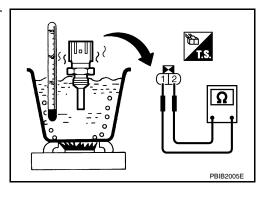
- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance	
	Temperature [°C (°F)]	20 (68)	2.37 - 2.63 kΩ
1 and 2		50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ

## Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.



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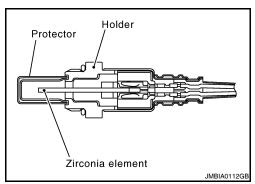
# P0130 A/F SENSOR 1

Description INFOID:000000004780107

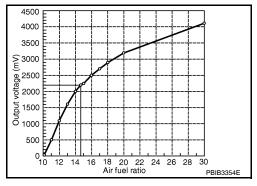
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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



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



DTC Logic

#### DTC DETECTION LOGIC

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

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

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

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

#### With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Let it idle for 2 minutes.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-185, "Diagnosis Procedure".

## **P0130 A/F SENSOR 1**

#### [HR16DE] < COMPONENT DIAGNOSIS > NO-1 >> With CONSULT-III: GO TO 3. NO-2 >> Without CONSULT-III: GO TO 7. Α 3.CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III. EC Check "A/F SEN1 (B1)" indication. Does the indication fluctuates around 2.2 V? >> GO TO 4. YES NO >> Go to EC-185, "Diagnosis Procedure". $oldsymbol{4}.$ PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I Select "A/F SEN1 (B1) P1276" of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III. 2. Touch "START". When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen. Е **ENG SPEED** 1,000 - 3,200 rpm VHCL SPEED SE More than 64 km/h (40 mph) F B/FUEL SCHDL 1.0 - 8.0 msec D position (A/T) Selector lever 5th position (M/T) If "TESTING" is not displayed after 20 seconds, retry from step 2. **CAUTION:** Always drive vehicle at a safe speed. Н 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 during releasing the accelerator pedal. Which does "TESTING" change to? COMPLETED>>GO TO 6. OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4. $oldsymbol{6}$ .PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III Touch "SELF-DIAG RESULT" Which is displayed on CONSULT-III screen? YES >> INSPECTION END M NO >> Go to EC-185, "Diagnosis Procedure". .PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B Perform Component Function Check. Refer to EC-183, "Component Function Check". N 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. 0 Is the inspection result normal? YES >> INSPECTION END NO >> Go to EC-185, "Diagnosis Procedure". Component Function Check INFOID:0000000004780109 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.

## **P0130 A/F SENSOR 1**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

3. Shift the selector lever to the D position (A/T) or 1st position (M/T), 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 during releasing the accelerator pedal.

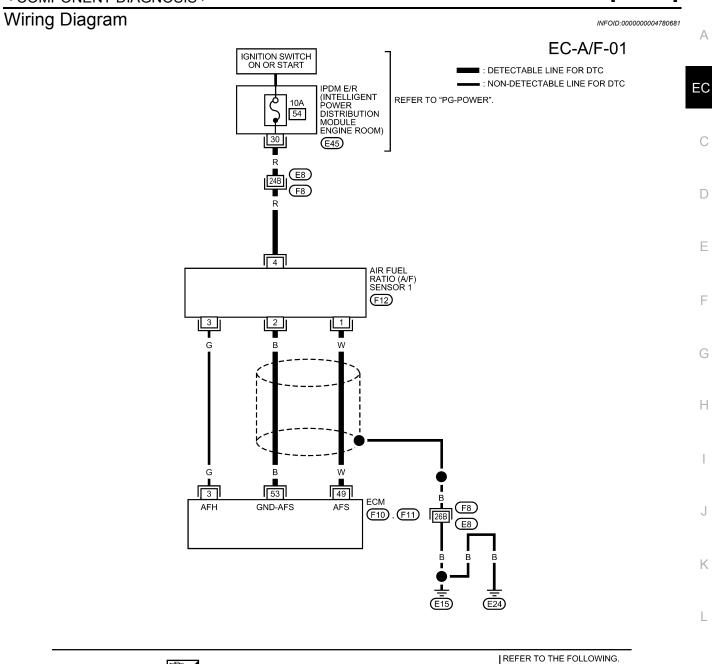
- 4. Repeat steps 2 to 3 for five times.
- 5. Stop the vehicle and turn ignition switch OFF.
- 6. Wait at least 10 seconds and restart engine.
- 7. Repeat steps 2 to 3 for five times.
- 8. Stop the vehicle.
- 9. Check 1st trip DTC.

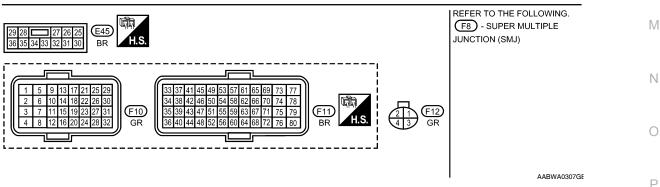
#### Is 1st trip DTC detected?

YES >> Go to EC-185, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:0000000004780110





# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

A/F sensor 1  Connector Terminal		Ground	Voltage
		Ground	
F12	4	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 E8, F8
- IPDM E/R harness connector E45
- 10 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F12	1	F11	49	Existed
1 12	F12 2		53	Existed

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

A/F sei	nsor 1	Ground	Continuity	
Connector Terminal		Glound	Continuity	
F12	1	Ground	Not existed	
ГΙΖ	2	Giodila	INUL EXISTED	

EC	М	Ground	Continuity	
Connector Terminal		Ground	Continuity	
F11	49	Ground	Not existed	
FII	53	Giouna	Not existed	

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5. CHECK INTERMITTENT INCIDENT

Perform EC-120, "Diagnosis Procedure".

P0130 A/F SENSOR 1	
< COMPONENT DIAGNOSIS > [HR16DE]	
Is the inspection result normal?	
YES >> GO TO 6.	Α
NO >> Repair or replace.	
6.REPLACE AIR FUEL RATIO (A/F) SENSOR 1	EC
Replace air fuel ratio (A/F) sensor 1.  CAUTION:	
• Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.	С
• Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial	
service tool).	D
>> INSPECTION END	
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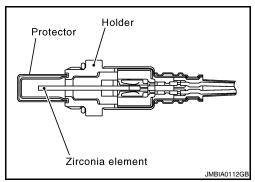
## P0131 A/F SENSOR 1

Description INFOID:000000004780111

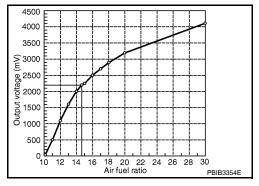
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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



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



DTC Logic

#### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0131	Air fuel ratio (A/F) sensor 1 circuit low voltage	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V.	Harness or connectors     (The A/F sensor 1 circuit is open or shorted.)     A/F sensor 1

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 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)" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" indication.

#### With GST

Follow the procedure "With CONSULT-III" above.

Is the indication constantly approx. 0 V?

## **P0131 A/F SENSOR 1**

#### [HR16DE] < COMPONENT DIAGNOSIS >

YES >> Go to EC-190, "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.

## Always drive vehicle at a safe speed.

3. Maintain the following conditions for about 20 consecutive seconds.

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

#### NOTE:

- Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 1, return to step
- 4. Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

## Is 1st trip DTC detected?

YES >> Go to EC-190, "Diagnosis Procedure".

NO >> INSPECTION END EC

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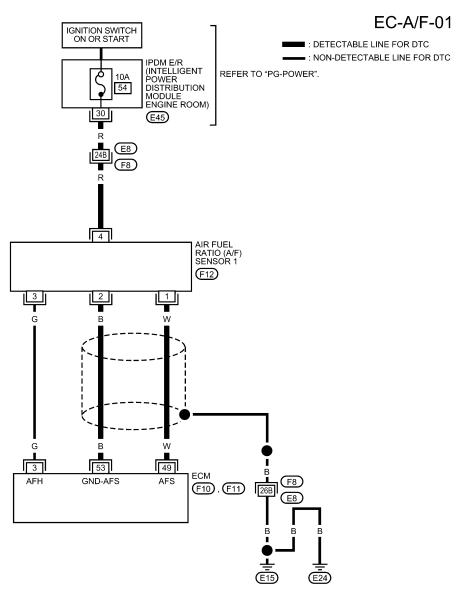
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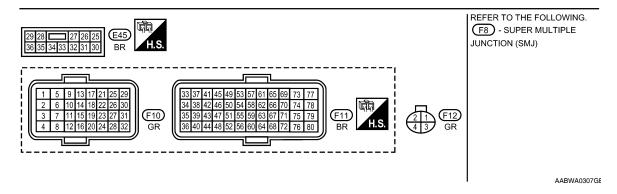
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Wiring Diagram

INFOID:0000000004780710





# Diagnosis Procedure

INFOID:0000000004780113

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

A/F sensor 1		Ground	Voltage
Connector	Terminal	Giodila	voltage
F12	4	Ground	Battery voltage

#### Is the inspection result normal?

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

NO >> GO 10 3.

# 3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- IPDM E/R harness connector E45
- 10 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sei	nsor 1	ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F12	1	F11	49	Existed
ГІ	2	ГП	53	EXISIEU

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

A/F sei	nsor 1	Ground	Continuity	
Connector Terminal		Ground	Continuity	
F12	1	Ground	Not existed	
ГІ	2	Giodila	Not existed	

ECM		Ground	Continuity
Connector	Terminal	Oround	Continuity
F11	49	Ground	Not existed
ГП	53	Giouria	Not existed

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5. CHECK INTERMITTENT INCIDENT

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Perform EC-120, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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

Replace air fuel ratio (A/F) sensor 1.

#### **CAUTION:**

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

>> INSPECTION END

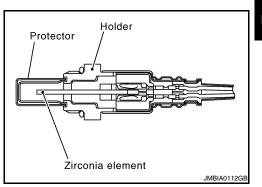
# P0132 A/F SENSOR 1

Description INFOID:0000000004780114

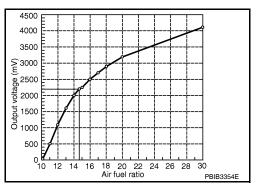
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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



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



DTC Logic

#### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Air fuel ratio (A/F) sensor 1 circuit high voltage	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V.	Harness or connectors     (The A/F sensor 1 circuit is open or shorted.)     A/F sensor 1

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 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)" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" indication.

## With GST

Follow the procedure "With CONSULT-IIII" above.

Is the indication constantly approx. 5 V?

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YES >> Go to EC-195, "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 about 20 consecutive seconds.

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

#### NOTE:

- Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.
- 4. Check 1st trip DTC.

#### With GST

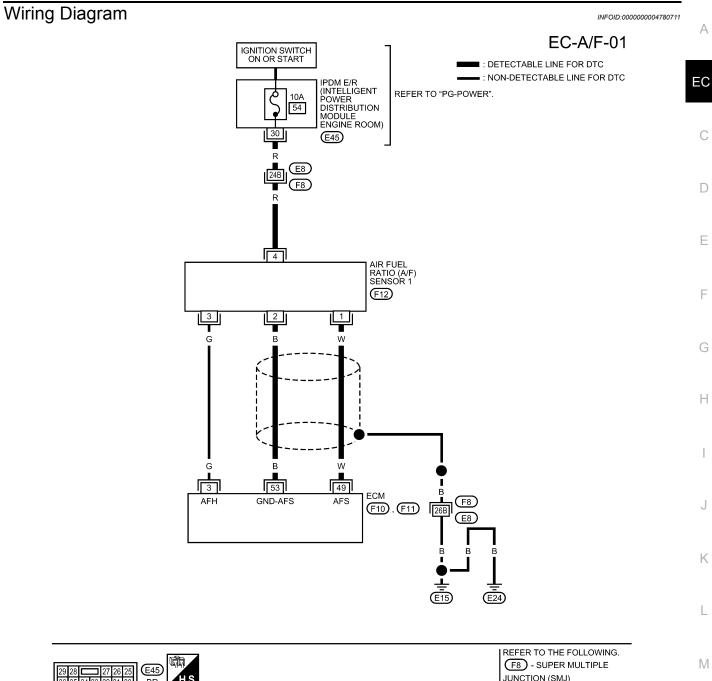
Follow the procedure "With CONSULT-III" above.

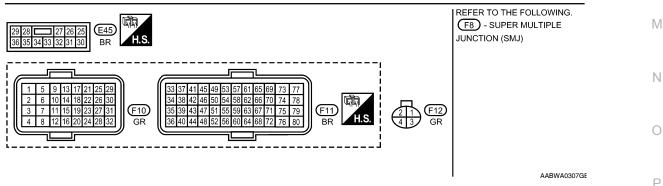
## Is 1st trip DTC is detected?

YES >> Go to EC-195, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:0000000004780116





# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### < COMPONENT DIAGNOSIS >

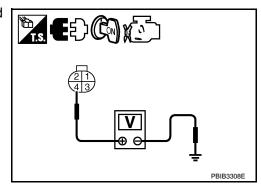
YES >> GO TO 2.

NO >> Repair or replace ground connection.

# $2.\mathsf{CHECK}$ AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

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

A/F sensor 1		Ground	Voltage
Connector	Terminal	Glound	voltage
F12	4	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 E8, F8
- IPDM E/R harness connector E45
- 10 A fuse (No. 54)
- · Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F s	ensor 1	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F12	1	F11	49	Existed
1 12	2	1 11	53	LAISIEU

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

A/F sensor 1		Ground	Continuity
Connector	Terminal	Oround	Continuity
F12	1	Ground	Not existed
1 12	2	Olouliu	NOT EXISTED

ECM		Ground	Continuity
Connector	Terminal	Giodila	Continuity
F11	49	Ground	Not existed
1 11	53	Ground	NOT EXISTED

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5.CHECK INTERMITTENT INCIDENT

P0132 A/F SENSOR 1 < COMPONENT DIAGNOSIS > [HR16DE]	
< COMPONENT DIAGNOSIS > [HR16DE]  Perform <u>EC-120</u> , "Diagnosis Procedure".	
Is the inspection result normal?	Α
YES >> GO TO 6.	
NO >> Repair or replace.	EC
6.REPLACE AIR FUEL RATIO (A/F) SENSOR 1	LO
Replace air fuel ratio (A/F) sensor 1.  CAUTION:	
• Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard	С
surface such as a concrete floor; use a new one.  • Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).	D
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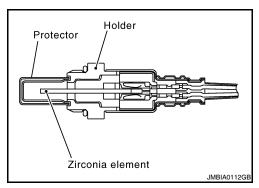
## P0133 A/F SENSOR 1

Description INFOID:000000004780117

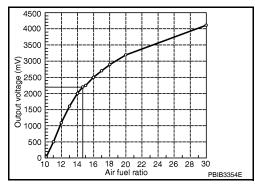
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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



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



DTC Logic

#### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0133	Air fuel ratio (A/F) sensor 1 circuit slow response	The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	<ul> <li>Harness or connectors (The A/F sensor 1 circuit is open or shorted.)</li> <li>A/F sensor 1</li> <li>A/F sensor 1 heater</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> <li>Exhaust gas leaks</li> <li>PCV</li> <li>Mass air flow sensor</li> </ul>

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

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

#### Do you have CONSULT-III?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

## >> 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 1minute under no load.

- 3. Let engine idle for 1 minute.
- 4. Increase the engine speed up to 4,000 to 5,000 rpm and keep it for 10 seconds.

- 5. Fully release accelerator pedal and then let engine idle for about 1 minute.
- Check 1st trip DTC detected?.

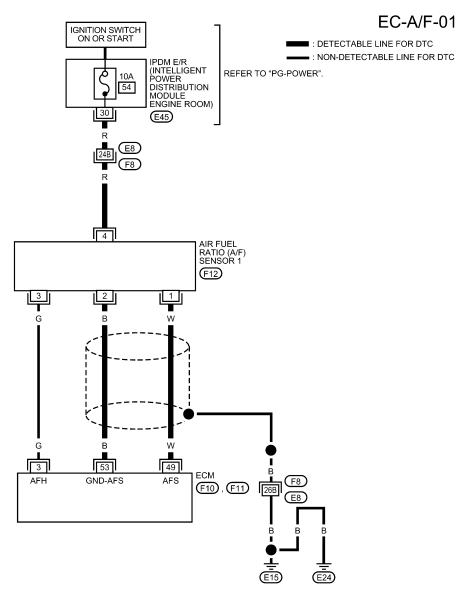
## Is 1st trip DTC detected?

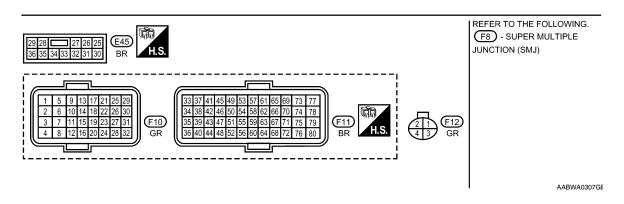
YES >> Go to EC-201, "Diagnosis Procedure".

NO >> INSPECTION END

# Wiring Diagram

INFOID:0000000004780712





# Diagnosis Procedure

INFOID:0000000004780119

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

## Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.retighten a/f sensor 1

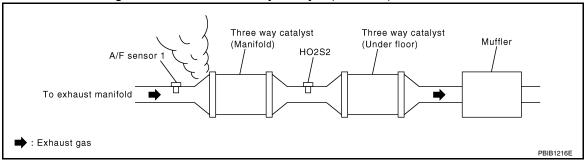
Loosen and retighten the A/F sensor 1. Refer to EM-31, "Exploded View".

>> GO TO 3.

# 3. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

2. Listen for an exhaust gas leak before three way catalyst (manifold).



## Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

# 4.CHECK FOR INTAKE AIR LEAK

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

#### Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 5.

# 5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to <u>EC-33, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".</u>
- 2. Run engine for at least 10 minutes at idle speed.

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

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to <u>EC-229, "DTC Logic"</u> or <u>EC-235, "DTC Logic"</u>.

NO >> GO TO 6.

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

- 1. Disconnect A/F sensor 1 harness connector.
- 2. Turn ignition switch ON.

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## < COMPONENT DIAGNOSIS >

Check the voltage between A/F sensor 1 harness connector and ground.

A/F ser	A/F sensor 1		Voltage
Connector	Terminal	Ground	voltage
F12	4	Ground	Battery voltage

# 

## Is the inspection result normal?

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

# 7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- IPDM E/R harness connector E45
- 10 A fuse (No. 54)
- · Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

# $8.\mathsf{CHECK}$ A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

A/F ser	nsor 1	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F12	1	F11	49	Existed
1 12	2		53	LXISIEU

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

A/F sensor 1		Ground	Continuity
Connector	Terminal	Ground	Continuity
F12	1 E12		Not existed
1 12	2	Ground	Not existed

EC	М	Ground	Continuity	
Connector Terminal		Ground	Continuity	
F11	49	Ground	Not existed	
ГП	53	Giouria	Not existed	

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

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

Refer to EC-139, "Component Inspection".

#### Is the inspection result normal?

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

10. CHECK MASS AIR FLOW SENSOR

# **P0133 A/F SENSOR 1**

P0133 A/F SENSOR 1	
< COMPONENT DIAGNOSIS > [HR16DE]	
Refer to EC-153, "Component Inspection".	
Is the inspection result normal?	Α
YES >> GO TO 11.  NO >> Replace mass air flow sensor.	
NO >> Replace mass air flow sensor.  11. CHECK PCV VALVE	EC
Refer to EC-456, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 12.	С
NO >> Repair or replace PCV valve.	
12.check intermittent incident	D
Perform EC-120, "Diagnosis Procedure".	
Is the inspection result normal?	Е
YES >> GO TO 13.	_
NO >> Repair or replace.  13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1	
	F
Replace air fuel ratio (A/F) sensor 1.  CAUTION:	
• Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard	G
surface such as a concrete floor; use a new one.  • Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner	
[commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial	
service tool).	Н
>> INSPECTION END	
>> INSPECTION END	
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## P0137 H02S2

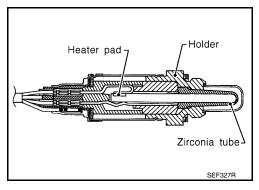
Description INFOID:000000004780120

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.

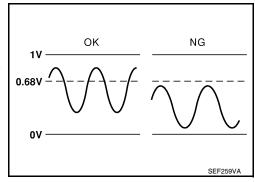


**DTC Logic** 

INFOID:0000000004780121

#### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor is not reached to the specified voltage.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

#### DTC CONFIRMATION PROCEDURE

# 1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 5.

2.PRECONDITIONING

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

#### **TESTING CONDITION:**

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

>> GO TO 3.

# 3. PERFORM DTC CONFIRMATION PROCEDURE

#### < COMPONENT DIAGNOSIS >

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.
- 6. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).

If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).

- 7. Open engine hood.
- 8. Select "HO2S2 (B1) P1147" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 9. Follow the instruction of CONSULT-III.

#### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

10. Touch "SELF-DIAG RESULT".

## Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-207, "Diagnosis Procedure".

CAN NOT BE DIAGNOSED>>GO TO 4.

# $oldsymbol{4}$ .PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 3.

# $oldsymbol{5}$ Perform component function check

Perform component function check. Refer to EC-205, "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-207, "Diagnosis Procedure".

# Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK-I

#### Without CONSULT-III

- 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.
- Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

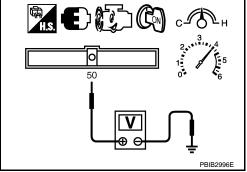
E	СМ			
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II



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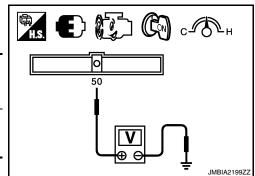
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## < COMPONENT DIAGNOSIS >

Check the voltage between ECM harness connector and ground under the following condition.

Е	CM			
Con- nector	Terminal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure.



## Is the inspection result normal?

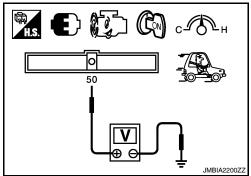
YES >> INSPECTION END

NO >> GO TO 3.

# 3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure.



## Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-207, "Diagnosis Procedure".

Wiring Diagram

IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)

> HEATED OXYGEN SENSOR 2

(F13)

**E**45

4

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O2SRR

(F10), (F11)

IGNITION SWITCH ON OR START

2

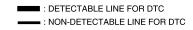
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GND-02

## EC-HO2S2-01





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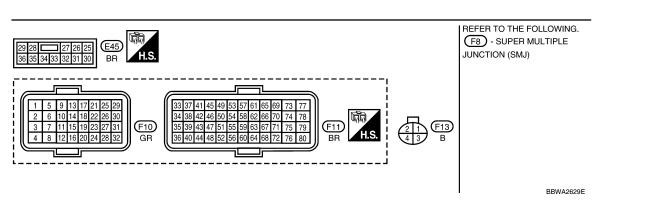
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# Diagnosis Procedure

INFOID:0000000004780123

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to <u>EC-33</u>, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- 2. Run engine for at least 10 minutes at idle speed.

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

YES >> Perform trouble diagnosis for DTC P0171. Refer to <a href="EC-229">EC-229</a>, "DTC Logic".

NO >> GO TO 3.

# 3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

НО	2S2	EC	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F13	1	F11	59	Existed

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

## Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO	2S2	E	СМ	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F13	4	F11	50	Existed

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

HO	2S2	Ground	Continuity	
Connector	Connector Terminal		Continuity	
F13	4	Ground	Not existed	

EC	CM	Ground	Continuity
Connector Terminal		Ground	Continuity
F11	50	Ground	Not existed

3. Also check harness for short to power.

## Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-209, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

# 6. REPLACE HEATED OXYGEN SENSOR 2

INFOID:0000000004780124

Replace heated oxygen sensor 2.

## **CAUTION:**

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

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>> INSPECTION END

# 7. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

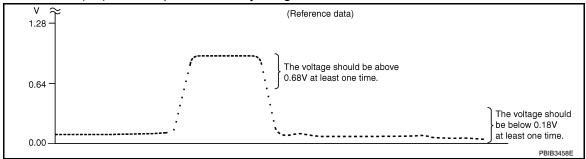
YES >> GO TO 2.

NO >> GO TO 3.

# 2.CHECK HEATED OXYGEN SENSOR 2

#### With CONSULT-III

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



"HO2S2 (B1)" should be above 0.68 V at least once when the "FUEL INJECTION" is + 25%. "HO2S2 (B1)" should be below 0.18 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

- Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 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.

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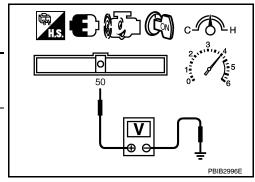
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## < COMPONENT DIAGNOSIS >

5. Check the voltage between ECM harness connector and ground under the following condition.

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.



#### Is the inspection result normal?

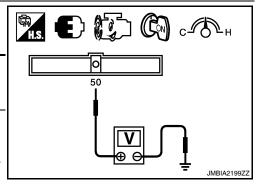
YES >> INSPECTION END

NO >> GO TO 4.

# 4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

E	CM			
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.



#### Is the inspection result normal?

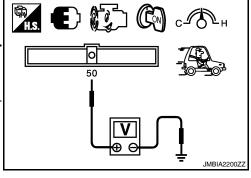
YES >> INSPECTION END

NO >> GO TO 5.

# 5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.	



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

## 6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

#### **CAUTION:**

• Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

• Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

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## P0138 H02S2

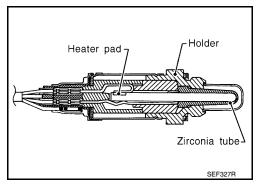
Description INFOID:000000004780125

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.



**DTC** Logic

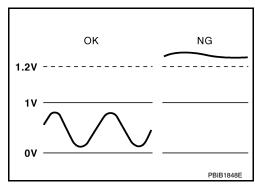
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#### DTC DETECTION LOGIC

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

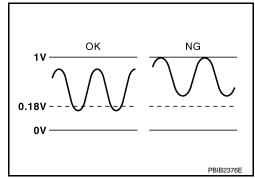
#### **MALFUNCTION A**

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition 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 the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
		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
P0138	Heated oxygen sensor 2 circuit high voltage	В)	The minimum voltage from the sensor is not reached to the specified voltage.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> </ul>

# Is the inspection result normal? YES >> INSPECTION END

YES >> INSPECTION END

check, a 1st trip DTC might not be confirmed.

NO >> Go to <u>EC-215</u>, "<u>Diagnosis Procedure</u>".

# Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK-I

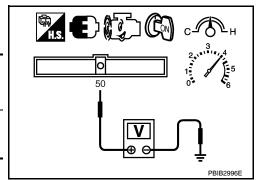
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INFOID:0000000004780127

## 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. Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.18 V at least once during this procedure.	



#### Is the inspection result normal?

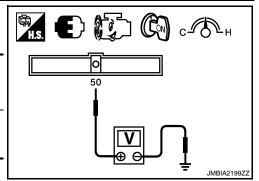
YES >> INSPECTION END

NO >> GO TO 2.

# 2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.18 V at least once during this procedure.	



#### Is the inspection result normal?

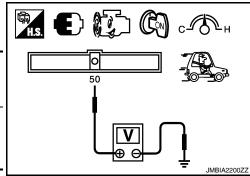
YES >> INSPECTION END

NO >> GO TO 3.

# 3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T)	The voltage should be above 0.18 V at least once during this procedure.	



#### Is the inspection result normal?

YES >> INSPECTION END

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

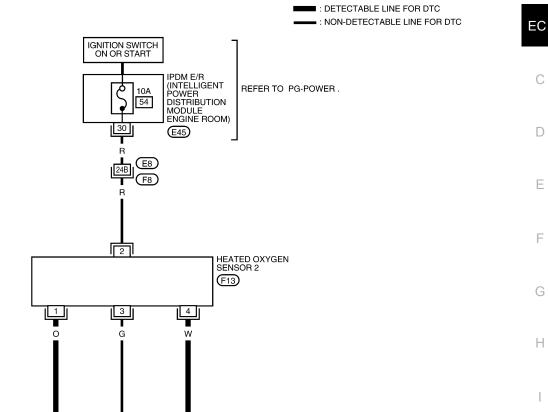
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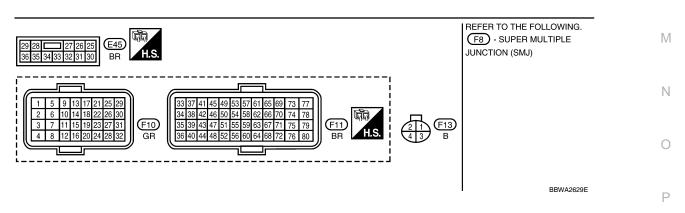
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## EC-HO2S2-01





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O2SRR

(F10), (F11)

# Diagnosis Procedure

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to <u>EC-212</u>, "<u>DTC Logic</u>". Which malfunction is detected?

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GND-02

5

#### < COMPONENT DIAGNOSIS >

A >> GO TO 2.

B >> GO TO 9.

# 2. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

# 3.CHECK HO2S2 CONNECTOR FOR WATER

- 1. Disconnect heated oxygen sensor 2 harness connector.
- 2. Check connectors for water.

#### Water should not exist.

## Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace harness or connectors.

# f 4 .CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

HO	2S2	E	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F13	1	F11	59	Existed

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# ${f 5.}$ CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2S2		E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
F13	4	F11	50	Existed

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

HO	2S2	Ground	Continuity
Connector Terminal		Cround	Continuity
F13	4	Ground	Not existed

EC	CM	Ground	Continuity	
Connector	Terminal	Ground	Continuity	
F11	50	Ground	Not existed	

3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 6.CHECK HEATED OXYGEN SENSOR 2

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

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F13	4	F11	50	Existed

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

HO:	2S2	Ground	Continuity	
Connector Terminal		Ground	Continuity	
F13 4		Ground	Not existed	

EC	M	Ground	Continuity	
Connector	Terminal	Ground	Continuity	
F11	50	Ground	Not existed	

3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 13. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-218. "Component Inspection".

#### Is the inspection result normal?

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

# 14. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

#### **CAUTION:**

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

#### >> INSPECTION END

# 15. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

## Component Inspection

INFOID:0000000004780129

## 1. INSPECTION START

Do you have CONSULT-III?

### Do you have CONSULT-III?

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

# 2.CHECK HEATED OXYGEN SENSOR 2

#### With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.

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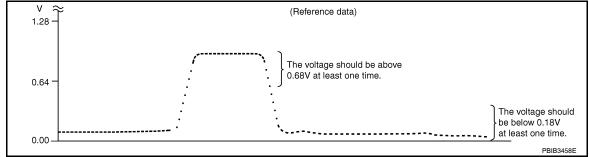
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- Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 7. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to  $\pm$  25%.



"HO2S2 (B1)" should be above 0.68 V at least once when the "FUEL INJECTION" is + 25%. "HO2S2 (B1)" should be below 0.18 V at least once when the "FUEL INJECTION" is – 25%.

## Is the inspection result normal?

YES >> INSPECTION END

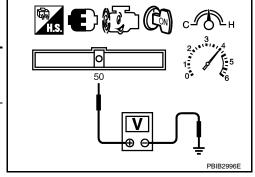
NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-I

#### Without CONSULT-III

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

E	CM				
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.	



#### Is the inspection result normal?

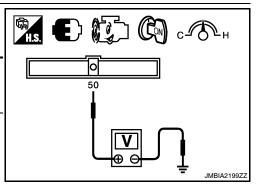
YES >> INSPECTION END

NO >> GO TO 4.

## 4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.	



Is the inspection result normal?

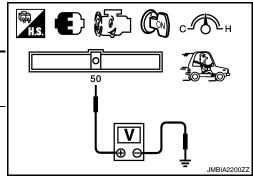
YES >> INSPECTION END

NO >> GO TO 5.

# 5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.	



### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

### **CAUTION:**

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

>> INSPECTION END

## P0139 H02S2

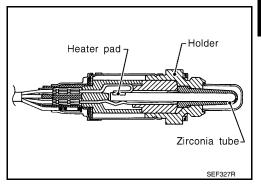
Description INFOID:0000000004780130

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.

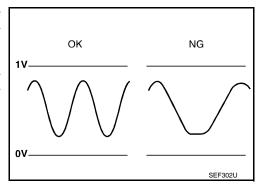
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



**DTC Logic** INFOID:0000000004780131

#### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

#### DTC CONFIRMATION PROCEDURE

## 1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 5.

### 2.PRECONDITIONING

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

>> GO TO 3.

# 3.PERFORM DTC CONFIRMATION PROCEDURE

## With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to normal operating temperature.

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#### < COMPONENT DIAGNOSIS >

- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.
- 5. Open engine hood.
- 6. Select "HO2S2 (B1) P0139" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 7. Follow the instruction of CONSULT-III.

#### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

Touch "SELF-DIAG RESULT".

#### Which is displayed on CONSULT-III?

OK >> INSPECTION END

NG >> GO TO 4.

CAN NOT BE DIAGNOSED>>GO TO 4.

## f 4.PERFORM THE RESULT OF DTC CONFIRMATION PROCEDURE

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

>> GO TO 3

## 5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-222, "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-224, "Diagnosis Procedure".

## Component Function Check

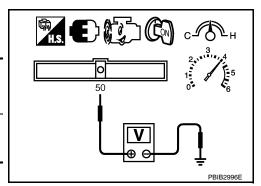
INFOID:0000000004780132

# 1.PERFORM COMPONENT FUNCTION CHECK-I

#### 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.
- Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Terminal	Ground	Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.30 V at least once during this procedure.	



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

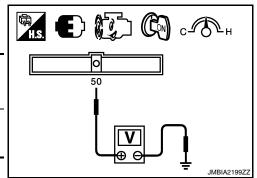
# 2.PERFORM COMPONENT FUNCTION CHECK-II

### < COMPONENT DIAGNOSIS >

[HR16DE]

Check the voltage between ECM harness connector and ground under the following condition.

ECM					
Con- nector	Terminal	Ground	Condition	Voltage	
F11	33 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.30 V at least once during this procedure.	



### Is the inspection result normal?

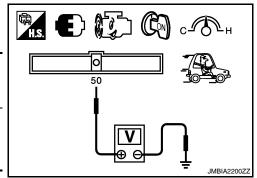
YES >> INSPECTION END

NO >> GO TO 3.

## 3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

Е	ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage	
F11	33 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T)	The voltage should be above 0.30 V at least once during this procedure.	



### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-224, "Diagnosis Procedure".

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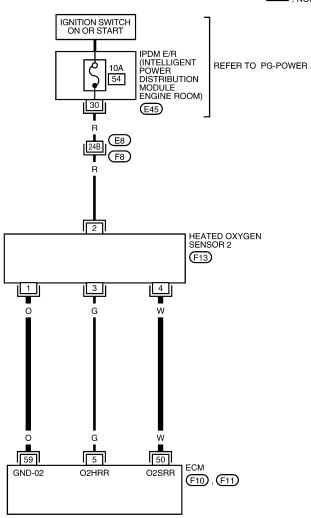
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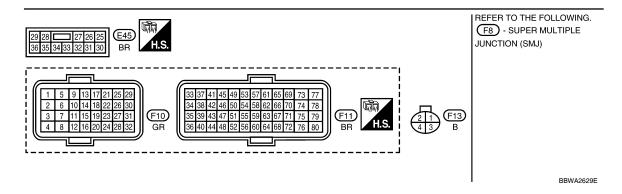
Wiring Diagram

INFOID:0000000004780714

### EC-HO2S2-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





# Diagnosis Procedure

INFOID:0000000004780133

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-33, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".

Run engine for at least 10 minutes at idle speed.

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

>> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-229, "DTC Logic" or EC-235. "DTC Logic".

NO >> GO TO 3.

# 3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

HO2S2		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F13	1	F11	59	Existed

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

### Is the inspection result normal?

YFS >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## f 4 .CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2S2		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F13	4	F11	50	Existed

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

HO	2S2	Ground	Continuity
Connector	Terminal	Ground	Continuity
F13	4	Ground	Not existed

EC	CM	Ground	Continuity	
Connector	Terminal		Continuity	
F11	50	Ground	Not existed	

3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-226, "Component Inspection".

#### Is the inspection result normal?

>> GO TO 7. YES

NO >> GO TO 6.

**EC-225** 

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## 6. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

### **CAUTION:**

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

### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

## Component Inspection

INFOID:0000000004780134

## 1.INSPECTION START

Do you have CONSULT-III?

## Do you have CONSULT-III?

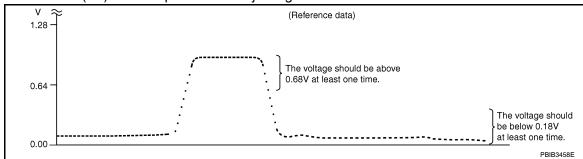
YES >> GO TO 2.

NO >> GO TO 3.

## 2. CHECK HEATED OXYGEN SENSOR 2

#### With CONSULT-III

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



"HO2S2 (B1)" should be above 0.68 V at least once when the "FUEL INJECTION" is + 25%. "HO2S2 (B1)" 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

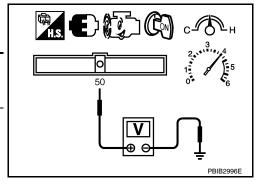
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.

### < COMPONENT DIAGNOSIS >

[HR16DE]

5. Check the voltage between ECM harness connector and ground under the following condition.

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.



### Is the inspection result normal?

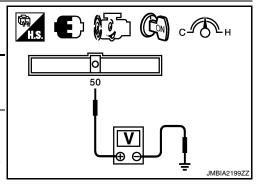
YES >> INSPECTION END

NO >> GO TO 4.

## 4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.



#### Is the inspection result normal?

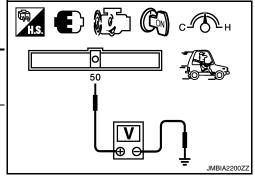
YES >> INSPECTION END

NO >> GO TO 5.

## 5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM				
Con- nector	Termi- nal	Ground	Condition	Voltage
F11	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in D position (A/T), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

## 6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

## **CAUTION:**

 Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

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• Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

## P0171 FUEL INJECTION SYSTEM FUNCTION

DTC Logic INFOID:0000000004780135

### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the A/F sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and lights up the 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	<ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)</li> </ul>	<ul> <li>Intake air leaks</li> <li>A/F sensor 1</li> <li>Fuel injector</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Lack of fuel</li> <li>Mass air flow sensor</li> <li>Incorrect PCV hose connection</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Clear the mixture ratio self-learning value. Refer to EC-33, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- Start engine.

#### Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

## 3. RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

#### NOTE:

When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

### Does engine start?

YES >> Go to EC-231, "Diagnosis Procedure".

NO >> Check exhaust and intake air leak visually.

## f 4.PERFORM DTC CONFIRMATION PROCEDURE-II

- Start engine and let it idle for at least 5 minutes.
- Check 1st trip DTC. 2.

### Is 1st trip DTC detected?

YES >> Go to EC-231, "Diagnosis Procedure".

NO >> GO TO 5. EC

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### P0171 FUEL INJECTION SYSTEM FUNCTION

### < COMPONENT DIAGNOSIS >

[HR16DE]

# 5. PERFORM DTC CONFIRMATION PROCEDURE-III

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Start engine.
- 3. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

VHCL SPEED SE

50 - 120 km/h (31 - 75 MPH)

#### **CAUTION:**

Always drive vehicle at a safe speed.

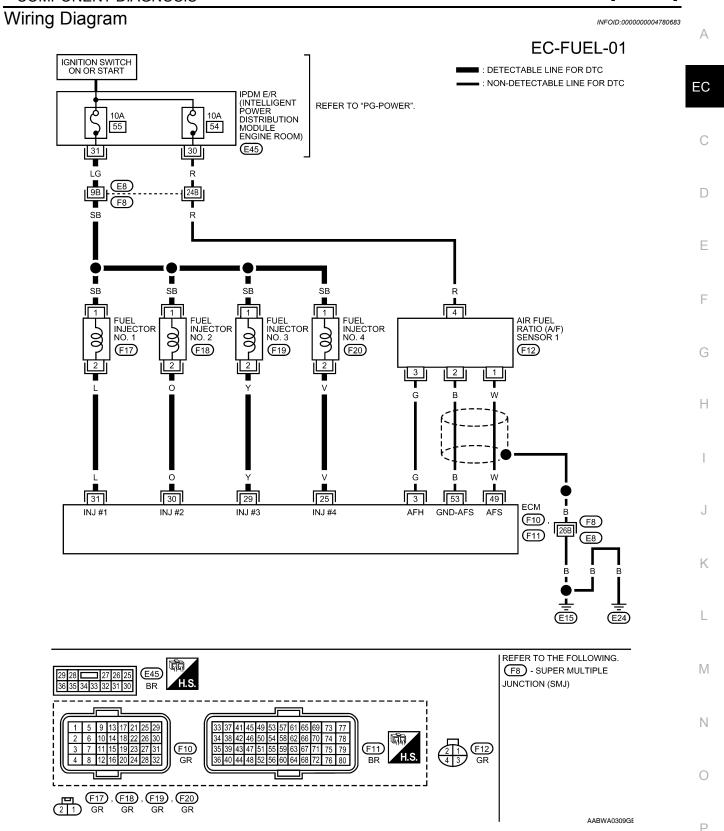
4. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-231, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:0000000004780136



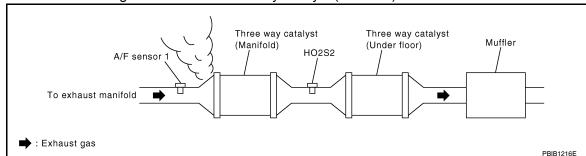
# Diagnosis Procedure

# 1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

### < COMPONENT DIAGNOSIS >

Listen for an exhaust gas leak before three way catalyst (manifold).



### Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

# 2. CHECK FOR INTAKE AIR LEAK

- 1. Listen for an intake air leak after the mass air flow sensor.
- Check PCV hose connection.

#### Intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

# 3.check a/f sensor 1 input signal circuit

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

A/F se	nsor 1	EC	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F12	1	F11	49	Existed
ГІ	2	ГП	53	Existed

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

A/F se	nsor 1	Ground	Continuity	
Connector Terminal		Giodila	Continuity	
F12	1	Ground	Not existed	
1 12	2	Ground	Not existed	

EC	CM	Ground	Continuity
Connector	Terminal	Giodila	Continuity
F11	49	Ground	Not existed
1 11	53	Giouna	NOI EXISIEU

6. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 4

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4. CHECK FUEL PRESSURE

1. Check fuel pressure. Refer to EC-498, "Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

## P0171 FUEL INJECTION SYSTEM FUNCTION

#### [HR16DE] < COMPONENT DIAGNOSIS >

NO >> GO TO 5.

# DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

### Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".

NO >> Repair or replace

## 6 CHECK MASS AIR FLOW SENSOR

#### With CONSULT-III

- 1. Install all removed parts.
- 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III.
- 3. For specification, refer to EC-504, "Mass Air Flow Sensor".

#### With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in Service \$01 with GST.
- For specification, refer to EC-504, "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-148, "DTC Logic".

## 7.CHECK FUNCTION OF FUEL INJECTOR

#### With CONSULT-III

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

#### Without CONSULT-III

- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

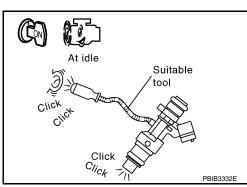
#### Clicking noise should be heard.

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to

EC-430, "Component Function Check".



# 8. CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- 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-34, "Removal and Installation". Keep fuel hose and all fuel injectors connected to fuel tube.
- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.

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## **P0171 FUEL INJECTION SYSTEM FUNCTION**

### < COMPONENT DIAGNOSIS >

[HR16DE]

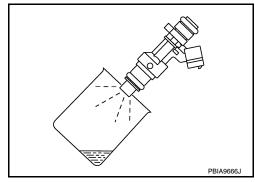
7. Crank engine for about 3 seconds.

Fuel should be sprayed evenly for each fuel injector.

## Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.



# 9.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

## P0172 FUEL INJECTION SYSTEM FUNCTION

DTC Logic INFOID:0000000004780137

### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the A/F sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and lights up the 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	Fuel injection system does not operate properly.     The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	A/F sensor 1     Fuel injector     Exhaust gas leaks     Incorrect fuel pressure     Mass air flow sensor

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Clear the mixture ratio self-learning value. Refer to EC-33, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- 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.

When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

### Does engine start?

YES >> Go to EC-237, "Diagnosis Procedure".

NO >> Check exhaust and intake air leak visually.

## f 4.PERFORM DTC CONFIRMATION PROCEDURE-II

- Start engine and let it idle for at least 5 minutes.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-237, "Diagnosis Procedure".

NO >> GO TO 5.

## ${f 5}$ .PERFORM DTC CONFIRMATION PROCEDURE-III

- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine.

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## **P0172 FUEL INJECTION SYSTEM FUNCTION**

## < COMPONENT DIAGNOSIS >

[HR16DE]

3. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

VHCL SPEED SE 50 - 120 km/h (31 - 75 MPH)

### **CAUTION:**

Always drive vehicle at a safe speed.

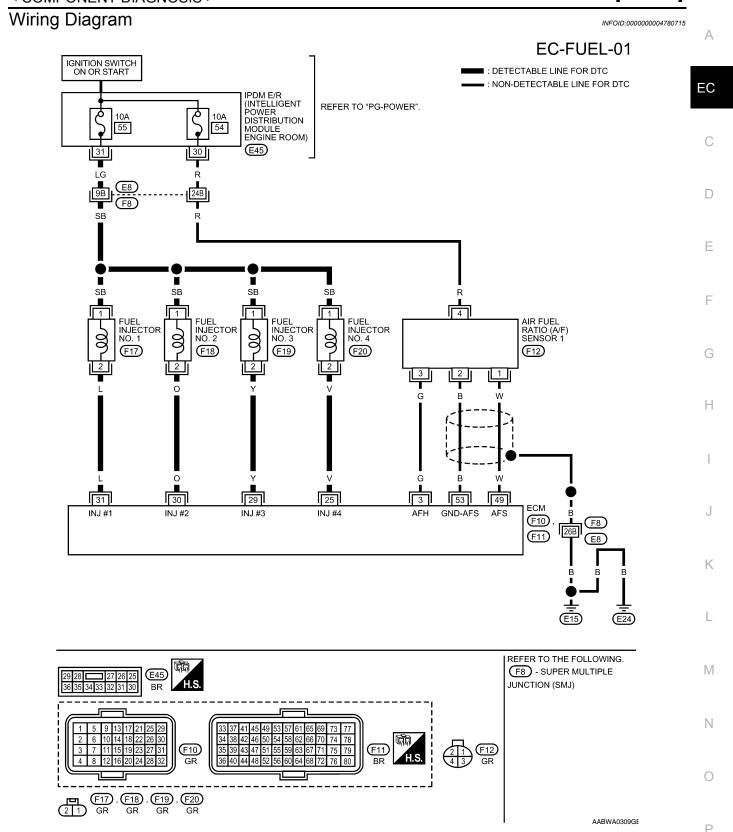
4. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-237, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:0000000004780138



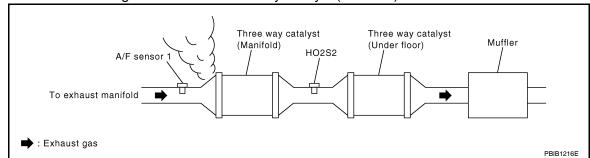
# Diagnosis Procedure

# 1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

### < COMPONENT DIAGNOSIS >

Listen for an exhaust gas leak before three way catalyst (manifold).



#### Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

# 2.CHECK FOR INTAKE AIR LEAK

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

#### Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

## 3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- 1. Turn ignition switch OFF.
- 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 se	nsor 1	ECM		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity		
F12	1	F11	49	Existed		
1 12	2	1 11	53	LXISIEU		

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

A/F sensor 1		Ground	Continuity	
Connector	Terminal	Ground	Continuity	
F12	1	Ground	Not existed	
1 12	2	Giodila	NOI EXISIEU	

		1		
ECM		Ground	Continuity	
Connector	Terminal	Ciouna	Continuity	
F11	49	Ground	Not existed	
1 11	53	Giouna	Ground Not exist	Not existed

6. Also check harness for short to power.

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

### 4. CHECK FUEL PRESSURE

1. Check fuel pressure. Refer to EC-498, "Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

### P0172 FUEL INJECTION SYSTEM FUNCTION

## < COMPONENT DIAGNOSIS >

# 5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

#### Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".

NO >> Repair or replace

## 6.CHECK MASS AIR FLOW SENSOR

#### With CONSULT-III

- Install all removed parts.
- 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III.
- 3. For specification, refer to EC-504, "Mass Air Flow Sensor".

#### With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in "Service \$01" with GST.
- For specification, refer to <u>EC-504, "Mass Air Flow Sensor"</u>.

#### 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-148, "DTC Logic".

## 7.CHECK FUNCTION OF FUEL INJECTOR

#### With CONSULT-III

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

#### Without CONSULT-III

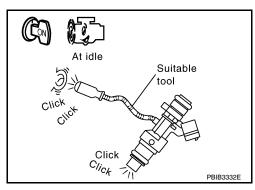
- 1. Let engine idle.
- Listen to each fuel injector operating sound.

#### Clicking noise should be heard.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-430, "Component Function Check".



# 8. CHECK FUEL INJECTOR

Remove fuel injector assembly. Refer to EM-34, "Removal and Installation".

Keep fuel hose and all fuel injectors connected to fuel tube.

- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- 4. Disconnect all ignition coil harness connectors.
- 5. Prepare pans or saucers under each fuel injectors.
- 6. Crank engine for about 3 seconds.

Make sure fuel does not drip from fuel injector.

#### Is the inspection result normal?

YFS >> GO TO 9.

NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

## 9.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

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**EC-239** 

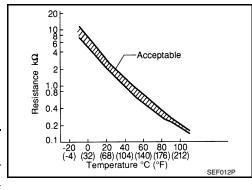
## P0181 FTT SENSOR

Description INFOID:000000004780138

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 $[k\Omega]$
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90



<sup>\*:</sup> These data are reference values and are measured between ECM terminal 43 (Fuel tank temperature sensor) and ground.

#### **CAUTION:**

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

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181	Fuel tank temperature sensor circuit range/per-formance	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch and wait at least 10 seconds.
- 2. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-242, "Diagnosis Procedure".

NO >> GO TO 3.

## 3.CHECK ENGINE COOLANT TEMPERATURE

#### With CONSULT-III

- 1. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III.
- 2. Check "COOLAN TEMP/S" indication.

#### With GST

Follow the procedure "With CONSULT-III" above.

### Is "COOLAN TEMP/S" indication less than 60°C (140°F)?

YES >> INSPECTION END

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

## **P0181 FTT SENSOR**

[HR16DE] < COMPONENT DIAGNOSIS >

### With CONSULT-III

- Cool engine down until "COOLAN TEMP/S" indication is less than 60°C (140°F).
   Wait at least 10 seconds.
- 3. Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

## Is 1st trip DTC detected?

>> Go to EC-242, "Diagnosis Procedure". YES

>> INSPECTION END NO

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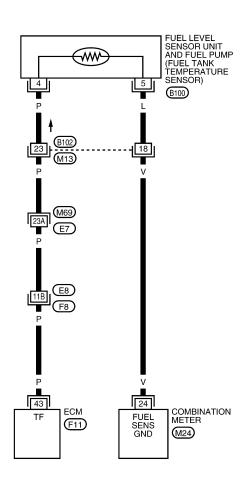
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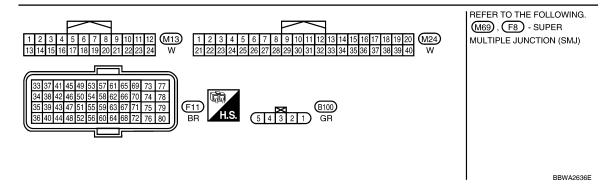
Wiring Diagram

INFOID:0000000004780684

## EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





# Diagnosis Procedure

INFOID:0000000004780141

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

Fuel level sensor un	Ground	Voltage	
Connector	Terminal	Giodila	voltage
B100	4	Ground	Approx. 5 V

#### Is the inspection result normal?

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

# 3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B102, M13
- Harness connectors M69, E7
- Harness connectors E8, F8
- · 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.

# f 4.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect combination meter harness connector.
- 3. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and combination meter harness connector.

Fuel level sensor unit and fuel pump		Combination meter		Continuity
Connector	Terminal	Connector Terminal		Continuity
B100	5	M24	24	Existed

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 B102, M13
- · Harness for open or short between "fuel level sensor unit and fuel pump" and combination meter
  - >> Repair open circuit or short to ground or short to power in harness or connector.

**EC-243** 

## 6.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-244, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace "fuel level sensor unit and fuel pump".

## .CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

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#### >> INSPECTION END

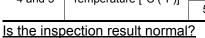
## Component Inspection

INFOID:0000000004780142

# $1.\mathsf{CHECK}$ FUEL TANK TEMPERATURE SENSOR

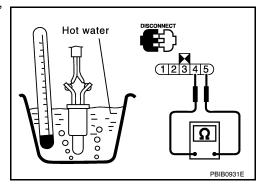
- Turn ignition switch OFF.
- Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit.
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

Terminals	Condition		Resistance
4 and 5	4 and 5 Temperature [°C (°F)]	20 (68)	2.3 - 2.7 kΩ
T and 3		50 (122)	0.79 - 0.90 kΩ



>> INSPECTION END YES

NO >> Replace "fuel level sensor unit and fuel pump".



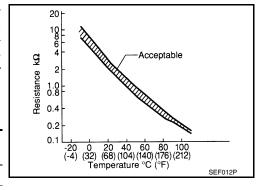
## P0182, P0183 FTT SENSOR

Description INFOID:000000004780143

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



<sup>\*:</sup> These data are reference values and are measured between ECM terminal 43 (Fuel tank temperature sensor) and ground.

#### **CAUTION:**

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

DTC Logic

#### 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.)
P0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Fuel tank temperature sensor

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

YES >> Go to EC-246, "Diagnosis Procedure".

NO >> INSPECTION END

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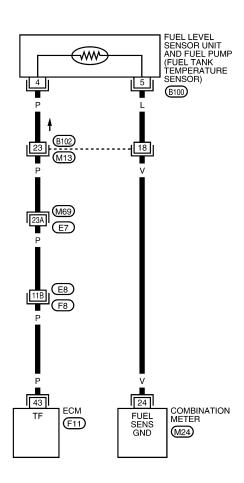
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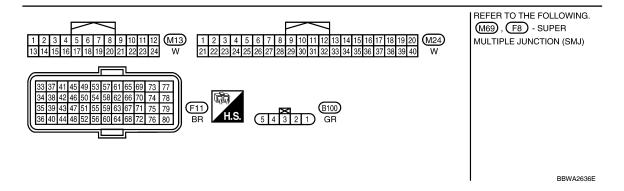
Wiring Diagram

INFOID:0000000004780716

## EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





# Diagnosis Procedure

INFOID:0000000004780145

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

Fuel level sensor un	Ground	Voltage	
Connector	Terminal	Giodila	voltage
B100	4	Ground	Approx. 5 V

#### Is the inspection result normal?

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

# 3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B102, M13
- Harness connectors M69, E7
- Harness connectors E8, F8
- · 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.

## f 4.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect combination meter harness connector.
- 3. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and combination meter harness connector.

Fuel level sensor unit and fuel pump		Combination meter		Continuity
Connector	Terminal	Connector Terminal		Continuity
B100	5	M24	24	Existed

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 B102, M13
- · Harness for open or short between "fuel level sensor unit and fuel pump" and combination meter
  - >> Repair open circuit or short to ground or short to power in harness or connector.

## 6.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-248, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace "fuel level sensor unit and fuel pump".

## .CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

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### >> INSPECTION END

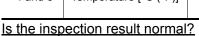
# **Component Inspection**

INFOID:0000000004780146

# 1. CHECK FUEL TANK TEMPERATURE SENSOR

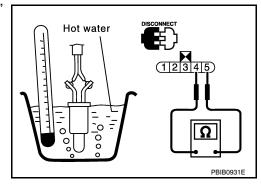
- 1. Turn ignition switch OFF.
- Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit.
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance		
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7 kΩ	
	remperature [ O ( 1 )]	50 (122)	0.79 - 0.90 kΩ	



YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump".



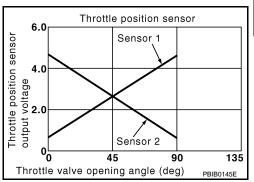
INFOID:0000000004780148

## P0222, P0223 TP SENSOR

Description INFOID:0000000004780147

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

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



**DTC Logic** 

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	Harness or connectors     (TP sensor 1 circuit is open or shorted.)
P0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	Electric throttle control actuator (TP sensor 1)

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

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 let it idle for 1 second.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-250, "Diagnosis Procedure".

NO >> INSPECTION END

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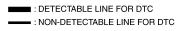
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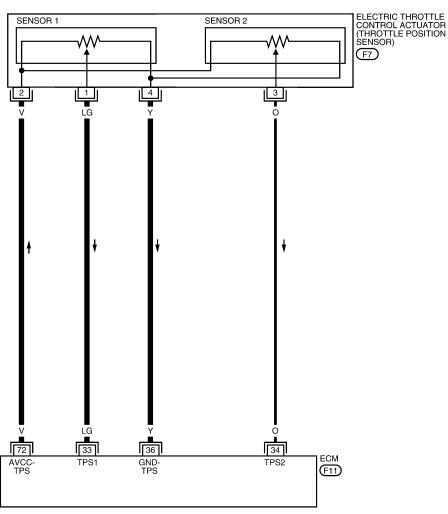
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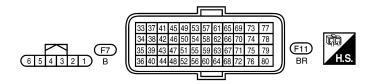
Wiring Diagram

INFOID:0000000004780688

## EC-TPS1-01







BBWA2655E

# Diagnosis Procedure

INFOID:0000000004780149

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

# < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.check throttle position sensor 1 power supply circuit

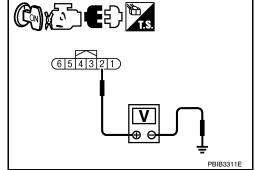
- Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle c	Ground	Voltage		
Connector	Terminal	Giodila	voitage	
F7	2	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



# 3.check throttle position sensor 1 ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle of	throttle control actuator		ECM	
Connector	Terminal	Connector Terminal		Continuity
F7	4	F11	36	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## $oldsymbol{4}.$ CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F7	1	F11	33	Existed	

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-252, "Component Inspection".

#### Is the inspection result normal?

>> GO TO 7. YES

NO >> GO TO 6.

# **6.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace electric throttle control actuator.
- Perform <u>EC-252</u>, "Special Repair Requirement".

>> INSPECTION END

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# 7.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

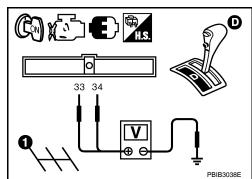
## Component Inspection

INFOID:0000000004780150

# 1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set selector lever to D (A/T) or 1st (M/T) position.
- 6. Check the voltage between ECM harness connector and ground.

ECM					
ECIVI		Ground	Condition		Voltage
Connector	Terminal				
F11	33 (TP sensor 1 signal)		Accelerator pedal	Fully released	More than 0.36V
		Ground		Fully de- pressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully de- pressed	More than 0.36V



### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.replace electric throttle control actuator

- 1. Replace electric throttle control actuator.
- 2. Perform EC-252, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004780151

## 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# 2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

# P0300, P0301, P0302, P0303, P0304 MISFIRE

**DTC Logic** INFOID:0000000004780152

### DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

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.

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 on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300	Multiple cylinder misfire detected	Multiple cylinders misfire.	Improper spark plug
P0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	Insufficient compression     Incorrect fuel pressure
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	The fuel injector circuit is open or shorted
P0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	Fuel injector     Intake air leak
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	The ignition signal circuit is open or shorted Lack of fuel Signal plate A/F sensor 1 Incorrect PCV hose connection

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

**EC-253** 

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Restart engine and let it idle for about 15 minutes.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-254, "Diagnosis Procedure".

NO >> GO TO 3.

# 3.perform dtc confirmation procedure-ii $\,$

Turn ignition switch OFF and wait at least 10 seconds.

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Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.

### Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

#### **CAUTION:**

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

Engine speed	Engine speed in the freeze frame data $\pm400~\text{rpm}$		
Vehicle speed	Vehicle speed in the freeze frame data $\pm$ 10 km/h (6 MPH)		
Base fuel schedule in freeze frame data $\times$ (1 $\pm$ 0.1)			
Engine coolant temperature (T)	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).		
condition	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).		

The time to driving varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

3. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-254, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004780153

# 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.
- Check PCV hose connection.

### Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 2.

# 2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

#### Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 3.

YES-2 >> Without CONSULT-III: GO TO 4.

NO >> Repair or replace it.

3.PERFORM POWER BALANCE TEST

#### With CONSULT-III

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

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 4.

# 4. CHECK FUNCTION OF FUEL INJECTOR

Start engine and let engine idle.

### < COMPONENT DIAGNOSIS >

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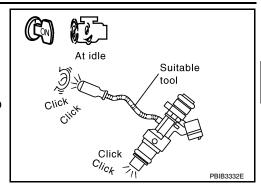
Listen to each fuel injector operating sound.

### Clicking noise should be heard.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-432. "Component Inspection".



## ${f 5.}$ CHECK FUNCTION OF IGNITION COIL-I

#### CAUTION:

Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- Remove fuel pump fuse in IPDM E/R to release fuel pressure.

#### NOTE:

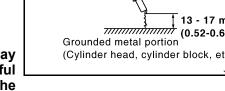
Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 -0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal por-

#### Spark should be generated.

#### **CAUTION:**

 During the operation, always stay 0.5 m (19.7 in) away from the spark plug and the ignition coil within. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.



 It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 6.

# 6. CHECK FUNCTION OF IGNITION COIL-II

- Turn ignition switch OFF.
- Disconnect spark plug and connect a known-good spark plug.
- Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

### Spark should be generated.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Check ignition coil, power transistor and their circuits. Refer to EC-439, "Component Function Check".

13 - 17 mm (0.52-0.66 in) (Cylinder head, cylinder block, etc.)

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# < COMPONENT DIAGNOSIS >

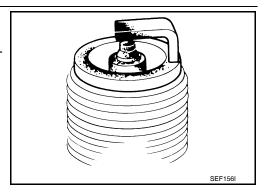
7.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-117, "Spark Plug".

NO >> Repair or clean spark plug. Then GO TO 8.



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# 8. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

### Spark should be generated.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <a href="EM-117">EM-117</a>, "Spark Plug".

# 9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-23, "Inspection".

#### Is the inspection result normal?

YES >> GO TO 10.

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

# 10. CHECK FUEL PRESSURE

- 1. Install all removed parts.
- Check fuel pressure. Refer to <u>EC-498</u>, "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.

# 12. CHECK IGNITION TIMING

Check the following items. Refer to <u>EC-26, "BASIC INSPECTION: Special Repair Requirement"</u>. For specification, refer to <u>EC-504, "Ignition Timing"</u>.

#### Is the inspection result normal?

YES >> GO TO 13.

NO >> Follow the EC-26, "BASIC INSPECTION: Special Repair Requirement".

# 13. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

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A/F se	nsor 1		ECM	Continuity	
Connector	Terminal	Connect	or Terminal	Continuity	
F12	1	F11	49	Existed	
F12	2		53	Existed	
		nuity be	tween A/F s	ensor 1 ha	ness connector and ground, or ECM harness connector
and gr	ound.				
A/F se	nsor 1				
Connector	Terminal	Ground	Continuity		
F40	1	0			
F12	2	Ground	Not existed		
EC	CM	Ground	Continuity		
Connector	Terminal	Cround	Continuity		
F11	49	Ground	Not existed		
	53	0.00	. 101 0/11010		
i. Also cl	heck harn	ess for s	short to power	er.	
s the inspe			<u>al?</u>		
_	> GO TO		uit or chart t	o around o	short to nower in harness or connectors
			tuit of short t 1 HEATER	o ground o	short to power in harness or connectors.
· · · · · · · · · · · · · · · · · · ·			nt Inspection	<u>ı"</u> .	
s the inspe	ection res	<u>ult norm</u>	<u>al?</u>		

YES >> GO TO 15.

NO >> Replace A/F sensor 1.

15. CHECK MASS AIR FLOW SENSOR

#### With CONSULT-III

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

For specification, refer to EC-504, "Mass Air Flow Sensor".

#### With GST

NO

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

For specification, refer to EC-504, "Mass Air Flow Sensor".

### Is the measurement value within the specification?

YES >> GO TO 16.

> >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-148, "DTC Logic".

# 16. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in <a>EC-487</a>, "Symptom Table".

#### Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or replace.

# 17.ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to "How to Erase DTC and 1st Trip DTC" in EC-90, "Diagnosis Description".

>> GO TO 18.

# P0300, P0301, P0302, P0303, P0304 MISFIRE

< COMPONENT DIAGNOSIS >

[HR16DE]

18. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

INFOID:0000000004780155

# P0327, P0328 KS

Description INFOID:0000000004780154

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.

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**DTC Logic** 

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detected condition	Possible cause
P0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)
P0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

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

>> GO TO 2.

# 2.perform dtc confirmation procedure

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

# Is 1st trip DTC detected?

>> Go to EC-260, "Diagnosis Procedure". YES

NO >> INSPECTION END

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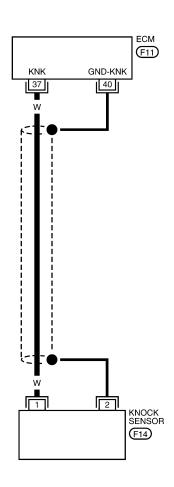
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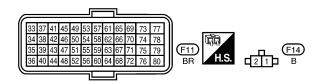
Wiring Diagram

INFOID:0000000004780689

### EC-KS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2637E

# Diagnosis Procedure

INFOID:0000000004780156

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

Knock sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
F14	2	F11 40		Existed	

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

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 3.check knock sensor input signal circuit for open and short

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

Knock	sensor	ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
F14	1	F11	37	Existed	

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

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK KNOCK SENSOR

Refer to EC-261, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 5.

>> Replace knock sensor. NO

# 5.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

### >> INSPECTION END

# Component Inspection

# 1. CHECK KNOCK SENSOR

- Turn ignition switch OFF.
- Disconnect knock sensor harness connector.
- 3. Check resistance between knock sensor terminals as per the following.

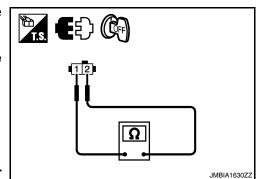
#### NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .

Terminals	Resistance
1 and 2	Approx. 532 - 588 kΩ [at 20°C (68°F)]

## **CAUTION:**

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



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# Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace knock sensor.

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# P0335 CKP SENSOR (POS)

Description INFOID:0000000004780158

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

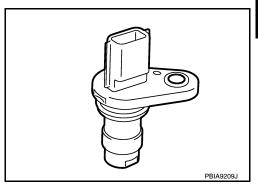
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

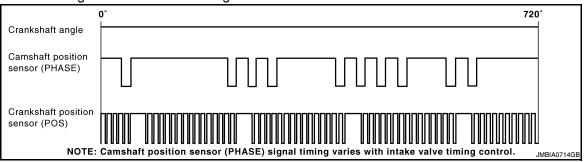
The changing gap causes the magnetic field near the sensor to change.

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

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.





DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sensor (POS) circuit	<ul> <li>The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.</li> <li>The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.</li> <li>The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.</li> </ul>	Harness or connectors [Crankshaft position sensor (POS) circuit is open or shorted.] (Refrigerant pressure sensor circuit is shorted.) (Accelerator pedal position sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) Crankshaft position sensor (POS) Refrigerant pressure sensor Accelerator pedal position sensor EVAP control system pressure sensor Signal plate

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

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?

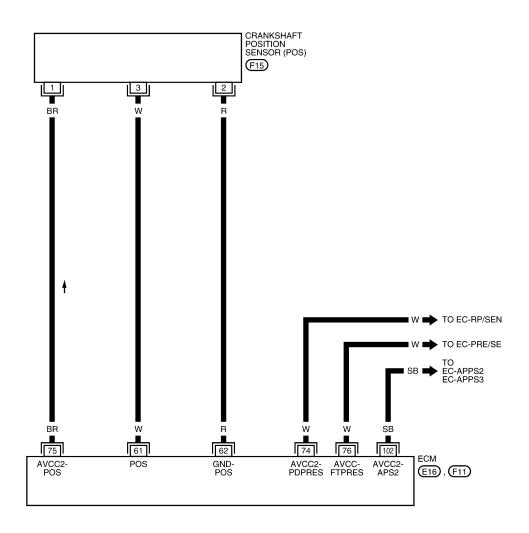
YES >> Go to EC-265, "Diagnosis Procedure".

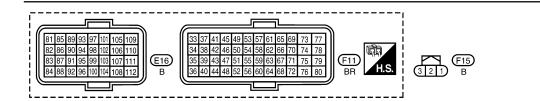
NO >> INSPECTION END

# Wiring Diagram

INFOID:0000000004780690

# EC-POS-01 : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC





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#### < COMPONENT DIAGNOSIS >

# Diagnosis Procedure

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# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

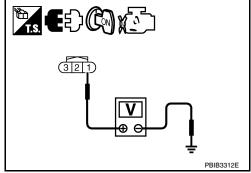
- Disconnect crankshaft position (CKP) sensor (POS) harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between CKP sensor (POS) harness connector and ground.

CKP sens	or (POS)	Ground	Voltage
Connector Terminal		Cround	voitage
F15 1		Ground	Approx. 5 V

#### Is the inspection result normal?

>> GO TO 8. YES

NO >> GO TO 3.



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

- Turn ignition switch ON.
- Disconnect ECM harness connector.
- Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F15	1	F11 75		Existed

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit.

# f 4.CHECK CKP SENSOR POWER SUPPLY CIRCUIT

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

EC	М	Sensor		
Connector	Terminal	Name	Connector	Terminal
	74	Refrigerant pressure sensor	E17	3
F11 75 76		CKP sensor (POS)	F15	1
		EVAP control system pressure sensor	B104	3
E16	102	APP sensor	E12	5

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair short to ground or short to power in harness or connectors.

# 5.CHECK COMPONENTS

#### Check the following.

- Refrigerant pressure sensor (Refer to EC-458, "Diagnosis Procedure".)
- EVAP control system pressure sensor (Refer to EC-314, "Component Inspection".)

#### Is the inspection result normal?

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# < COMPONENT DIAGNOSIS >

YES >> GO TO 6.

NO >> Replace malfunctioning components.

## 6.CHECK APP SENSOR

Refer to EC-402, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

# 7. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- 2. Perform EC-402, "Special Repair Requirement".

#### >> INSPECTION END

# 8.CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F15	2	F11	62	Existed

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

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# ${f 9}.$ CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Disconnect ECM harness connector.
- 2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	or (POS)	EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F15	3	F11	61	Existed

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

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 10.check crankshaft position sensor (pos)

## Refer to EC-267, "Component Inspection".

## Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace crankshaft position sensor (POS).

# 11. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

### Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace the signal plate.

# 12. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

### >> INSPECTION END

# Component Inspection

INFOID:0000000004780161

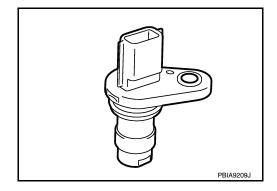
# 1. CHECK CRANKSHAFT POSITION SENSOR (POS)-I

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

## Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace crankshaft position sensor (POS).



# $2.\mathsf{CHECK}$ CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as per the following.

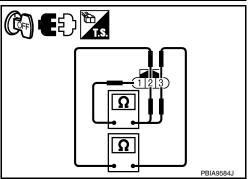
Terminals (Polarity)	Resistance [Ω at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞
2 (+) - 3 (-)	



### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS).



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# P0340 CMP SENSOR (PHASE)

Description INFOID:000000004780162

The camshaft position sensor (PHASE) senses the retraction of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

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

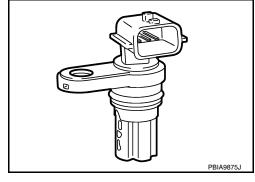
The sensor consists of a permanent magnet and Hall IC.

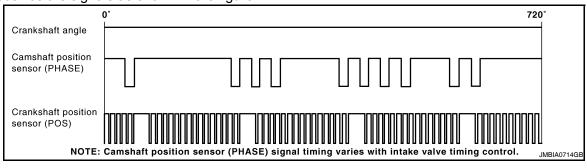
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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

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

ECM receives the signals as shown in the figure.





DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0340 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-358, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sensor (PHASE) circuit	<ul> <li>The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.</li> <li>The cylinder No. signal is not sent to ECM during engine running.</li> <li>The cylinder No. signal is not in the normal pattern during engine running.</li> </ul>	Harness or connectors     (The sensor circuit is open or shorted)     Camshaft position sensor (PHASE)     Camshaft (INT)     Starter motor     Starting system circuit     Dead (Weak) battery

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 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.

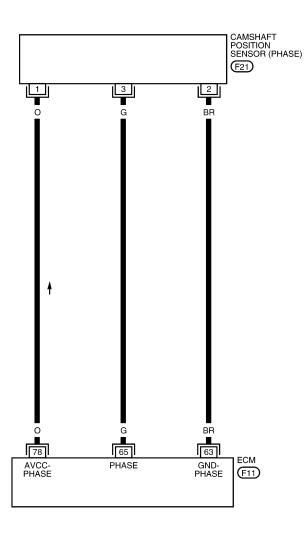
P0340 CMP SENSOR (PHASE)		
< COMPONENT DIAGNOSIS >	[HR16DE]	
Is 1st trip DTC detected?		А
YES >> Go to <u>EC-270, "Diagnosis Procedure"</u> . NO >> GO TO 3.		$\wedge$
3.PERFORM DTC CONFIRMATION PROCEDURE-I		-0
<ol> <li>Maintaining engine speed at more than 800 rpm for at least 5 seconds.</li> <li>Check 1st trip DTC.</li> </ol>		EC
Is 1st trip DTC detected?		С
YES >> Go to <u>EC-270, "Diagnosis Procedure"</u> . NO >> INSPECTION END		
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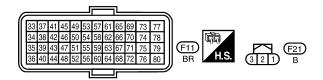
Wiring Diagram

INFOID:0000000004780691

## EC-PHASE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2639E

# Diagnosis Procedure

INFOID:0000000004780164

1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

# < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Check starting system (Refer to SC-16, "Trouble Diagnosis with Multitasking Battery Diagnostic Station".).

# 2.CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

# 3.check camshaft position (cmp) sensor (phase) power supply circuit

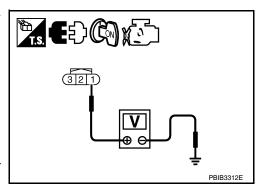
- Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between CMP sensor (PHASE) harness connector and ground.

CMP senso	r (PHASE)	Ground	Voltage	
Connector Terminal		Ground	voitage	
F21	1	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



# f 4.CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF. 1.
- 2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F21	2	F11	63	Existed

3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# ${f 5}.$ CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

CMP sensor (PHASE)		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F21	3	F11	65	Existed

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

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# **O.**CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-272, "Component Inspection".

## Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace camshaft position sensor (PHASE). EC

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EC-271

### < COMPONENT DIAGNOSIS >

# 7. CHECK CAMSHAFT (INT)

Check the following.

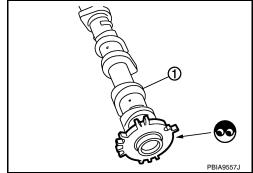
- · Accumulation of debris to the signal plate of camshaft (1) rear end
- · Chipping signal plate of camshaft rear end

## Is the inspection result normal?

YES >> GO TO 8.

NO >> Remove

>> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



# 8. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

INFOID:0000000004780165

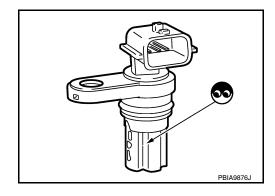
# 1. CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace camshaft position sensor (PHASE).



# 2. CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

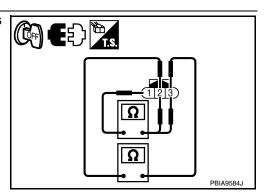
Check resistance camshaft position sensor (PHASE) terminals as per the following.

Terminals (Polarity)	Resistance [Ω at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞
2 (+) - 3 (-)	

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace camshaft position sensor (PHASE).



# P0420 THREE WAY CATALYST FUNCTION

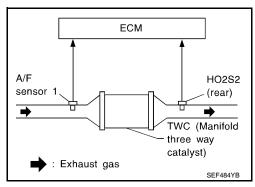
**DTC Logic** INFOID:0000000004780166

#### DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420	Catalyst system efficiency below threshold	<ul> <li>Three way catalyst (manifold) does not operate properly.</li> <li>Three way catalyst (manifold) does not have enough oxygen storage capacity.</li> </ul>	Three way catalyst (manifold) Exhaust tube Intake air leaks Fuel injector Fuel injector leaks Spark plug Improper ignition timing

### DTC CONFIRMATION PROCEDURE

# 1. INSPECTION START

Do you have CONSULT-III?

### Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 7.

# 2.PRECONDITIONING

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

#### **TESTING CONDITION:**

Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

# 3.PERFORM DTC CONFIRMATION PROCEDURE-I

#### With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Make sure that "COOLAN TEMP/S" indication is more than 70°C (158°F). If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
- Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-III.
- 9. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
- 10. Check the indication of "CATALYST".

Which is displayed on CONSULT-III screen?

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### P0420 THREE WAY CATALYST FUNCTION

### < COMPONENT DIAGNOSIS >

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CMPLT >> GO TO 6. INCMP >> GO TO 4.

# 4. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Wait 5 seconds at idle.
- 2. Rev engine up to 2,000 to 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).

### Does the indication change to "CMPLT"?

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

# 5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

- 1. Stop engine and cool it down to less than 70°C (158°F).
- 2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

# 6. PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-275, "Diagnosis Procedure".

NO >> INSPECTION END

# 7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-274, "Component Function Check".

#### NOTE:

Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-275, "Diagnosis Procedure".

# Component Function Check

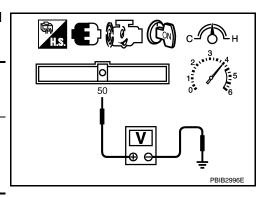
INFOID:0000000004780167

# 1. PERFORM COMPONENT FUNCTION CHECK

#### 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. Open engine hood.
- 6. Check the voltage between ECM harness connector and ground under the following condition.

ECM				
Con- nector	Terminal	Ground Condition	Voltage	
F11	50 (HO2S2 signal)	Ground	Keeping engine speed at 2,500 rpm constant under no load	The voltage fluctuation cycle takes more than 5 seconds. 1 cycle: $0.6 - 1.0 \rightarrow 0 - 0.3 \rightarrow 0.6 - 1.0$



## Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-275, "Diagnosis Procedure".

### P0420 THREE WAY CATALYST FUNCTION

< COMPONENT DIAGNOSIS >

[HR16DE]

Diagnosis Procedure

INFOID:0000000004780168

# 1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

Is the inspection result normal?

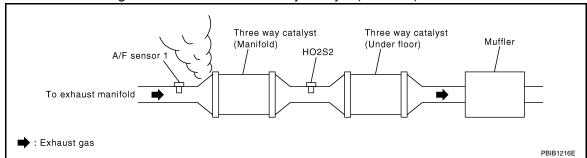
YES >> GO TO 2.

NO >> Repair or replace.

# 2. CHECK EXHAUST GAS LEAK

Start engine and run it at idle.

Listen for an exhaust gas leak before the three way catalyst (manifold).



### Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

# 3. CHECK INTAKE AIR LEAK

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

#### Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

# 4. CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to EC-30, "IGNITION TIMING: Special Repair Requirement".

For specification, refer to EC-504, "Idle Speed" and EC-504, "Ignition Timing".

### Is the inspection result normal?

YES >> GO TO 5.

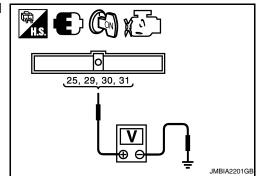
NO >> Follow the instruction of EC-26, "BASIC INSPECTION: Special Repair Requirement".

## 5. CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.

Check the voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal	Oround	vollage
F10	25	Ground	Battery voltage
	29		
	30		
	31		



#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform EC-431, "Diagnosis Procedure".

## 6.CHECK FUNCTION OF IGNITION COIL-I

#### **CAUTION:**

**EC-275** 

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#### < COMPONENT DIAGNOSIS >

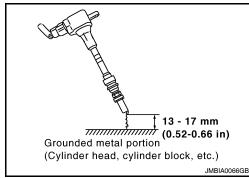
Do the following procedure in the place where ventilation is good without the combustible.

- 1. Turn ignition switch OFF.
- 2. Remove fuel pump fuse in IPDM E/R to release fuel pressure.

#### NOTE:

Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



### Spark should be generated.

#### CAUTION:

- During the operation, always stay 0.5 m (19.7 in) away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 7.

# 7.CHECK FUNCTION OF IGNITION COIL-II

- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a known-good spark plug.
- 3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

#### Spark should be generated.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Check ignition coil, power transistor and their circuits. Refer to EC-441, "Diagnosis Procedure".

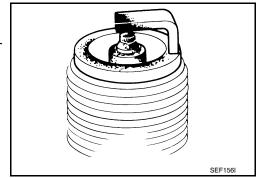
# 8. CHECK SPARK PLUG

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 <a href="EM-117">EM-117</a>, "Spark Plug".

NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

## P0420 THREE WAY CATALYST FUNCTION

# < COMPONENT DIAGNOSIS >

[HR16DE]

- Reconnect the initial spark plugs.
- Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

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# 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 <a href="EM-117">EM-117</a>, "Spark Plug".

# 10. CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF. Refer to EM-34, "Removal and Installation".
- 2. Remove fuel injector assembly.

Keep fuel hose and all fuel injectors connected to fuel tube.

- 3. Disconnect all ignition coil harness connectors.
- 4. Reconnect all fuel injector harness connectors disconnected.
- 5. Turn ignition switch ON.

### Does fuel drip from fuel injector?

YES >> GO TO 11.

NO >> Replace the fuel injector(s) from which fuel is dripping.

# 11. CHECK INTERMITTENT INCIDENT

### Refer to EC-120, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> Replace three way catalyst assembly.

NO >> Repair or replace harness or connector

**EC-277** 

# P0441 EVAP CONTROL SYSTEM

DTC Logic

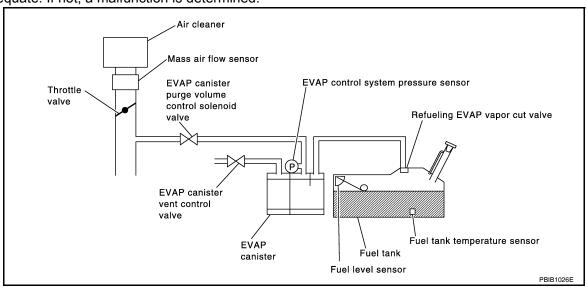
#### DTC DETECTION LOGIC

#### 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 in- correct 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     Drain filter

#### DTC CONFIRMATION PROCEDURE

# 1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 6.

# 2.PRECONDITIONING

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

### P0441 EVAP CONTROL SYSTEM

< COMPONENT DIAGNOSIS > [HR16DE]

#### **TESTING CONDITION:**

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 3.

# 3.PERFORM DTC CONFIRMATION PROCEDURE-I

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#### 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 let it idle for at least 70 seconds.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CON-SULT-III.
- 5. Touch "START".

#### Is COMPLETED displayed on CONSULT-III screen?

YES >> GO TO 5.

NO >> GO TO 4.

## 4.PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, "TESTING" will be displayed on the CONSULT-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 - 3,800 rpm
B/FUEL SCHDL	1.0 - 10.0 msec
COOLAN TEMP/S	More than 0°C (32°F)

#### **CAUTION:**

#### Always drive vehicle at a safe speed.

If "TESTING" is not changed for a long time, retry from step 2.

#### Is "COMPLETED" displayed on CONSULT-III screen?

YES >> GO TO 5.

NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3.

## $oldsymbol{5}$ .PERFORM DTC CONFIRMATION PROCEDURE-II

Touch "SELF-DIAG RESULT".

#### Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-280, "Diagnosis Procedure".

## $oldsymbol{6}$ .PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-279, "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-280, "Diagnosis Procedure".

### Component Function Check

INFOID:0000000004780170

# 1. PERFORM COMPONENT FUNCTION CHECK

#### Without CONSULT-III

- Lift up drive wheels.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and wait at least 70 seconds.

#### **EC-279**

### < COMPONENT DIAGNOSIS >

Set voltmeter probes to ECM harness connector and ground.

ECM		
Connector	Terminal	Ground
F11	42 (EVAP control system pressure sensor signal)	Ground

- 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.

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	PBIB3313E		

Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Selector lever	Any position other than P, N or R

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-280, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004780171

# CHECK EVAP CANISTER

- 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

- 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 <a href="EC-74">EC-74</a>. "System Description".
- 2. Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- 4. Rev engine up to 2,000 rpm.
- Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL C/V" opening and check vacuum existence.

PURG VOL C/V	Vacuum
100%	Existed
0%	Not existed

## Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

# 3. CHECK PURGE FLOW

#### Without CONSULT-III

- Start engine and warm it up to normal operating temperature.
- 2. Stop engine.

## P0441 EVAP CONTROL SYSTEM

### < COMPONENT DIAGNOSIS >

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- 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-74, "System Description".
- 4. Start engine and let it idle.

### Do not depress accelerator pedal even slightly.

5. Check vacuum gauge indication before 60 seconds passed after starting engine.

## Vacuum should not exist.

Revving engine up to 2,000rpm after 100 seconds passed after starting engine.

#### Vacuum should exist.

#### Is the inspection result normal?

YES >> GO TO 7.

>> GO TO 4. NO

# CHECK EVAP PURGE LINE

- Turn ignition switch OFF.
- Check EVAP purge line for improper connection or disconnection. Refer to EC-74, "System Description".

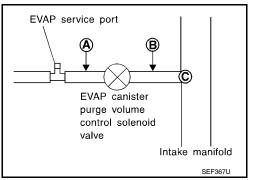
### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair it.

# ${f 5}$ . CHECK EVAP PURGE HOSE AND PURGE PORT

- Disconnect purge hoses connected to EVAP service port A and EVAP canister purge volume control solenoid valve **B**.
- Blow air into each hose and EVAP purge port **C**.



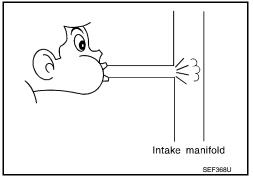
Check that air flows freely.

### 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.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. Check that engine speed varies according to the valve opening.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

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# 7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-296, "Component Inspection".

#### Is the inspection result normal?

< COMPONENT DIAGNOSIS >

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.
- 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-315. "DTC Logic" for DTC P0452, EC-322, "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 DRAIN FILTER

Refer to EC-283, "Component Inspection (Drain filter)".

### Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace drain filter.

# 12. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-304, "Component Inspection".

# Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace EVAP canister vent control valve.

# 13. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

Refer to EC-500, "Inspection".

### Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace it.

# 14.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 15.

# 15. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

**EC-282** 

## **P0441 EVAP CONTROL SYSTEM**

### < COMPONENT DIAGNOSIS >

[HR16DE]

#### >> INSPECTION END

# Component Inspection (Drain filter)

#### INFOID:0000000004803069

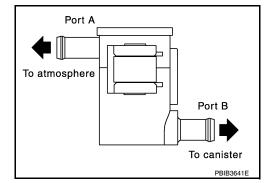
# 1. CHECK DRAIN FILTER

- 1. Check visually for insect nests in the drain filter air inlet.
- Check visually for cracks or flaws in the appearance. 2.
- Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.

## Is the inspection result normal?

YES

>> INSPECTION END NO >> Replace drain filter.



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# P0442 EVAP CONTROL SYSTEM

DTC Logic INFOID:000000004780172

#### DTC DETECTION LOGIC

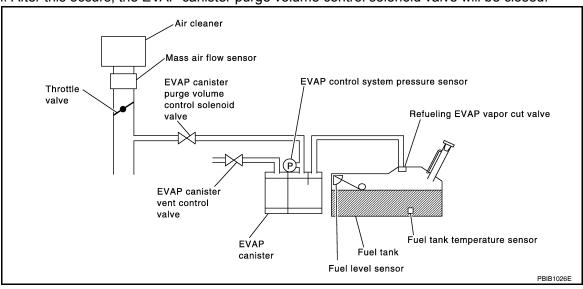
#### NOTE

# If DTC P0442 is displayed with DTC P0456, first perform the trouble diagnosis for DTC P0456. Refer to <u>EC-335, "DTC Logic"</u>.

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 fails to close. Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. Foreign matter or fuel tank leaks 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 Drain filter

#### **CAUTION:**

 Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

### P0442 EVAP CONTROL SYSTEM

• If the fuel filler cap is not tightened properly, the MIL may come on.

Use only a genuine NISSAN rubber tube as a replacement.

#### DTC CONFIRMATION PROCEDURE

< COMPONENT DIAGNOSIS >

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

- 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).

#### NOTE:

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

### Do you have CONSULT-III?

YFS >> GO TO 2. NO >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 4. Make sure 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 instruction displayed.

#### NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-26, "BASIC INSPECTION: Special Repair Requirement".

### Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-285, "Diagnosis Procedure".

3.perform component function check

#### With GST

#### NOTE:

Be sure to read the explanation of DRIVING PATTERN in EC-478, "How to Set SRT Code" before driving vehicle.

- Start engine.
- 2. Drive vehicle according to DRIVING PATTERN.
- Stop vehicle.
- 4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- Select Service \$07 with GST.

#### Is 1st trip DTC displayed?

YES-1 >> P0441: Go to EC-280. "Diagnosis Procedure".

YES-2 >> P0442: Go to EC-285, "Diagnosis Procedure".

>> INSPECTION END

# Diagnosis Procedure

1. CHECK FUEL FILLER CAP DESIGN

Turn ignition switch OFF.

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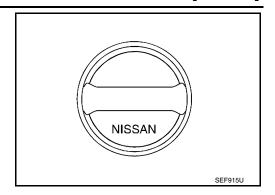
Check for genuine NISSAN fuel filler cap design.

#### Is the inspection result normal?

< COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Replace with genuine NISSAN fuel filler cap.



[HR16DE]

# 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.

>> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten NO 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.

>> GO TO 4. NO

## f 4.CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-289, "Component Inspection (Fuel filler cap)".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one.

### **5.**CHECK FOR EVAP LEAK

Refer to EC-500, "Inspection".

#### Is there any leak in EVAP line?

YES >> Repair or replace.

NO >> GO TO 6.

# 6.CHECK DRAIN FILTER

Refer to EC-289, "Component Inspection (Drain filter)".

### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace drain filter.

# 7.CHECK EVAP CANISTER VENT CONTROL VALVE

#### Check the following.

- EVAP canister vent control valve is installed properly.
  - Refer to EC-502, "Exploded View".
- EVAP canister vent control valve.

Refer to EC-304, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace EVAP canister vent control valve and O-ring.

## $oldsymbol{8}.$ CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

### P0442 EVAP CONTROL SYSTEM

#### < COMPONENT DIAGNOSIS >

[HR16DE]

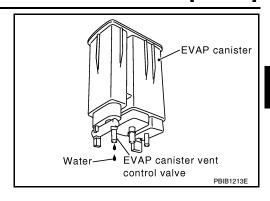
Does water drain from the EVAP canister?

Does water drain from the EVAP canister?

YES >> GO TO 9.

NO-1 >> With CONSULT-III: GO TO 11.

NO-2 >> Without CONSULT-III: GO TO 12.



# 9. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor

The weight should be less than 1.9 kg (4.2 lb).

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 11.

YES-2 >> Without CONSULT-III: GO TO 12.

NO >> GO TO 10.

10. 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.

11.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### With CONSULT-III

- 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 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" opening to 100%.
- 5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

YFS >> GO TO 14.

NO >> 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.
- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 14.

NO >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-74, "System Description".

Is the inspection result normal?

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YES >> GO TO 14.

NO >> Repair or reconnect the hose.

# 14.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-296, "Component Inspection".

#### Is the inspection result normal?

< COMPONENT DIAGNOSIS >

YES >> GO TO 15.

NO >> Replace EVAP canister purge volume control solenoid valve.

# 15. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-244. "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace fuel level sensor unit.

# 16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-312, "DTC Logic".

#### Is the inspection result normal?

>> GO TO 17. YES

NO >> Replace EVAP control system pressure sensor.

# 17. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-74, "System Description".

#### Is the inspection result normal?

>> GO TO 18. YES

>> Repair or reconnect the hose.

# 18.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 19.

# 19. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-450, "Description".

### Is the inspection result normal?

YES >> GO TO 20.

NO >> Repair or replace hoses and tubes.

# 20. CHECK RECIRCULATION LINE

Check recirculation line between fuel filler tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

#### Is the inspection result normal?

YES >> GO TO 21.

NO >> Repair or replace hose, tube or fuel filler tube.

# 21. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-453, "Component Inspection (Refueling EVAP vapor cut valve)".

### Is the inspection result normal?

YES >> GO TO 22.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

# 22. CHECK FUEL LEVEL SENSOR

Refer to DI-16. "Fuel Level Sensor Signal Inspection".

### Is the inspection result normal?

YES >> GO TO 23.

# **P0442 EVAP CONTROL SYSTEM**

# < COMPONENT DIAGNOSIS >

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NO >> Replace fuel level sensor unit.

# 23. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

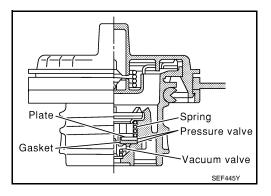
>> INSPECTION END

# Component Inspection (Fuel filler cap)

INFOID:0000000004803116

# 1. CHECK FUEL FILLER CAP

- Turn ignition switch OFF.
- 2. Remove fuel filler cap.
- 3. Wipe clean valve housing.



- Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
- Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 -

2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm<sup>2</sup>,

-0.87 to -0.48 psi)

### Is the inspection result normal?

YFS >> 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

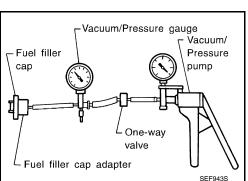
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INFOID:0000000004803095

# Component Inspection (Drain filter)

# 1. CHECK DRAIN FILTER

- Check visually for insect nests in the drain filter air inlet.
- Check visually for cracks or flaws in the appearance.
- Check visually for cracks or flaws in the hose.



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# **P0442 EVAP CONTROL SYSTEM**

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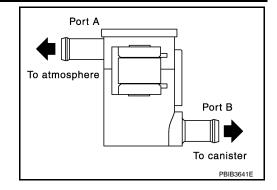
[HR16DE]

- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.

# Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace drain filter.

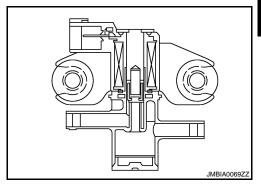


INFOID:0000000004780176

# P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description INFOID:0000000004780175

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

#### DTC DETECTION LOGIC

DTC No. DTC detecting condition Possible cause Trouble diagnosis name The canister purge flow is detected during EVAP control system pressure sensor the vehicle is stopped while the engine is · EVAP canister purge volume control solerunning, even when EVAP canister purge noid valve volume control solenoid valve is completely EVAP canister purge (The valve is stuck open.) closed. P0443 volume control solenoid EVAP canister vent control valve valve · EVAP canister The canister purge flow is detected during Hoses the specified driving conditions, even when (Hoses are connected incorrectly or EVAP canister purge volume control soleclogged.) noid valve is completely closed.

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

- Perform DTC CONFIRMATION PROCEDURE when the fuel 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.

## Do you have CONSULT-III

YES >> GO TO 2.

NO >> GO TO 4.

# 2.PERFORM DTC CONFIRMATION PROCEDURE A

## With CONSULT-III

- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- 3. Check that the following condition are met. FUEL T/TMP SE: 0 35°C (32 95°F)
- 4. Start engine and wait at least 60 seconds.
- Check 1st trip DTC.

## Is 1st trip DTC detected?

YES >> Go to EC-293, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE B

## With CONSULT-III

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- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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.

Touch "SELF-DIAG RESULT".

#### Which is displayed on CONSULT-III?

OK >> INSPECTION END

NG >> Go to EC-293, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE A

#### With GST

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

ECM		Ground	Voltage (V)	
Connector	Terminal	Ground	voitage (v)	
F11	43 (Fuel tank temperature sensor signal)	Ground	3.1 - 4.0	

- Start engine and wait at least 60 seconds.
- 4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-293, "Diagnosis Procedure".

NO >> GO TO 5.

# 5. PERFORM DTC CONFIRMATION PROCEDURE

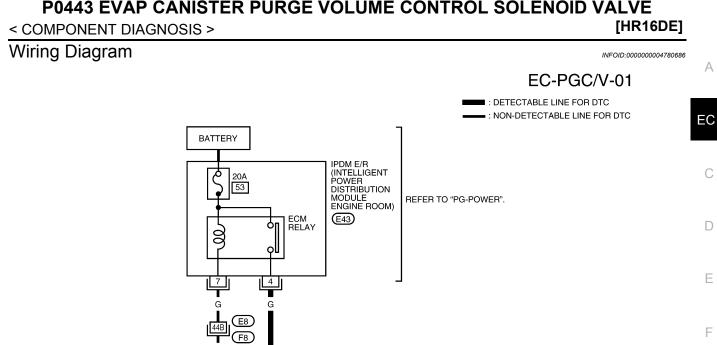
#### With GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and let it idle for at least 20 seconds.
- 4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

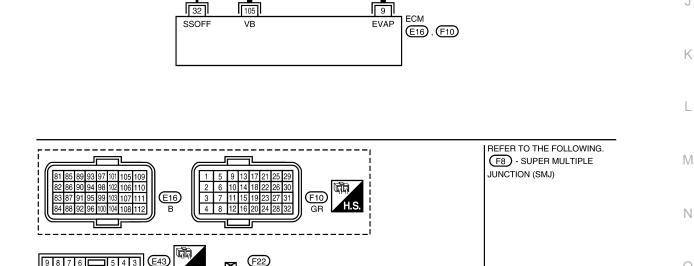
YES >> Go to EC-293, "Diagnosis Procedure".

NO >> INSPECTION END



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EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE



# Diagnosis Procedure

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# 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.

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Turn ignition switch ON.

## < COMPONENT DIAGNOSIS >

[HR16DE]

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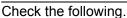
 Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge volume control solenoid valve		Ground	Voltage
Connector	Terminal		
F22	1	Ground	Battery voltage

## Is the inspection result normal?

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

# 2.DETECT MALFUNCTIONING PART



- · Harness connectors E8, F8
- IPDM E/R harness connector E43
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- · Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

EVAP canister purge volume control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	2	F10	9	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- Check connectors for water.

#### Water should not exist.

#### 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-314, "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.

[HR16DE] < COMPONENT DIAGNOSIS >

- Reconnect harness connectors disconnected.
- 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.

## Is the inspection result normal?

YFS >> GO TO 8.

NO >> GO TO 7.

# 7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-296, "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

- Disconnect rubber tube connected to EVAP canister vent control valve.
- 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-304, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace EVAP canister vent control valve.

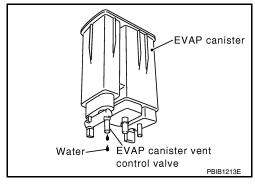
# 10.check if evap canister is saturated with water

- 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.

#### 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 1.9 kg (4.2 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

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< COMPONENT DIAGNOSIS >

[HR16DE]

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection

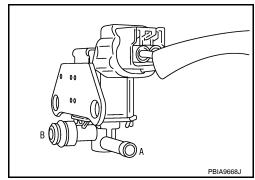
INFOID:0000000004780178

# 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.
- Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

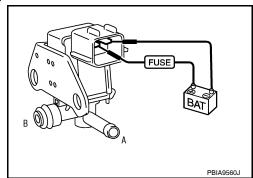
Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



#### Without CONSULT-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

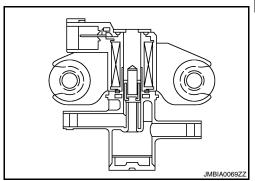
< COMPONENT DIAGNOSIS >

[HR16DE]

# P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID **VALVE**

Description INFOID:0000000004780179

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:0000000004780180

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

## **TESTING CONDITION:**

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 13 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

>> Go to EC-298, "Diagnosis Procedure". YES

NO >> INSPECTION END EC

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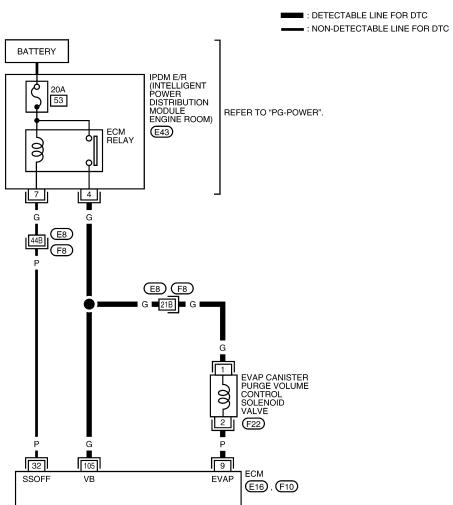
< COMPONENT DIAGNOSIS >

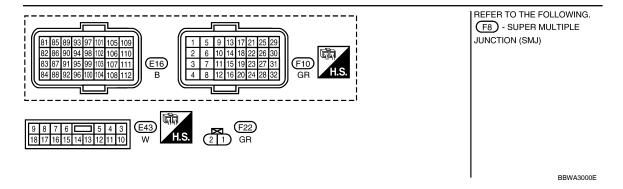
[HR16DE]

Wiring Diagram

INFOID:0000000004780719

# EC-PGC/V-01





# Diagnosis Procedure

INFOID:0000000004780181

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- Turn ignition switch ON.

# < COMPONENT DIAGNOSIS >

[HR16DE]

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			
F22	1	Ground	Battery voltage	

# SEF206W

## Is the inspection result normal?

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

# 2.DETECT MALFUNCTIONING PART

Check the following.

- IPDM E/R harness connector E43
- Harness connectors E8, F8
- 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.
- Disconnect ECM harness connector. 2.
- 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	
F22	2	F10	9	Existed

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

#### Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 4.

YES-2 >> Without CONSULT-III: GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# f 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.

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

# ${f 5}.$ CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-300, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace EVAP canister purge volume control solenoid valve.

# O.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

**EC-299** 

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# < COMPONENT DIAGNOSIS >

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004780182

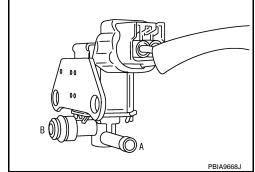
[HR16DE]

# 1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### With CONSULT-III

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- Turn ignition switch ON.
- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

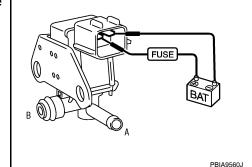
Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



#### Without CONSULT-III

- 1. Turn ignition switch OFF.
- 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

# P0447 EVAP CANISTER VENT CONTROL VALVE

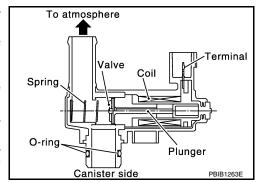
Description INFOID:0000000004780183

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:0000000004780184

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

#### **TESTING CONDITION:**

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

# 2.perform dtc confirmation procedure

- Start engine and wait at least 8 seconds.
- Check 1st trip DTC. 2.

# Is 1st trip DTC detected?

YES >> Go to EC-302, "Diagnosis Procedure".

>> INSPECTION END NO

>> GO TO 2.

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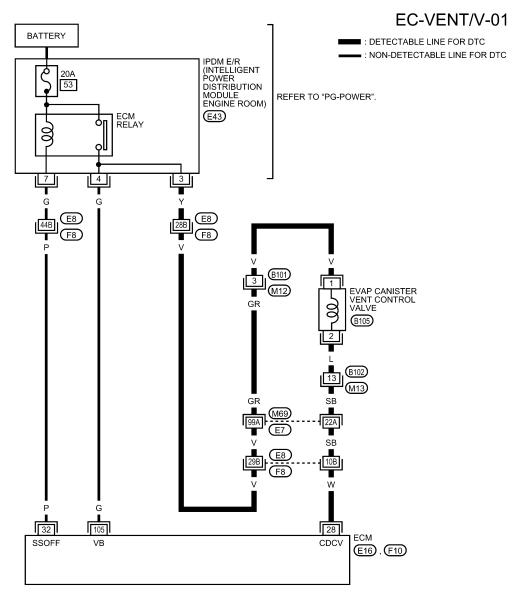
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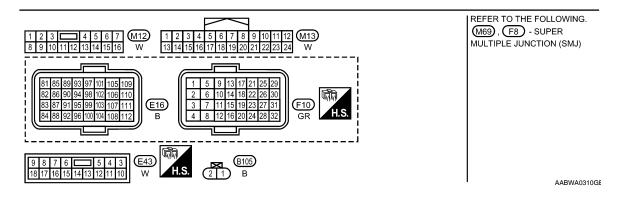
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Wiring Diagram

INFOID:0000000004780687





# Diagnosis Procedure

INFOID:0000000004780185

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

# P0447 EVAP CANISTER VENT CONTROL VALVE

< COMPONENT DIAGNOSIS >

[HR16DE]

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.
- Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-III.
- 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

- Turn ignition switch OFF.
- Disconnect EVAP canister vent control valve harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between EVAP canister vent control valve harness connector and ground.

EVAP canister ve	nt control valve	Ground	Voltage
Connector	Terminal	Ground	voltage
B105	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 E8, F8
- Harness connectors E7. M69
- Harness connectors M12, B101
- 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.

# ${f 5.}$ CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 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	Continuity
B105	2	E16	28	Existed

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.

Junction block connector F8, E8

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# P0447 EVAP CANISTER VENT CONTROL VALVE

#### < COMPONENT DIAGNOSIS >

- Harness connectors E7, M69
- Harness connectors M13, B102
- · 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.
- 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-304, "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-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

INFOID:0000000004780186

[HR16DE]

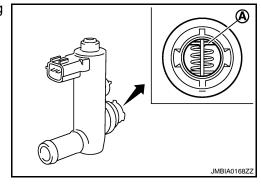
# 1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister.
- 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.



# $2. \hbox{CHECK EVAP CANISTER VENT CONTROL VALVE-II} \\$

#### 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.

Make sure new O-ring is installed properly.

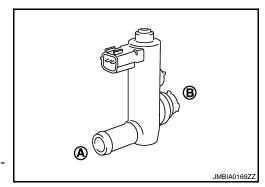
VENT CONT/V condition	Air passage continuity between (A) and (B)	
ON	Not existed	
OFF	Existed	

Operation takes less than 1 second.

#### Without CONSULT-III

Check air passage continuity and operation delay time under the following conditions.

Make sure new O-ring is installed properly.



# P0447 EVAP CANISTER VENT CONTROL VALVE

# < COMPONENT DIAGNOSIS >

[HR16DE]

Condition	Air passage continuity between (A) and (B)	
12 V direct current supply between terminals (1) and (2)	Not existed	
OFF	Existed	

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Operation takes less than 1 second.

# Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve.

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.

Make sure new O-ring is installed properly.

VENT CONT/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.
- Check air passage continuity and operation delay time under the following conditions.

Make sure new O-ring is installed properly.

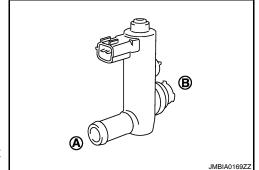
Condition	Air passage continuity between (A) and (B)	
12 V direct current supply between terminals (1) and (2)	Not existed	
OFF	Existed	

Operation takes less than 1 second.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve.



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# P0448 EVAP CANISTER VENT CONTROL VALVE

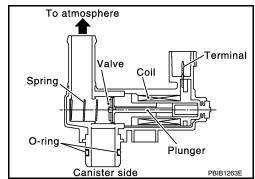
Description INFOID:000000004780187

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

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT-III

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 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. Start engine and let it idle for at least 1 minute.
- 5. Repeat next procedures three times.
- Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.

#### Never exceed 3 minutes.

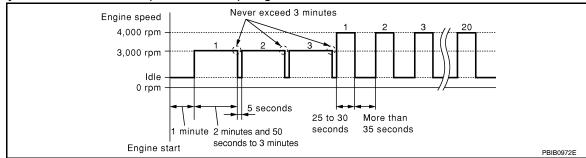
- Fully released accelerator pedal and keep engine idle for about 5 seconds.
- 6. Repeat next procedure 20 times.
- Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.

# P0448 EVAP CANISTER VENT CONTROL VALVE

# < COMPONENT DIAGNOSIS >

[HR16DE]

Fully released accelerator pedal and keep engine idle for at least 35 seconds.



7. Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

# Is 1st trip DTC detected?

YES >> Go to EC-308, "Diagnosis Procedure".

NO >> INSPECTION END

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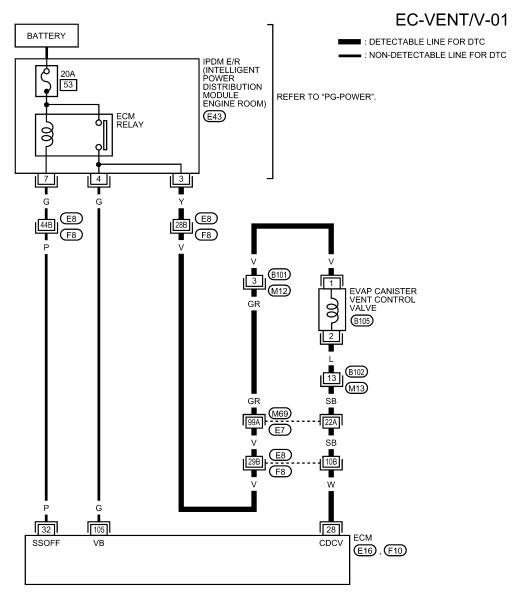
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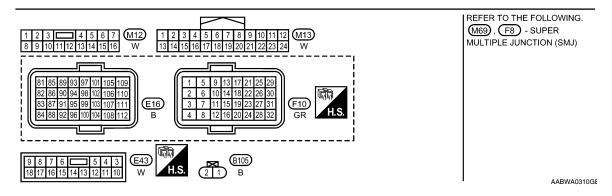
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# Wiring Diagram

INFOID:0000000004780720





# Diagnosis Procedure

INFOID:0000000004780189

# 1. CHECK RUBBER TUBE

- 1. Turn ignition switch OFF.
- 2. Disconnect rubber tube connected to EVAP canister vent control valve.
- Check the rubber tube for clogging.

P0448 EVAP CANISTER VENT CONTROL VALVE [HR16DE] < COMPONENT DIAGNOSIS > Is the inspection result normal? Α YES >> GO TO 2. NO >> Clean rubber tube using an air blower. 2.CHECK EVAP CANISTER VENT CONTROL VALVE EC Refer to EC-310, "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 D Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Check if water will drain from the EVAP canister. Е Does water drain from EVAP canister? EVAP canister YES >> GO TO 4. NO >> GO TO 6. F Water **EVAP** canister vent control valve PBIB1213E Н 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 1.9 kg (4.2 lb). Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5.  ${f 5}$  . 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 Disconnect EVAP control system pressure sensor harness connector. Check connectors for water. N

#### 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-314, "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-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004780190

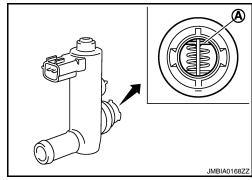
# 1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister.
- 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.

  Make sure new O-ring is installed properly.

VENT CONT/V condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

# Operation takes less than 1 second.

#### Without CONSULT-III

Check air passage continuity and operation delay time under the following conditions.

#### Make sure new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)	
12 V direct current supply between terminals (1) and (2)	Not existed	
OFF	Existed	

#### Operation takes less than 1 second.

#### Is the inspection result normal?

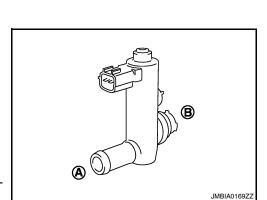
YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve.

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.
- Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



# P0448 EVAP CANISTER VENT CONTROL VALVE

# < COMPONENT DIAGNOSIS >

[HR16DE]

3. Check air passage continuity and operation delay time. Make sure new O-ring is installed properly.

VENT CONT/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.

Make sure new O-ring is installed properly.

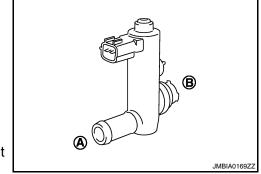
Condition	Air passage continuity between (A) and (B)	
12 V direct current supply between terminals (1) and (2)	Not existed	
OFF	Existed	

Operation takes less than 1 second.

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve.



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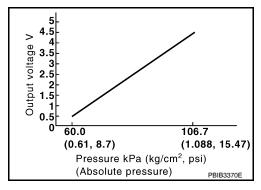
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INFOID:0000000004780192

# P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description INFOID:000000004780191

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

## 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 sensor (POS) circuit is shorted.]     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. 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.

#### Is 1st trip DTC detected?

YES >> Go to EC-312, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004780193

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

# < COMPONENT DIAGNOSIS >

[HR16DE]

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

- Disconnect EVAP control system pressure sensor harness connector.
- Check sensor harness connector for water.

#### Water should not exist.

## Is the inspection result normal?

YES >> GO TO 3.

>> Repair or replace harness connector. NO

# 3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 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
Connector	Terminal	Oround	voitage
B104	3	Ground	Approx. 5 V

## Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 4.

# 4. CHECK SENSOR POWER SUPPLY CIRCUITS

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

E	СМ	Sensor		
Connector	Terminal	Name	Connector	Terminal
-	74	Refrigerant pressure sensor	E17	3
F11	75	CKP sensor (POS) F15		1
	76	EVAP control system pressure sensor B104		3
E16	102	APP sensor	E12	5

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair short to ground or short to power in harness or connectors.

# 5. CHECK COMPONENTS

## Check the following.

- Crankshaft position sensor (POS) (Refer to EC-267, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-458, "Diagnosis Procedure".)

## Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

# **6.**CHECK APP SENSOR

Refer to EC-402, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 7.

# 7. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly
- Perform EC-402, "Special Repair Requirement".

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>> INSPECTION END

# 8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-314, "Component Inspection".

# Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

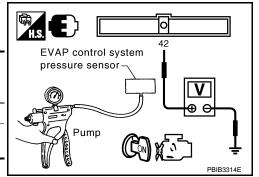
# Component Inspection

INFOID:0000000004780194

# 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 and ground under the following conditions.

ECM		Condition	
Connector	Terminal	[Applied vacuum kPa (kg/cm <sup>2</sup> , psi)	Voltage
	42	Not applied	1.8 - 4.8 V
F11	(EVAP control system pressure sensor signal)	-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 below -93.3 kPa (-0.952 kg/cm<sup>2</sup>, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm<sup>2</sup>, 14.69 psi).

# Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor

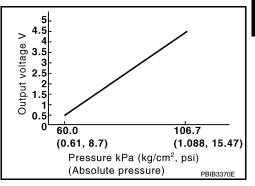
< COMPONENT DIAGNOSIS >

[HR16DE]

# P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description INFOID:0000000004780195

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:0000000004780196

## 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 sensor (POS) circuit is shorted.)     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT-III

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- Make sure that "FUEL T/TMP SE" indication is more than 0°C (32°F).
- Start engine and wait at least 20 seconds.
- 7. Check 1st trip DTC.

## With GST

1. Start engine and warm it up to normal operating temperature.

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# < COMPONENT DIAGNOSIS >

[HR16DE]

Set voltmeter probes to ECM harness connector and ground as per the following.

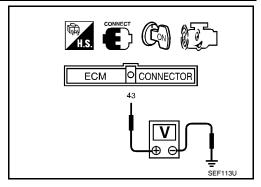
	ECM	Ground	
Connector	Terminal	Ground	
F11	43 (Fuel tank temperature sensor signal)	Ground	

- Make sure that the voltage is less than 4.2 V.
  Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and wait at least 20 seconds.
- 6. Check 1st trip DTC.

# Is 1st trip DTC detected?

>> Go to EC-317, "Diagnosis Procedure". YES

NO >> INSPECTION END



Wiring Diagram

# EC-PRE/SE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

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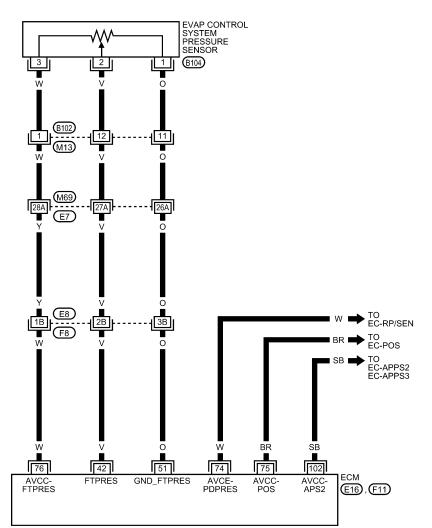
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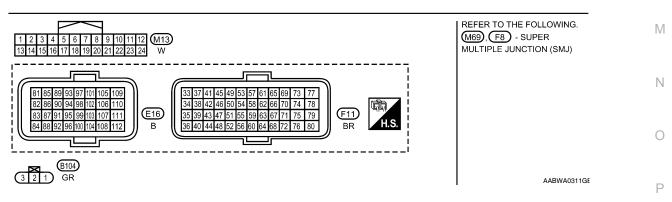
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INFOID:0000000004780197

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# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

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YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK CONNECTOR

< COMPONENT DIAGNOSIS >

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check sensor harness connector for water.

#### Water should not exist.

## Is the inspection result normal?

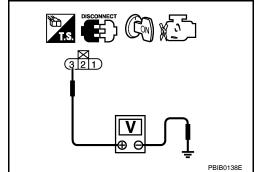
YES >> GO TO 3.

NO >> Repair or replace harness connector.

# 3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control syste	em pressure sensor	Ground	Voltage	
Connector	Terminal	Ground	voitage	
B104	3	Ground	Approx. 5 V	



[HR16DE]

## 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.
- 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	Continuity
B104	3	F11	76	Existed

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

# 5. DETECT MALFUNCTIONING PART

## Check the following.

- Harness connectors B102, M13
- Harness connectors M69. E7
- · Harness connectors E8, F8
- 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.

# 6. CHECK SENSOR POWER SUPPLY CIRCUIT

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

#### < COMPONENT DIAGNOSIS >

[HR16DE]

E	СМ	Sensor		
Connector	Terminal	Name	Connector	Terminal
	74	Refrigerant pressure sensor	E17	3
F11	75	CKP sensor (POS) F15		1
	76	EVAP control system pressure sensor B104		3
E16	102	APP sensor	E12	5

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Is the inspection result normal?

>> GO TO 7. YES

NO >> Repair short to ground or short to power in harness or connectors.

# .CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-267, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-458, "Diagnosis Procedure".)

## Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

# 8.CHECK APP SENSOR

Refer to EC-402, "Component Inspection".

# Is the inspection result normal?

>> GO TO 10. YES

NO >> GO TO 9.

# 9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly
- 2. Perform EC-402, "Special Repair Requirement".

#### >> INSPECTION END

# 10.check evap control system pressure sensor ground circuit for open and **SHORT**

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 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	Continuity
B104	1	F11	51	Existed

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 B102, M13
- Harness connectors M69. E7
- · Harness connectors E8, F8
- 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.

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# < COMPONENT DIAGNOSIS >

[HR16DE]

# 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	Continuity
B104	2	F11	42	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 B102, M13
- · Harness connectors M69, E7
- Harness connectors E8, F8
- 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.

# 14. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-320, "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-120, "Diagnosis Procedure".

>> INSPECTION END

# Component Inspection

INFOID:0000000004780451

# 1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 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 and ground under the following conditions.

ECM		Condition	
Connector	Terminal	[Applied vacuum kPa (kg/cm <sup>2</sup> , psi)	Voltage
	42	Not applied	1.8 - 4.8 V
F11	(EVAP control system pressure sensor signal)	-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value

# EVAP control system pressure sensor Pump PBIB3314E

#### **CAUTION:**

- · Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-0.952 kg/cm<sup>2</sup>, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm<sup>2</sup>, 14.69 psi).

Is the inspection result normal?

< COMPONENT DIAGNOSIS >

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor

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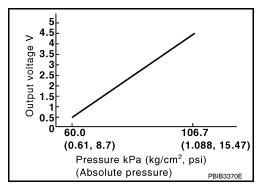
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INFOID:0000000004780200

# P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description INFOID:000000004780199

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

# 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 sensor (POS) circuit is shorted.]     (Accelerator pedal circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position 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 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.

>> 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.
- Select "DATA MONITOR" mode with CONSULT-III.
- 5. Make sure that "FUEL T/TMP SE" indication is more than 0°C (32°F).
- Start engine and wait at least 20 seconds.
- 7. Check 1st trip DTC.

### With GST

Start engine and warm it up to normal operating temperature.

# < COMPONENT DIAGNOSIS >

[HR16DE]

Set voltmeter probes to ECM harness connector and ground as per the following.

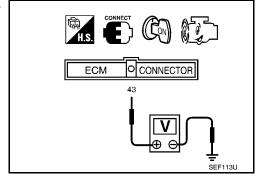
	ECM	Ground
Connector	Terminal	Giodila
F11	43 (Fuel tank temperature sensor signal)	Ground

- 3. Make sure that the voltage is less than 4.2 V.4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and wait at least 20 seconds.
- 6. Check 1st trip DTC.

# Is 1st trip DTC detected?

>> Go to EC-324, "Diagnosis Procedure". YES

NO >> INSPECTION END



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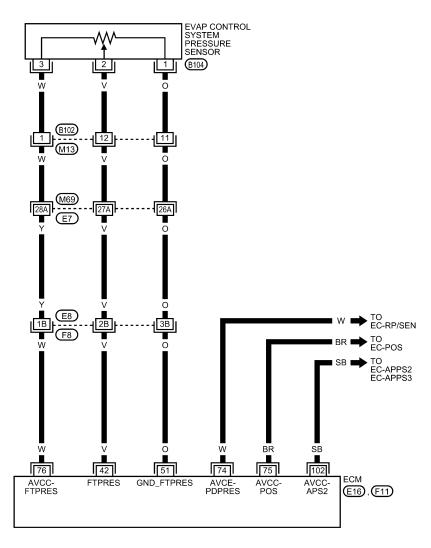
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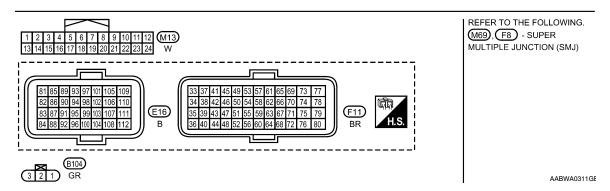
Wiring Diagram

INFOID:0000000004780721

# EC-PRE/SE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





# Diagnosis Procedure

INFOID:0000000004780201

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

### P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

# < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK CONNECTOR

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check sensor harness connector for water.

#### Water should not exist.

### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

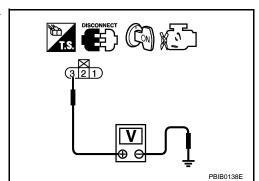
# 3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage
Connector	Terminal	Oround	voltage
B104	3	Ground	Approx. 5 V

#### Is the inspection result normal?

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



## 4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		E	CM	Continuity	
Connector	Terminal	Connector Terminal		Continuity	
B104	3	F11	76	Existed	

### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

## DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors B102, M13
- Harness connectors M69, E7
- Harness connectors E8, F8
- 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.

## 6. CHECK SENSOR POWER SUPPLY CIRCUIT

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

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#### < COMPONENT DIAGNOSIS >

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
	74	Refrigerant pressure sensor	E17	3
F11	75	CKP sensor (POS)	F15	1
	76	EVAP control system pressure sensor	B104	3
E16	102	APP sensor	E12	5

### Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair short to ground or short to power in harness or connectors.

## .CHECK COMPONENTS

### Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-267, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to EC-458, "Diagnosis Procedure".)

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

## 8.CHECK APP SENSOR

### Refer to EC-402. "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

## 9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly
- 2. Perform EC-402, "Special Repair Requirement".

#### >> INSPECTION END

## 10.check evap control system pressure sensor ground circuit for open and **SHORT**

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 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	Continuity
B104	1	F11	51	Existed

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

#### Is the inspection result normal?

YES >> GO TO 12.

>> GO TO 11. NO

# 11. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors B102, M13
- Harness connectors M69. E7
- · Harness connectors E8, F8
- 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.

## P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< COMPONENT DIAGNOSIS >

[HR16DE]

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		E	CM	Continuity
Connector	Terminal	Connector Terminal		Continuity
B104	2	F11	42	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 B102, M13
- · Harness connectors M69, E7
- · Harness connectors E8, F8
- 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.

## 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-304, "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-328, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 17.

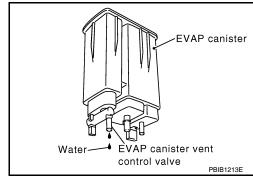
NO >> Replace EVAP control system pressure sensor.

## 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.

#### Does water drain from EVAP canister?

YES >> GO TO 18. NO >> GO TO 20.



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### P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< COMPONENT DIAGNOSIS >

[HR16DE]

## 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 1.9 kg (4.2 lb).

### Is the inspection result normal?

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

# 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-120, "Diagnosis Procedure".

>> INSPECTION END

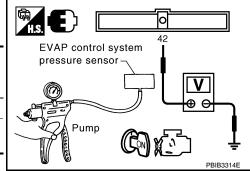
## Component Inspection

INFOID:0000000004780452

# 1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 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 and ground under the following conditions.

	ECM	Condition	Voltage	
Connector	Terminal	[Applied vacuum kPa (kg/cm <sup>2</sup> , psi)		
	42	Not applied	1.8 - 4.8 V	
F11	(EVAP control system pressure sensor signal)	-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 below -93.3 kPa (-0.952 kg/cm<sup>2</sup>, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm<sup>2</sup>, 14.69 psi).

## Is the inspection result normal?

YES >> INSPECTION END

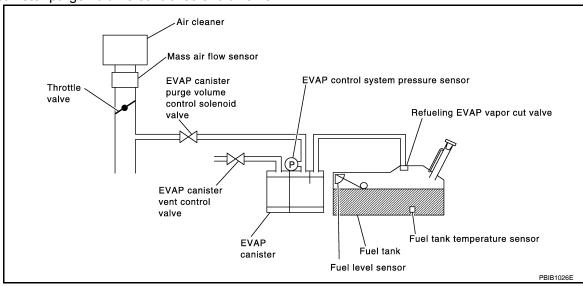
NO >> Replace EVAP control system pressure sensor

## P0455 EVAP CONTROL SYSTEM

**DTC Logic** INFOID:0000000004780203

### 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	ne DTC detecting condition	Possible cause
P0455 EVAP control syst gross leak detecte	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 fails to 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 Drain filter

#### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- · Use only a genuine NISSAN rubber tube as a replacement.

## DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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#### **CAUTION:**

### Never remove fuel filler cap during the DTC CONFIRMATION PROCEDURE.

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

#### NOTE:

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

#### **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.

#### Do you have CONSULT-III?

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

## 2. PERFORM DTC CONFIRMATION 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. Make sure 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)

Select "EVAP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

#### NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to <u>EC-26, "BASIC INSPECTION: Special Repair Requirement"</u>.

#### 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-330, "Diagnosis Procedure"

P0442 >> Go to EC-285, "Diagnosis Procedure"

## 4. PERFORM DTC CONFIRMATION PROCEDURE

#### With GST

#### NOTE:

Be sure to read the explanation of DIRVING PATTERN in <u>EC-478</u>, "How to <u>Set SRT Code"</u> before driving vehicle.

- Start engine.
- Drive vehicle according to DRIVING PATTERN.
- 3. Stop vehicle.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES-1 >> P0455: Go to EC-330, "Diagnosis Procedure".

YES-2 >> P0442: Go to EC-285, "Diagnosis Procedure".

YES-3 >> P0441: Go to EC-280, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004780204

### P0455 EVAP CONTROL SYSTEM

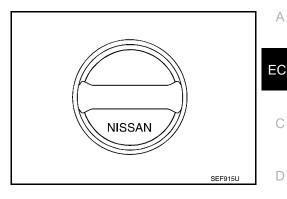
[HR16DE] < COMPONENT DIAGNOSIS >

- Turn ignition switch OFF.
- Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace with genuine NISSAN fuel filler cap.



# 2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten until 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.

f 4 .CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-333, "Component Inspection (Fuel filler cap)",

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one.

5.CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.

Refer to EC-74, "System Description".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or reconnect the hose.

**O.**CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK DRAIN FILTER

Refer to EC-334, "Component Inspection (Drain filter)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace drain filter.

8.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly. Refer to EC-502, "Exploded View".
- EVAP canister vent control valve.

Refer to EC-304, "Component Inspection".

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EC-331

## < COMPONENT DIAGNOSIS > Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace EVAP canister vent control valve and O-ring.

## 9. CHECK FOR EVAP LEAK

### Refer to EC-500, "Inspection".

#### Is there any leak in EVAP line?

YES >> Repair or replace.

NO-1 >> With CONSULT-III: GO TO 10.

NO-2 >> Without CONSULT-III: GO TO 11.

10.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### With CONSULT-III

- 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 2. Start engine.
- 3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- Touch "Qu" on CONSULT-III screen to increase "PURG VOL C/V" opening to 100%.
- 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.
- Stop engine.
- 3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

#### Vacuum should exist.

#### Is the inspection result normal?

YES >> GO TO 14.

NO >> GO TO 12.

# 12. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-74, "System Description".

#### Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 13.

YES-2 >> Without CONSULT-III: GO TO 14.

>> Repair or reconnect the hose.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### With CONSULT-III

- Start engine.
- 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 15.

NO >> GO TO 14.

# 14.check evap canister purge volume control solenoid valve

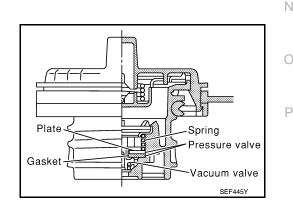
### Refer to EC-296, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 15.

P0455 EVAP CONTROL SYSTEM [HR16DE] < COMPONENT DIAGNOSIS > >> Replace EVAP canister purge volume control solenoid valve. 15. CHECK FUEL TANK TEMPERATURE SENSOR Α Refer to EC-244, "Component Inspection". Is the inspection result normal? EC YES >> GO TO 16. >> Replace fuel level sensor unit. NO 16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR Refer to EC-314, "Component Inspection". Is the inspection result normal? D YES >> GO TO 17. >> Replace EVAP control system pressure sensor. NO 17. CHECK EVAP/ORVR LINE Е Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-450, "Description". Is the inspection result normal? F YES >> GO TO 18. NO >> Repair or replace hoses and tubes. 18. CHECK RECIRCULATION LINE Check recirculation line between fuel filler tube and fuel tank for clogging, kink, cracks, looseness and improper connection. Н Is the inspection result normal? YES >> GO TO 19. >> Repair or replace hose, tube or fuel filler tube. 19. CHECK REFUELING EVAP VAPOR CUT VALVE Refer to EC-453, "Component Inspection (Refueling EVAP vapor cut valve)". Is the inspection result normal? YES >> GO TO 20. >> Replace refueling EVAP vapor cut valve with fuel tank. NO K 20.CHECK INTERMITTENT INCIDENT Refer to EC-120, "Diagnosis Procedure". >> INSPECTION END Component Inspection (Fuel filler cap) INFOID:0000000004803117 1. CHECK FUEL FILLER CAP

- 1. Turn ignition switch OFF.
- 2. Remove fuel filler cap.
- 3. Wipe clean valve housing.



**EC-333** 

## **P0455 EVAP CONTROL SYSTEM**

### < COMPONENT DIAGNOSIS >

[HR16DE]

Vacuum/

Pressure

pump

-Vacuum/Pressure gauge

One-way

valve

-Fuel filler

Fuel filler cap adapter

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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<sup>2</sup>, 2.22 -

2.90 psi)

Vacuum:  $-6.0 \text{ to } -3.3 \text{ kPa} (-0.061 \text{ to } -0.034 \text{ kg/cm}^2,$ 

-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

## Component Inspection (Drain filter)

INFOID:0000000004803096

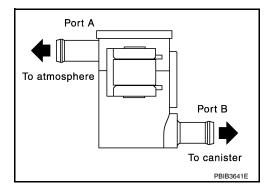
# 1. CHECK DRAIN FILTER

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.

## Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace drain filter.



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## P0456 EVAP CONTROL SYSTEM

DTC Logic

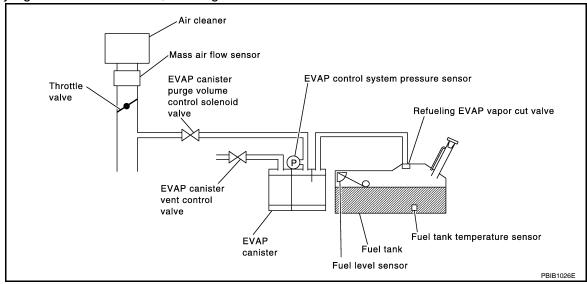
#### DTC DETECTION LOGIC

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 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 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 fails to close. Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line rubber tube bent Loose or disconnected rubber tube EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit Fuel tank temperature sensor O-ring of EVAP canister vent control valve is missing or damaged EVAP canister is saturated with water EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks Fuel level sensor and the circuit Foreign matter caught in EVAP canister purge volume control solenoid valve Drain filter

#### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.

< COMPONENT DIAGNOSIS >

· Use only a genuine NISSAN rubber tube as a replacement.

### DTC CONFIRMATION PROCEDURE

## 1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 4.

2.PRECONDITIONING

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

#### NOTE:

- If DTC P0456 is displayed with P0442, first perform trouble diagnosis for DTC P0456.
- After repair, make sure that the hoses and clips are installed properly.
- Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

#### **TESTING CONDITION:**

- · Open engine hood before conducting 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 parts is/are removed.
- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

# 3.perform dtc confirmation procedure

#### With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Make sure 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 refilling/draining fuel until the output voltage condition 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.
- Turn ignition switch ON.
- Select "EVAP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

#### NOTE:

If the engine speed cannot be maintained within the range displayed on CONSULT-III screen, go to EC-26, "BASIC INSPECTION: Special Repair Requirement".

### Which is displayed on CONSULT-III?

OK >> INSPECTION END

NG >> Go to EC-337, "Diagnosis Procedure".

## 4. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-337, "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?

NO >> Go to EC-337, "Diagnosis Procedure".

## Component Function Check

INFOID:0000000004780207

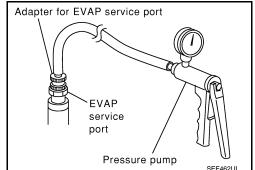
## 1. PERFORM COMPONENT FUNCTION CHECK

#### With GST

#### **CAUTION:**

- Do not use compressed air, doing so may damage the EVAP system.
- Do not start engine.
- Do not exceeded 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi).
- Attach the EVAP service port adapter securely to the EVAP service port.
- Set the pressure pump and a hose. 2.
- Also set a vacuum gauge via 3-way connector and a hose.
- 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<sup>2</sup>, 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<sup>2</sup>, 0.06 psi).



Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-337, "Diagnosis Procedure"

## 2. RELEASE PRESSURE

- 1. Disconnect GST.
- 2. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 3.
- Restart engine and let it idle for 90 seconds.
- Keep engine speed at 2,000 rpm for 30 seconds. 5.
- Turn ignition switch OFF.

#### NOTE:

For more information, refer to GST Instruction Manual.

>> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004780208

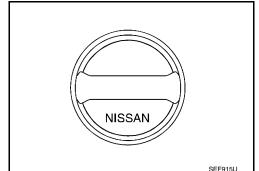
## 1. CHECK FUEL FILLER CAP DESIGN

- 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.

**EC-337** 

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#### < COMPONENT DIAGNOSIS >

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten until ratcheting sound is heard.

## 3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

#### Is the inspection result normal?

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

## f 4.CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-340, "Component Inspection (Fuel filler cap)".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one.

## 5.CHECK FOR EVAP LEAK

Refer to EC-500, "Inspection".

### Is there any leak in EVAP line?

YES >> Repair or replace.

NO >> GO TO 6.

## 6.CHECK DRAIN FILTER

Refer to EC-341, "Component Inspection (Drain filter)".

### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace drain filter.

## 7. CHECK EVAP CANISTER VENT CONTROL VALVE

#### Check the following.

EVAP canister vent control valve is installed properly.

Refer to EC-502, "Exploded View".

EVAP canister vent control valve.

Refer to EC-304, "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 IF EVAP CANISTER IS SATURATED WITH WATER

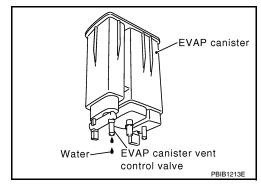
- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- Check if water will drain from the EVAP canister.

### Does water drain from EVAP canister?

YES >> GO TO 9.

NO-1 >> With CONSULT-III: GO TO 11.

NO-2 >> Without CONSULT-III: GO TO 12.



## 9. 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 1.9 kg (4.2 lb).

## **P0456 EVAP CONTROL SYSTEM**

< COMPONENT DIAGNOSIS >	[HR16DE]
Is the inspection result normal?	
YES-1 >> With CONSULT-III: GO TO 11.	
YES-2 >> Without CONSULT-III: GO TO 12.	
NO >> GO TO 10.	
10. DETECT MALFUNCTIONING PART	E
Check the following.	
<ul> <li>EVAP canister for damage</li> <li>EVAP hose between EVAP canister and vehicle frame for clogging or poor connection</li> </ul>	
2 LVAI Those between LVAI canister and vehicle frame for dogging of poor connection	
>> Repair hose or replace EVAP canister.	
11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION	ON
	·
<ul><li>With CONSULT-III</li><li>Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP</li></ul>	service port.
2. Start engine.	ос. 1.00 ро. и
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.	
<ol> <li>Touch "Qu" on CONSULT-III screen to increase "PURG VOL CONT/V" opening to 100%.</li> <li>Check vacuum hose for vacuum.</li> </ol>	
5. Check vacuum nose for vacuum.	
Vacuum should exist.	
Is the inspection result normal?	
YES >> GO TO 14.	
NO >> GO TO 13.	
12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION	NC
Without CONSULT-III	
The start engine and warm it up to normal operating temperature.	
<ol> <li>Stop engine.</li> <li>Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP</li> </ol>	sarvica port
4. Start engine and let it idle for at least 80 seconds.	service port.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.	
Vacuum ahauld aviat	
Vacuum should exist.	
Is the inspection result normal?	
YES >> GO TO 15. NO >> GO TO 13.	
13.check vacuum hose	
Check vacuum hoses for clogging or disconnection. Refer to <u>EC-74, "System Description"</u> .	
Is the inspection result normal?	
YES >> GO TO 14. NO >> Repair or reconnect the hose.	
14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to EC-293, "Diagnosis Procedure".	
Is the inspection result normal?	
YES >> GO TO 15.  NO >> Replace EVAP canister purge volume control solenoid valve.	
15. CHECK FUEL TANK TEMPERATURE SENSOR	
Refer to EC-244, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 16. NO >> Replace fuel level sensor unit.	
16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR	

## P0456 EVAP CONTROL SYSTEM

### < COMPONENT DIAGNOSIS >

[HR16DE]

Refer to EC-314, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace EVAP control system pressure sensor.

## 17. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-74, "System Description".

#### Is the inspection result normal?

YES >> GO TO 18.

NO >> Repair or reconnect the hose.

## 18.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 19.

## 19. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to <u>EC-450</u>, "<u>Description</u>".

### Is the inspection result normal?

YES >> GO TO 20.

NO >> Repair or replace hoses and tubes.

## 20. CHECK RECIRCULATION LINE

Check recirculation line between fuel filler tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

#### Is the inspection result normal?

YES >> GO TO 21.

NO >> Repair or replace hose, tube or fuel filler tube.

# 21.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-453, "Component Inspection (Refueling EVAP vapor cut valve)".

### Is the inspection result normal?

YES >> GO TO 22.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

# 22. CHECK FUEL LEVEL SENSOR

Refer to DI-16, "Fuel Level Sensor Signal Inspection".

#### Is the inspection result normal?

YES >> GO TO 23.

IO >> Replace fuel level sensor unit.

## 23. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

## Component Inspection (Fuel filler cap)

INFOID:0000000004803118

## 1. CHECK FUEL FILLER CAP

- 1. Turn ignition switch OFF.
- 2. Remove fuel filler cap.

## **P0456 EVAP CONTROL SYSTEM**

### < COMPONENT DIAGNOSIS >

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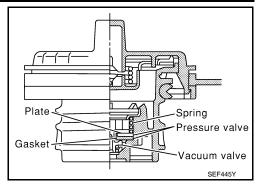
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Wipe clean valve housing.



Install fuel filler cap adapter (commercial service tool) to fuel filler cap.

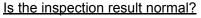
Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 -

2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm<sup>2</sup>,

-0.87 to -0.48 psi)



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

## Component Inspection (Drain filter)

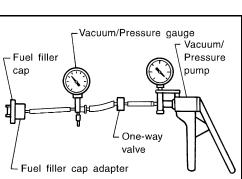
# 1. CHECK DRAIN FILTER

- Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- Check visually for cracks or flaws in the hose.
- Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- Blow air into port A and check that there is no leakage.

Is the inspection result normal?

>> INSPECTION END YES

NO >> Replace drain filter.



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Port A

To atmosphere

INFOID:0000000004803097

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To canister PBIB3641E

Port B

EC-341

## P0460 FUEL LEVEL SENSOR

Description INFOID:000000004780210

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

The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line.

It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic INFOID:000000004780211

### 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-357, "DTC Logic".

When the vehicle is parked, naturally the fuel level in the fuel tank is 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) Combination meter Fuel level sensor

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and wait maximum of 2 consecutive minutes.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-342, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004780212

## 1. CHECK COMBINATION METER FUNCTION

Refer to DI-13, "Trouble Diagnosis".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Refer to DI-13, "Trouble Diagnosis"

2.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

< COMPONENT DIAGNOSIS >

[HR16DE]

## P0461 FUEL LEVEL SENSOR

Description INFOID:0000000004780213

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

The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line.

It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic INFOID:0000000004780214

### 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-357, "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	G
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)     Combination meter     Fuel level sensor	Н

#### DTC CONFIRMATION PROCEDURE

# 1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-343, "Component Function Check".

Use component function check to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-344, "Diagnosis Procedure".

## Component Function Check

## 1.PRECONDITIONING

#### WARNING:

When performing following procedure, be sure to observe the handling of the fuel. Refer to FL-4, "General Precaution".

#### **TESTING CONDITION:**

Before starting component function check, preparation of draining fuel and refilling fuel is required.

### Do you have CONSULT-III?

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 ■ (7-7/8 US gal, 6-5/ 8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.

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INFOID:0000000004780215

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## **P0461 FUEL LEVEL SENSOR**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

- Release fuel pressure from fuel line, refer to <u>EC-498</u>, "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 (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 

  (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 <u>EC-344</u>, "<u>Diagnosis Procedure</u>".

# 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 ■ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

- 1. Prepare a fuel container and a spare hose.
- Release fuel pressure from fuel line. Refer to <u>EC-498, "Inspection"</u>.
- 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 (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  $30 \equiv (7-7/8 \text{ US gal}, 6-5/8 \text{ Imp gal})$ .
- 9. Confirm that the fuel gauge indication varies.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-344, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004780216

# 1.check combination meter function

Refer to DI-13, "Trouble Diagnosis".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Refer to DI-13, "Trouble Diagnosis"

# 2.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

< COMPONENT DIAGNOSIS >

[HR16DE]

## P0462, P0463 FUEL LEVEL SENSOR

Description INFOID:0000000004780217

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

The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line.

It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic INFOID:0000000004780218

### 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-357, "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
P0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	shorted)  Harness or connectors (The sensor circuit is open or shorted)  Combination meter  Fuel level sensor

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is between 11 V and 16 V at ignition switch ON.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

YES >> Go to EC-345, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

## 1. CHECK COMBINATION METER FUNCTION

Refer to DI-13, "Trouble Diagnosis".

### Is the inspection result normal?

YFS >> GO TO 2.

NO >> Refer to DI-13, "Trouble Diagnosis"

## 2.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

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INFOID:0000000004780219

## P0462, P0463 FUEL LEVEL SENSOR

< COMPONENT DIAGNOSIS >

[HR16DE]

## P0500 VSS

Description INFOID:0000000004780220

The vehicle speed signal is sent to the combination meter from the "ABS actuator and electric unit (control unit)" via the CAN communication line. The combination meter then sends a signal to the ECM via the CAN communication line.

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DTC Logic INFOID:0000000004780221

#### DTC DETECTION LOGIC

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-357, "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 Combination meter ABS actuator and electric unit (control unit)

#### DTC CONFIRMATION PROCEDURE

## 1.INSPECTION START

Do you have CONSULT-III?

### Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 5.

## 2.PRECONDITIONING

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

>> GO TO 3.

## 3.CHECK VEHICLE SPEED 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

- Start engine.
- 2. Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. The vehicle speed on CON-SULT-III should exceed 10 km/h (6 mph) when rotating wheels with suitable gear position.

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-348, "Diagnosis Procedure".

## 4.PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode with CONSULT-III.
- Warm engine up to normal operating temperature.
- Maintain the following conditions for at least 50 consecutive seconds. **CAUTION:**

Always drive vehicle at a safe speed.

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ENG SPEED	A/T: 1,900 - 6,000 rpm M/T: 2,500 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	A/T: 4.8 - 31.8 msec M/T: 3.8 - 31.8 msec
Selector lever	Except P or N position (A/T) Except Neutral position (M/T)
PW/ST SIGNAL	OFF

### 4. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-348, "Diagnosis Procedure".

NO >> INSPECTION END

## 5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-348, "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-348, "Diagnosis Procedure".

## Component Function Check

INFOID:0000000004780222

## 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-348, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004780223

# 1. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-18, "CONSULT-III Function (ABS)".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

# 2.CHECK COMBINATION METER

Refer to DI-12, "CONSULT-III Function (METER/M&A)".

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## P0506 ISC SYSTEM

Description INFOID:0000000004780224

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

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

If the target idle speed is out of the specified value, perform <u>EC-32</u>, <u>"IDLE AIR VOLUME LEARNING : Special Repair Requirement"</u>, 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.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-349, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

## 1. CHECK INTAKE AIR LEAK

- 1. Start engine and let it idle.
- 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.
- Replace ECM.

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INFOID:0000000004780226

## **P0506 ISC SYSTEM**

< COMPONENT DIAGNOSIS >

[HR16DE]

3. Perform <u>EC-29</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement".

## P0507 ISC SYSTEM

Description INFOID:0000000004780227

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic INFOID:0000000004780228

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

If the target idle speed is out of the specified value, perform EC-32, "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

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-351, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

## 2.check intake air leak

- Start engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

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## **P0507 ISC SYSTEM**

### < COMPONENT DIAGNOSIS >

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### Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 3.

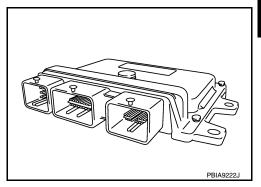
# 3.REPLACE ECM

- Stop engine.
- 2. Replace ECM.
- 3. Perform EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement".

## P0603 ECM POWER SUPPLY

Description INFOID:0000000004780234

ECM has the memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc. even when the ignition switch is turned ON.



**DTC Logic** INFOID:0000000004780235

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0603	Engine control module	ECM back-up RAM system does not function properly.	• ECM

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 1 second.
- Start engine and let it idle for 1 second. 2.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- Repeat steps 2 and 3 for four times.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

>> Go to EC-353, "Diagnosis Procedure". YES

>> INSPECTION END NO

## Diagnosis Procedure

# 1. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Erase DTC. Refer to "How to Erase DTC and 1st Trip DTC" in EC-90, "Diagnosis Description".
- Perform DTC CONFIRMATION PROCEDURE. Refer to EC-353, "DTC Logic".

### Is the 1st trip DTC P0603 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

## 2.REPLACE ECM

- Replace ECM.
- Perform EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement".

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## **P0603 ECM POWER SUPPLY**

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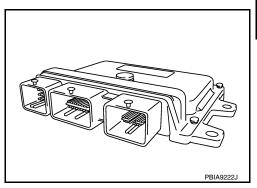
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## P0605 ECM

Description INFOID:000000004780237

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



DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 Engine control module		A)	ECM calculation function is malfunctioning.	
	Engine control module	B)	ECM EEP-ROM system is malfunctioning.	• ECM
		C)	ECM self shut-off function is malfunctioning.	

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

- 1. Turn ignition switch ON.
- Check 1st trip DTC.

## Is 1st trip DTC detected?

YES >> Go to EC-356, "Diagnosis Procedure".

NO >> GO TO 3.

# 3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- 3. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-356, "Diagnosis Procedure".

NO >> GO TO 4.

## f 4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- 3. Repeat step 2 for 32 times.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-356, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004780239

# 1.INSPECTION START

- Turn ignition switch ON.
- Erase 1st trip DTC. Refer to "How to Erase DTC and 1st Trip DTC" in <u>EC-90</u>, "<u>Diagnosis Description</u>". Perform DTC CONFIRMATION PROCEDURE. Refer to <u>EC-355</u>, "<u>DTC Logic"</u>.

### Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

# 2.REPLACE ECM

- Replace ECM.
- 2. Perform EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement".

## P0607 ECM

Description INFOID:0000000004780240

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

#### 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

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

### Is DTC detected?

YES >> Go to EC-357, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

1.INSPECTION START

- Turn ignition switch ON.
- 2. Erase DTC. Refer to "How to Erase DTC and 1st Trip DTC" in .EC-90, "Diagnosis Description"
- Perform DTC CONFIRMATION PROCEDURE. Refer to EC-357, "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. Perform EC-29, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Requirement".

>> INSPECTION END

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## P0643 SENSOR POWER SUPPLY

DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0643	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	Harness or connectors     (APP sensor 1 circuit is shorted.)     (TP sensor circuit is shorted.)     (Battery current sensor circuit is shorted.)     (PSP sensor circuit is shorted.)     [Camshaft position sensor (PHASE) circuit is shorted.]     Accelerator pedal position sensor     Throttle position sensor     Battery current sensor     Power steering pressure sensor     Camshaft position sensor (PHASE)

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 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-359, "Diagnosis Procedure".

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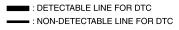
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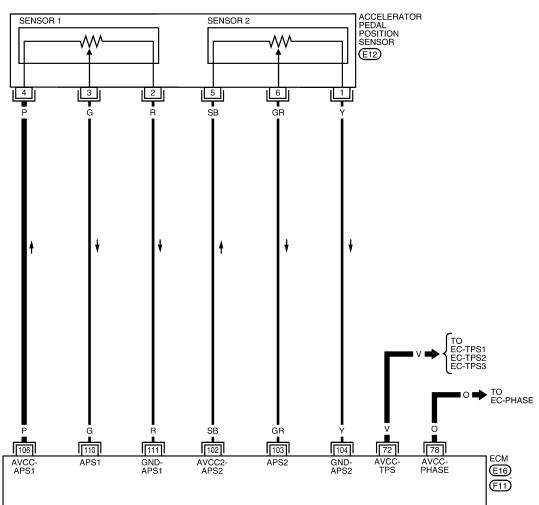
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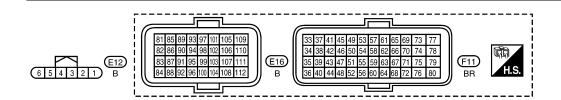
Wiring Diagram

INFOID:0000000004780693

## EC-SEN/PW-01







BBWA2649E

INFOID:0000000004780244

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

Is the inspection result normal?

### < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

APP s	sensor	Ground	Voltage	
Connector	Terminal	Oround	voltage	
E12	4	Ground	Approx. 5 V	

## Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.



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

ECM		Sensor		
Connector Terminal		Name	Connector	Terminal
F11	72	Electric throttle control actuator	F7	2
1 11	78	CMP sensor (PHASE)	F21	1
E16	106	APP sensor	E12	4

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

## 4. CHECK COMPONENTS

Check the following.

Camshaft position sensor (PHASE) (Refer to <u>EC-272, "Component Inspection"</u>.)

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace camshaft position sensor (PHASE).

## 5.CHECK TP SENSOR

Refer to EC-174, "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. Perform <u>EC-31</u>, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

#### >> INSPECTION END

## 7. CHECK APP SENSOR

Refer to EC-402, "Component Inspection".

## Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

P0643 SENSOR POWER SUPPLY	
< COMPONENT DIAGNOSIS >	[HR16DE]
8. REPLACE ACCELERATOR PEDAL ASSEMBLY	Α
<ol> <li>Replace accelerator pedal assembly.</li> <li>Perform <u>EC-402</u>, "Special Repair Requirement".</li> </ol>	_
>> INSPECTION END	EC
9. CHECK INTERMITTENT INCIDENT	
Refer to EC-120, "Diagnosis Procedure".	С
>> INSPECTION END	D
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## P0850 PNP SWITCH

Description INFOID:000000004780245

When the selector lever position is P or N (A/T), Neutral position (M/T), park/neutral position (PNP) switch is ON

ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

#### 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) switch is not changed in the process of engine starting and driving.	Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.]     Park/neutral position (PNP) switch

#### DTC CONFIRMATION PROCEDURE

#### 1.INSPECTION START

Do you have CONSULT-III?

#### Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 5.

## 2.PRECONDITIONING

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

>> GO TO 3.

# 3. CHECK PNP SWITCH FUNCTION

#### With CONSULT-III

- 1. Turn ignition switch ON.
- Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. Then check the "P/N POSI SW" signal under the following conditions.

Selector lever position	Known-good signal
N or P position (A/T) Neutral position (M/T)	ON
Except above position	OFF

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to EC-364, "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.
- Maintain the following conditions for at least 50 consecutive seconds.

  CAUTION:

#### Always drive vehicle at a safe speed.

ENG SPEED	A/T: 1,650 - 6,375 rpm M/T: 1,930 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)

#### P0850 PNP SWITCH

#### < COMPONENT DIAGNOSIS >

NOSIS > [HR16DE]

B/FUEL SCHDL

A/T: 3.5 - 31.8 msec
M/T: 2.5 - 31.8 msec

VHCL SPEED SE

More than 64 km/h (40 mph)

Selector lever

Suitable position

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4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-364, "Diagnosis Procedure".

NO >> INSPECTION END

С

## 5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-363, "Component Function Check".

#### NOTE:

Use component function check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-364, "Diagnosis Procedure".

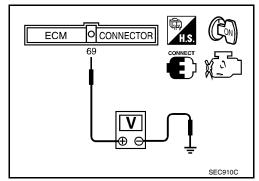
## Component Function Check

INFOID:0000000004780247

## 1. PERFORM COMPONENT FUNCTION CHECK

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector and ground under the following conditions.

E	CM	Ground Co		ndition	Voltage
Connector	Terminal	Ground	Condition		voitage
F11	69 (PNP switch	Ground	Selector	P or N (A/T) Neutral (M/T)	Approx. 0 V
	signal)	Ground	lever	Except above	Battery voltage



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-364, "Diagnosis Procedure".

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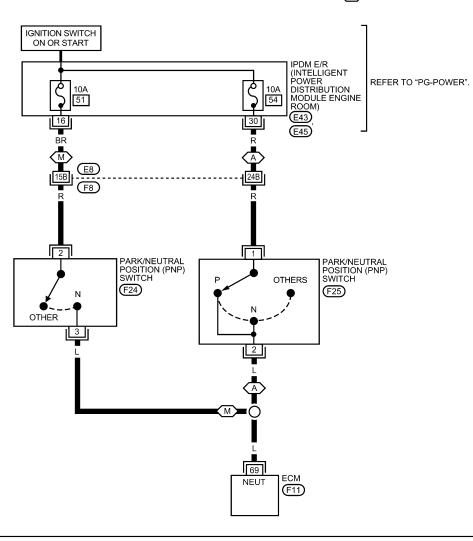
Wiring Diagram

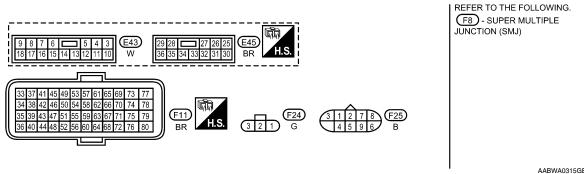
INFOID:0000000004780694

# EC-PNP/SW-01: DETECTABLE LINE FOR DTC

: NON-DETECTABLE LINE FOR DTC







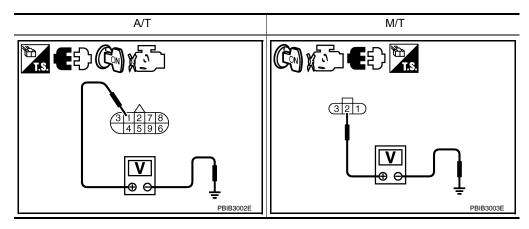
## Diagnosis Procedure

INFOID:0000000004780248

# 1. CHECK PNP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect park/neutral position (PNP) switch harness connector.
- 3. Turn ignition switch ON.

Check the voltage between PNP switch harness connector and ground.



PNP sv	vitch	Ground	Voltage
Connector	Terminal	Ground	Voltage
F25 (A/T)	1	Ground	Battery voltage
F24 (M/T)	2	Giodila	Ballery Vollage

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

## 2.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E8, F8
- IPDM E/R harness connector E43 (M/T)
- IPDM E/R harness connector E45 (A/T)
- 10 A fuse (No. 51) (M/T)
- 10 A fuse (No. 54) (A/T)
- · Harness for open or short between PNP switch and fuse

#### Is the inspection result normal?

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

# ${f 3.}$ CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between PNP switch harness connector and ECM harness connector.

•	PNP	switch	EC	M	Continuity
	Connector	Terminal	Connector	Terminal	Continuity
•	F25 (A/T)	2	F11	69	Existed
	F24 (M/T)	3	1 11	09	LXISIEU

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK PNP SWITCH

Refer to AT-95, "Component Inspection" (A/T) or MT-12, "Checking" (M/T).

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace PNP switch. EC

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# 5. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

## P1148 CLOSED LOOP CONTROL

< COMPONENT DIAGNOSIS >

[HR16DE]

# P1148 CLOSED LOOP CONTROL

DTC Logic

#### DTC DETECTION LOGIC

NOTE:

DTC P1148 is displayed with another DTC for A/F sensor 1. Perform the trouble diagnosis for the corresponding DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
D11/18	Closed loop control function  Closed loop control function  The closed loop control function for bank 2 does on the control function function for bank 2 does on the control function function for bank 2 does on the control function functio	Harness or connectors     (The A/F sensor 1 circuit is open or shorted.)	
F 1140		not operate even when vehicle is driving in the	A/F sensor 1     A/F sensor 1 heater

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## P1217 ENGINE OVER TEMPERATURE

DTC Logic INFOID:0000000004780250

#### DTC DETECTION LOGIC

< COMPONENT DIAGNOSIS >

#### NOTF:

- 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-357, "DTC Logic".

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will

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)	<ul> <li>Cooling fan does not operate properly (Overheat).</li> <li>Cooling fan system does not operate properly (Overheat).</li> <li>Engine coolant was not added to the system using the proper filling method.</li> <li>Engine coolant is not within the specified range.</li> </ul>	Harness or connectors     (The cooling fan circuit is open or shorted.)     IPDM E/R (Cooling fan relay-1)     Cooling fan relays-2 and -3     Cooling fan motor     Radiator hose     Radiator     Radiator cap     Reservoir tank     Water pump     Thermostat     Water control valve

#### **CAUTION:**

When a malfunction is indicated, be sure to replace the coolant. Refer to CO-11, "Changing Engine Coolant". Also, replace the engine oil. Refer to LU-8, "Draining" and LU-8, "Refilling".

- Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-15, "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-368, "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-369, "Diagnosis Procedure".

## Component Function Check

INFOID:0000000004780251

[HR16DE]

## 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 guarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

#### P1217 ENGINE OVER TEMPERATURE

#### < COMPONENT DIAGNOSIS >

[HR16DE]

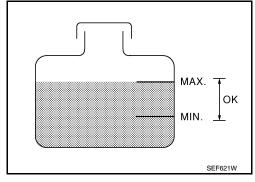
Check the coolant level in the reservoir tank and radiator.

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-369, "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-369, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform component function check-iii

#### With CONSULT-III

- 1. Turn ignition switch ON.
- Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that cooling fan motor operates at each speed (LOW/HI).

#### Without CONSULT-III

Perform IPDM E/R auto active test and check cooling fan motor operation. Refer to PG-19, "Auto Active Test". Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-369, "Diagnosis Procedure".

## Diagnosis Procedure

1. CHECK COOLING FAN OPERATION

#### With CONSULT-III

- Turn ignition switch ON.
- Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-III.
- Make sure that cooling fan motor operates at each speed (LOW/HI).

#### Without CONSULT-III

- Perform IPDM E/R auto active test and check cooling fan motor operation. Refer to PG-19, "Auto Active Test".
- Make sure that cooling fan motor operates at each speed (Low/High).

#### Is the inspection result normal?

YES >> GO TO 2.

>> Go to EC-424, "Diagnosis Procedure". NO

## 2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-11, "Inspection".

#### Is leakage detected?

YES >> GO TO 3.

>> GO TO 4. NO

# 3.CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak.

- Hose (Refer to CO-11, "Inspection".)
- Radiator (Refer to CO-14, "Checking Radiator".)
- Water pump (Refer to CO-21, "Inspection".)

>> Repair or replace malfunctioning part.

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#### < COMPONENT DIAGNOSIS >

## 4. CHECK RADIATOR CAP

Check radiator cap. Refer to CO-14, "Checking Radiator Cap".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap.

## 5. CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat.

## 6. CHECK WATER CONTROL VALVE

Check water control valve. Refer to CO-23, "Inspection".

## Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace water control valve

## 7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-169, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace engine coolant temperature sensor.

## 8. 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-15, "Anti-freeze Coola	nt Mixture Ratio"
	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-11, "Inspection"
	4	Radiator cap	Pressure tester	CO-14, "Checking Radiato	r Cap"
ON* <sup>2</sup>	5	Coolant leaks	Visual	No leaks	CO-11, "Inspection"
ON* <sup>2</sup>	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	CO-23, "Inspection"
ON* <sup>1</sup>	7	Cooling fan motor	CONSULT-III	Operating	EC-422, "Component Function Check"
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON* <sup>3</sup>	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-11, "Inspection"
OFF* <sup>4</sup>	10	Coolant return from res- ervoir tank to radiator	Visual	Should be initial level in reservoir tank	CO-25, "Inspection"
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-82, "Disassembly and Assembly"
	12	Cylinder block and pistons	Visual	No scuffing on cylinder walls or piston	EM-103, "Inspection"

## **P1217 ENGINE OVER TEMPERATURE**

## < COMPONENT DIAGNOSIS > [HR16DE]

- \*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

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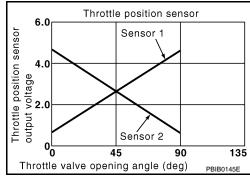
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## P1225 TP SENSOR

Description INFOID.000000004780253

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

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



**DTC Logic** 

INFOID:0000000004780254

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	Electric throttle control actuator (TP sensor 1 and 2)

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 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.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-372, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004780255

## 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- Remove the intake air duct.

#### **P1225 TP SENSOR**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

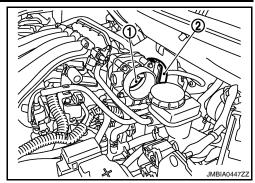
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.
- Electric throttle control actuator (2)

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Remov

>> Remove the foreign matter and clean the electric throttle control actuator inside.



# 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- 2. Perform EC-373. "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

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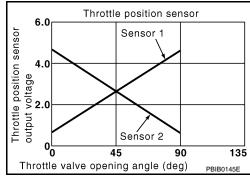
INFOID:0000000004780258

#### P1226 TP SENSOR

Description INFOID:000000004780257

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

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



**DTC Logic** 

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226	Closed throttle position learning performance	Closed throttle position learning is not performed successfully, repeatedly.	Electric throttle control actuator (TP sensor 1 and 2)

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF, wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Repeat steps 2 and 3 for 32 times.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-374, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004780259

## 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- Remove the intake air duct.

#### **P1226 TP SENSOR**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

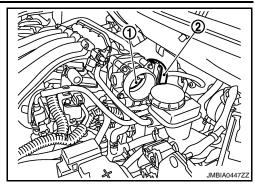
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.
- Electric throttle control actuator (2)

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove

>> Remove the foreign matter and clean the electric throttle control actuator inside.



# 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- 2. Perform EC-375, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

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#### P1421 COLD START CONTROL

Description INFOID:000000004780261

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

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 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 that the "COOLAN TEMP/S" indication is between 4°C (39°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.
- Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

#### Is 1st trip DTC detected?

YES >> Go to EC-376, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004780263

## 1.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-32, "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

## P1421 COLD START CONTROL

P1421 COLD START CONTROL	
< COMPONENT DIAGNOSIS > [HR16DE]	
Is the inspection result normal?	1
YES >> GO TO 3.	Α
NO >> Repair or replace malfunctioning part	
3. CHECK FUEL INJECTION SYSTEM FUNCTION	EC
Perform DTC CONFIRMATION PROCEDURE for DTC P0171. Refer to EC-229, "DTC Logic".	
Is the inspection result normal?  YES >> GO TO 4.	
NO >> Go to EC-231, "Diagnosis Procedure" for DTC P0171.	С
4.PERFORM DTC CONFIRMATION PROCEDURE	
<ol> <li>Turn ignition switch ON.</li> <li>Erase 1st trip DTC. Refer to "How to Erase DTC and 1st Trip DTC" in <u>EC-90, "Diagnosis Description"</u>.</li> <li>Perform DTC CONFIRMATION PROCEDURE. Refer to <u>EC-376, "DTC Logic"</u>.</li> </ol>	D
Is the 1st trip DTC P1421 displayed again?	Е
YES >> GO TO 5.	
NO >> INSPECTION END  5.REPLACE ECM	F
<ol> <li>Replace ECM.</li> <li>Perform <u>EC-29</u>, "<u>ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT</u>: <u>Special Repair Requirement</u>".</li> </ol>	G
>> INSPECTION END	
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# < COMPONENT DIAGNOSIS >

P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

Description INFOID:000000004780294

ECM receives primary speed sensor signal from TCM via the CAN communication line. ECM uses this signal for engine control.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P1715 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC U1000,XXXX.
- If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-263, "DTC Logic".
- If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to <u>EC-268</u>, "DTC Logic".
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-355, "DTC Logic".
- If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-357</u>, "<u>DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715	Input speed sensor (Primary speed sensor) (TCM output)	Primary speed sensor signal is different from the theoretical value calculated by ECM from secondary speed sensor signal and engine rpm signal.	Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (Primary speed sensor circuit is open or shorted) TCM

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

Start engine and drive the vehicle at more than 50 km/h (31 MPH) for at least 5 seconds.

Always drive vehicle at a safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-378, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004780296

[HR16DE]

## 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-39, "OBD-II Diagnostic Trouble Code (DTC)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

2.REPLACE TCM

Replace TCM.

## P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

< COMPONENT DIAGNOSIS >

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>> INSPECTION END

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## P1805 BRAKE SWITCH

Description INFOID:000000004780297

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

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name DTC detecting condition		Possible cause	
P1805	Brake switch	A brake switch signal is not sent to ECM for extremely long time while the vehicle is driving.	Harness or connectors     (Stop lamp switch circuit is open or shorted.)     Stop lamp switch	

#### DTC CONFIRMATION PROCEDURE

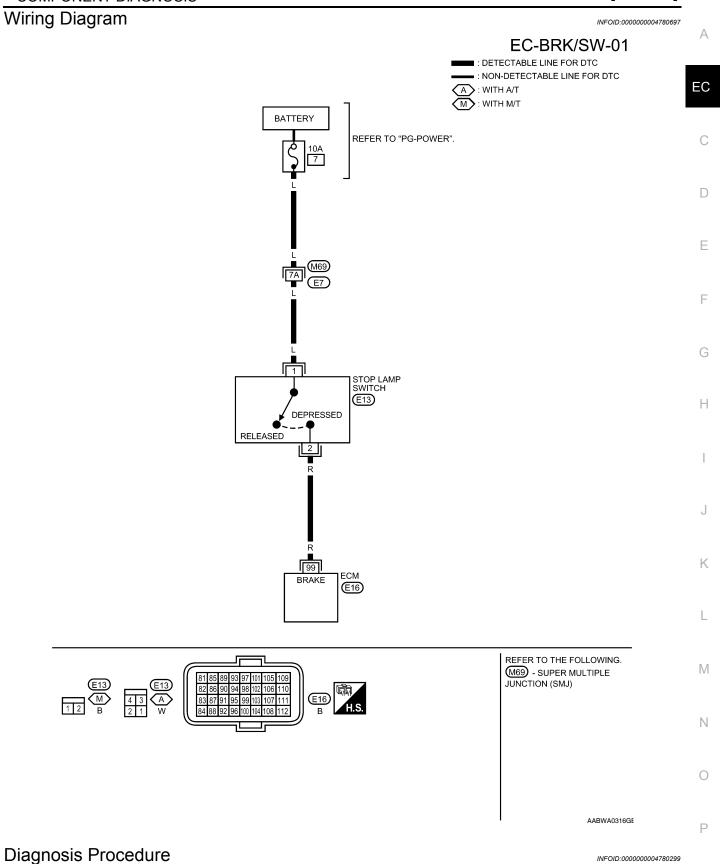
# 1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Fully depress the brake pedal for at least 5 seconds.
- Erase the DTC.
- 4. Check 1st trip DTC.

## Is 1st trip DTC detected?

YES >> Go to EC-381, "Diagnosis Procedure".

NO >> INSPECTION END



# 1. CHECK STOP LAMP SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check the stop lamp when depressing and releasing the brake pedal.

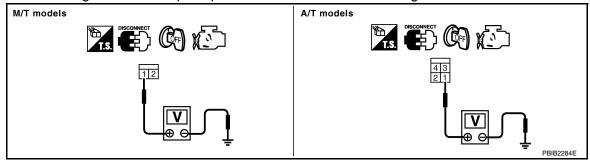
Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

#### Is the inspection result normal?

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

# 2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect stop lamp switch harness connector.
- Check the voltage between stop lamp switch harness connector and ground.



Stop lam	o switch	Ground	Voltage
Connector Terminal		Oround	voitage
E13	1	Ground	Battery voltage

#### Is the inspection result normal?

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

## 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E7, M69
- 10 A fuse (No. 7)
- · 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

- Disconnect ECM harness connector.
- Check the continuity between ECM harness connector and stop lamp switch harness connector.

EC	М	Stop lam	p switch	Continuity
Connector Terminal		Connector	Terminal	Continuity
E16	99	E13	2	Existed

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

#### Is the inspection result normal?

YES >> GO TO 5

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5. CHECK STOP LAMP SWITCH

Refer to EC-383, "Component Inspection (Stop Lamp Switch)".

#### Is the inspection result normal?

YES >> GO TO 6.

#### P1805 BRAKE SWITCH

#### < COMPONENT DIAGNOSIS >

[HR16DE]

NO >> Replace stop lamp switch.

## 6. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

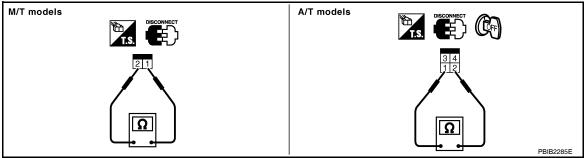
#### >> INSPECTION END

## Component Inspection (Stop Lamp Switch)

#### INFOID:0000000004780300

## 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	(	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
i anu z	Brake pedar	Slightly depressed	Existed

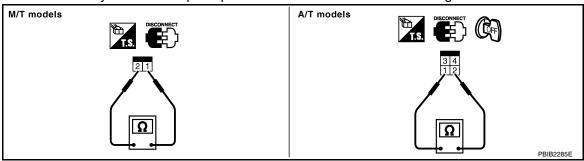
#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

## 2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to <a href="BR-6">BR-6</a>, "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
	Brake pedal	Slightly depressed	Existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch.

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#### < COMPONENT DIAGNOSIS >

[HR16DE]

## P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Description INFOID:000000004780301

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

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	Harness or connectors     (Throttle control motor relay circuit is open)     Throttle control motor relay
P2103	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	Harness or connectors     (Throttle control motor relay circuit is shorted)     Throttle control motor relay

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V.

#### Witch DTC is detected?

P2100 >> GO TO 2.

P2103 >> GO TO 3.

# 2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2100

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

#### Is DTC detected?

YES >> Go to EC-385, "Diagnosis Procedure".

NO >> INSPECTION END

## 3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103 $\,$

- 1. Turn ignition switch ON and wait at least 1 second.
- Check DTC.

#### Is DTC detected?

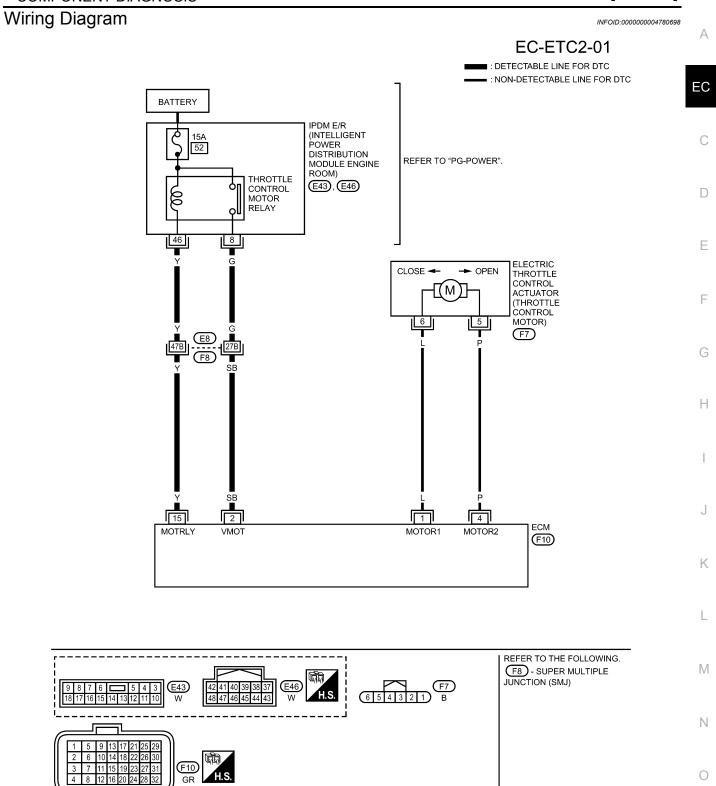
YES >> Go to EC-385. "Diagnosis Procedure".

NO >> INSPECTION END

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## Diagnosis Procedure

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

Turn ignition switch OFF.

## P2100, P2103 THROTTLE CONTROL MOTOR RELAY

#### < COMPONENT DIAGNOSIS >

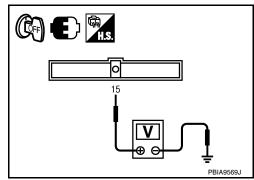
[HR16DE]

Check the voltage between ECM harness connector and ground.

E	CM	Ground	Voltage
Connector Terminal		Voltage	voltage
F10	15	Ground	Battery voltage

#### OK or NG

OK >> GO TO 5. NG >> GO TO 2.



# 2.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

- 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	Continuity
F10	15	E46	46	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 (No. 52) from IPDM E/R.
- 2. Check 15 A fuse for blown.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace 15 A fuse.

## 5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector and ground under the following conditions.

ECM		Ground	Condition	Voltage		
Connector	Terminal	Oround	Condition	Voltage		
F10	F10 2		2 Gr	2 Ground	Ignition switch: OFF	Approximately 0 V
			Ignition switch: ON	Battery voltage		

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#### OK or NG

OK >> GO TO 8.

NG >> GO TO 6.

## 6. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector.

## P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< COMPONENT DIAGNOSIS >

[HR16DE]

4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDN	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F10	2	E43	8	Existed

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

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- 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-120, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connectors.

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< COMPONENT DIAGNOSIS >

[HR16DE]

#### P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description INFOID:000000004780304

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

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

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to <u>EC-384, "DTC Logic"</u>.
- If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to <u>EC-397</u>, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101	Electric throttle control performance	Electric throttle control function does not operate properly.	Harness or connectors     (Throttle control motor circuit is open or shorted)     Electric throttle control actuator

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 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?

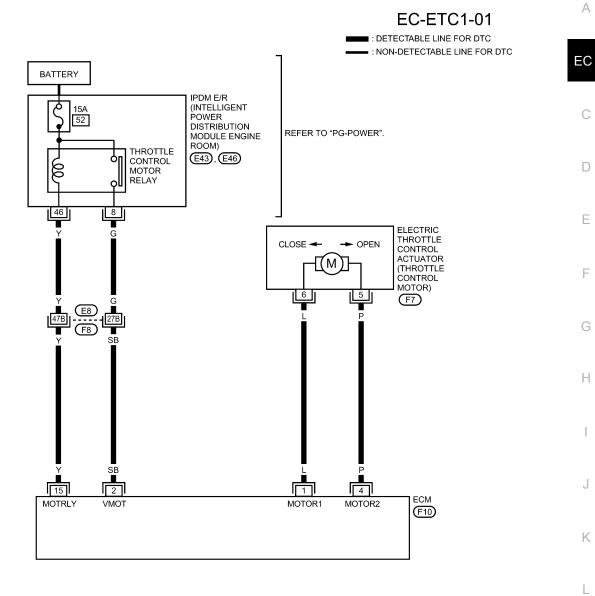
YES >> Go to EC-389, "Diagnosis Procedure".

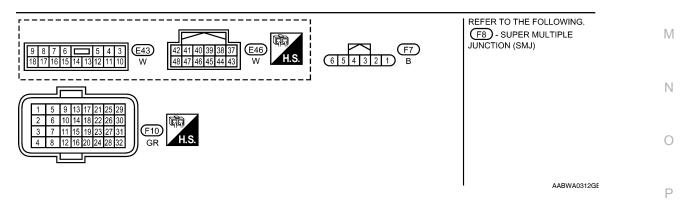
NO >> INSPECTION END

INFOID:0000000004780699

INFOID:0000000004780306







## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

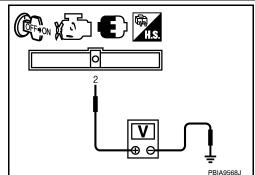
< COMPONENT DIAGNOSIS >

NO >> Repair or replace ground connection.

# 2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector and ground under the following conditions.

ECM		Ground	Condition	Voltage
Connector	Terminal	Ground	Condition	voltage
F10 2		Ground	Ignition switch: OFF	Approx. 0 V
		Ground	Ignition switch: ON	Battery voltage



[HR16DE]

#### Is the inspection result normal?

>> GO TO 9. YES

NO >> GO TO 3.

# 3.check throttle control motor relay power supply circuit

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Disconnect IPDM E/R harness connector.
- 4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

IPDM E/R		EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E46	46	F10	15	Existed

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

## f 4.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E8, F8
- 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 INPUT SIGNAL CIRCUIT-II

Check the continuity between ECM harness connector and IPDM E/R harness connector.

IPDM	IPDM E/R ECM			Continuity
Connector	Terminal	Connector	Terminal	Continuity
E43	8	F10	2	Existed

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 E8, F8
- 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.

< COMPONENT DIAGNOSIS >

[HR16DE]

# $\overline{7}$ .check fuse

Disconnect 15 A fuse (No. 52) from IPDM E/R.

2. Check 15 A fuse for blown.

#### Is the inspection result normal?

YFS >> GO TO 8.

NO >> Replace 15 A fuse.

## 8 . CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### 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

- Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- Disconnect ECM harness connector.
- 4. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle of	ontrol actuator	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F7	5		1	Not existed
	3	F10 4		Existed
	6	FIU	1	Existed
	0		4	Not existed

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

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace.

# 10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

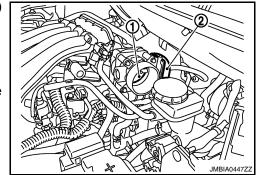
- 1. Remove the intake air duct.
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.
- Electric throttle control actuator (2)

#### 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-392, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 13.

# 12. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> GO TO 13. EC

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#### < COMPONENT DIAGNOSIS >

[HR16DE]

NO >> Repair or replace harness or connectors.

# 13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunction electric throttle control actuator.
- 2. Perform EC-392, "Special Repair Requirement".

#### >> INSPECTION END

## **Component Inspection**

INFOID:0000000004780307

# 1. CHECK THROTTLE CONTROL MOTOR

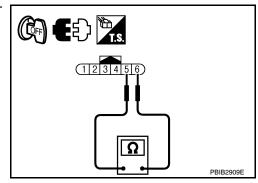
- 1. Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- 3. Check the resistance between electric throttle control actuator terminals as per the following.

Terminals	Resistance
5 and 6	Approx. 1 - 15 Ω [at 25°C (77°F)]

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.



# 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- 2. Perform EC-392, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004780461

# 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

## 2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

#### **P2118 THROTTLE CONTROL MOTOR**

< COMPONENT DIAGNOSIS >

[HR16DE]

## P2118 THROTTLE CONTROL MOTOR

Description INFOID:0000000004780309

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

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

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2118	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	Harness or connectors     (Throttle control motor circuit is shorted.)     Electric throttle control actuator     (Throttle control motor)

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-394, "Diagnosis Procedure".

NO >> INSPECTION END

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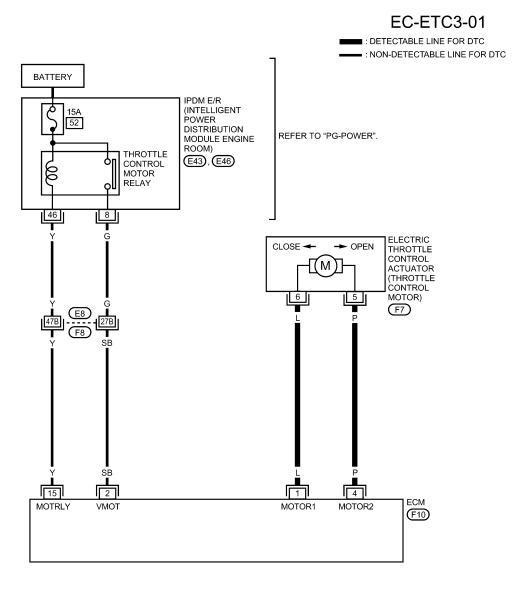
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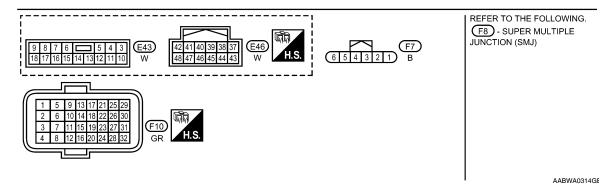
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Wiring Diagram

< COMPONENT DIAGNOSIS >

INFOID:0000000004780700





## Diagnosis Procedure

INFOID:0000000004780311

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### **P2118 THROTTLE CONTROL MOTOR**

## < COMPONENT DIAGNOSIS >

[HR16DE]

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.check throttle control motor output signal circuit for open and short

- Disconnect electric throttle control actuator harness connector.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle of	control actuator	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F7	5		1	Not existed
	3	F10	4	Existed
	6	1 10	1	Existed
	O		4	Not existed

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

## Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

# 3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-395, "Component Inspection",

## Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 5.

## 4.CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace harness or connectors.

## 5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- Perform EC-396, "Special Repair Requirement".

#### >> INSPECTION END

# Component Inspection

# 1. CHECK THROTTLE CONTROL MOTOR

- Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- Check the resistance between electric throttle control actuator terminals as per the following.

Terminals	Resistance
5 and 6	Approx. 1 - 15 Ω [at 25°C (77°F)]

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.replace electric throttle control actuator

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#### **P2118 THROTTLE CONTROL MOTOR**

#### < COMPONENT DIAGNOSIS >

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- 1. Replace electric throttle control actuator.
- 2. Perform EC-396, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004780462

# 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# $2.\mathsf{PERFORM}$ IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

#### P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< COMPONENT DIAGNOSIS >

[HR16DE]

#### P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Description INFOID:0000000004780314

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

The throttle position sensor detects the throttle valve position, and feeds the voltage signal to the ECM. The ECM judges the current opening angle of the throttle valve and controls the throttle valve opening angle in response to driving conditions via the throttle control motor.

**DTC Logic** INFOID:0000000004780315

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause	E
		Α	Electric throttle control actuator does not function properly due to the return spring malfunction.		
P2119	Electric throttle control actuator	В	Throttle valve opening angle in fail-safe mode is not in specified range.	Electric throttle control actuator	F
		С	ECM detect the throttle valve is stuck open.		

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- Turn ignition switch ON and wait at least 1 second.
- Set selector lever to D (A/T) or 1st (M/T) position and wait at least 3 seconds.
- Set selector lever to P (A/T) or Neutral (M/T) position.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and wait at least 1 second.
- Set selector lever to D (A/T) or 1st (M/T) position and wait at least 3 seconds.
- Set selector lever to P (A/T) or Neutral (M/T) position. 7.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- 9. Check DTC.

#### Is DTC detected?

YES >> Go to EC-397, "Diagnosis Procedure".

NO >> GO TO 3.

# 3.perform dtc confirmation procedure for malfunction c

- Turn ignition switch ON and wait at least 1 second.
- Set selector lever to D (A/T) or 1st (M/T) position and wait at least 3 seconds.
- Set selector lever to P (A/T) or Neutral (M/T) position.
- 4. Start engine and let it idle for 3 seconds.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-397, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

# 1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- Remove the intake air duct.

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INFOID:0000000004780316

#### P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

#### < COMPONENT DIAGNOSIS >

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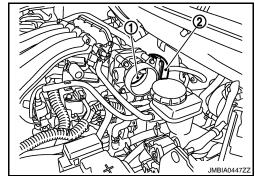
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.
- Electric throttle control actuator (2)

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove

>> Remove the foreign matter and clean the electric throttle control actuator inside.



# 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- 2. Perform EC-398. "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004780463

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

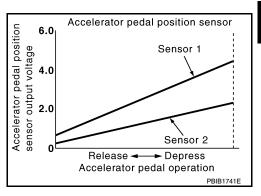
# P2122. P2123 APP SENSOR

Description INFOID:0000000004780318

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic INFOID:0000000004780319

#### DTC DETECTION LOGIC

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-358, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	Harness or connectors     (APP sensor 1 circuit is open or shorted.)
P2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	Accelerator pedal position sensor (APP sensor 1)

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YFS >> Go to EC-400, "Diagnosis Procedure".

NO >> INSPECTION END EC

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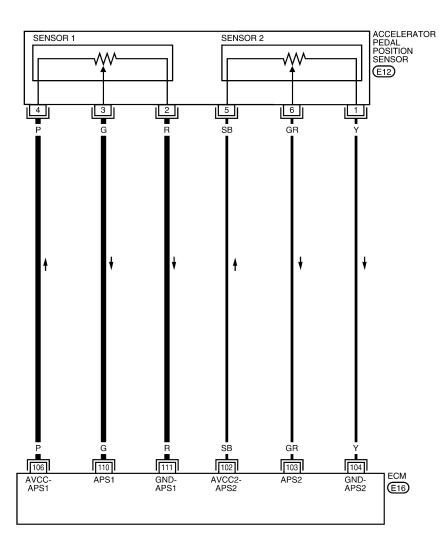
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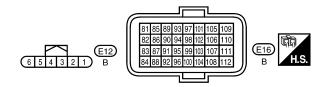
Wiring Diagram

INFOID:0000000004780701

#### EC-APPS1-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2652E

# Diagnosis Procedure

#### INFOID:0000000004780320

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

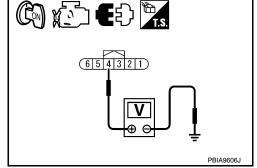
- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

APP se	ensor	Ground	Voltage	
Connector	Terminal	Ground		
E12	4	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



# ${f 3.}$ CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

APP s	ensor	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E12	2	E16	111	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### f 4.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		EC	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E12	3	E16	110	Existed

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 5. CHECK APP SENSOR

Refer to EC-402, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

#### **6.**REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Perform EC-402, "Special Repair Requirement".

#### >> INSPECTION END

#### 7. CHECK INTERMITTENT INCIDENT

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Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

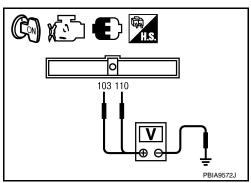
# Component Inspection

#### INFOID:0000000004780321

# 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

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

ECM		Ground	Condition		Voltage	
Connector	Terminal	Ground	Condition		voitage	
	110			Fully released	0.6 - 0.9 V	
E16	(APPsensor 1 signal)	Ground	Accelerator pedal	Fully depressed	3.9 - 4.7 V	
	103			Fully released	0.3 - 0.6 V	
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4 V	



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Perform EC-402, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004780322

# 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-31, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 2.

# 2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".

>> GO TO 3.

# 3. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

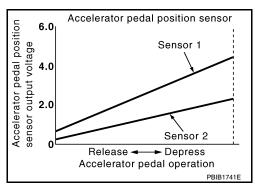
#### P2127, P2128 APP SENSOR

Description INFOID:0000000004780323

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic INFOID:0000000004780324

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	Harness or connectors     (APP sensor 2 circuit is open or shorted.)
P2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	<ul> <li>[Crankshaft position sensor (POS) circuit is shorted.]</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>(EVAP control system pressure sensor circuit is shorted.)</li> <li>Accelerator pedal position sensor (APP sensor 2)</li> <li>Crankshaft position sensor (POS)</li> <li>Refrigerant pressure sensor</li> <li>EVAP control system pressure sensor</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

# 2.perform dtc confirmation procedure

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

#### Is DTC detected?

YES >> Go to EC-404, "Diagnosis Procedure".

>> INSPECTION END NO

**EC-403** 

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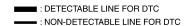
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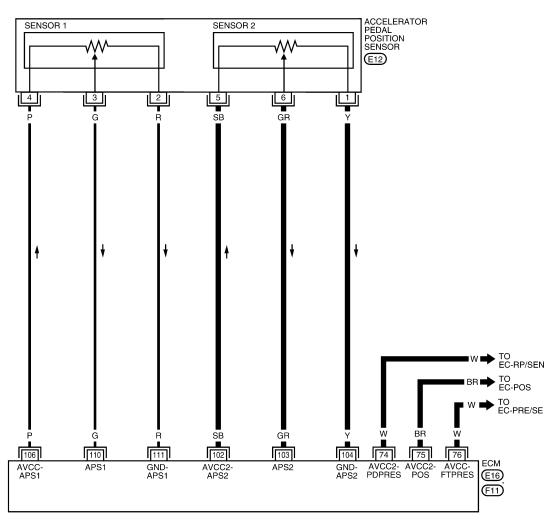
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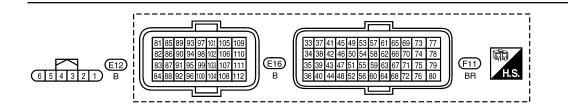
Wiring Diagram

INFOID:0000000004780702

#### EC-APPS2-01







BBWA3074E

INFOID:0000000004780325

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON. 2.
- 3. Check the voltage between APP sensor harness connector and around.

APP se	ensor	Ground	Voltage	
Connector	Connector Terminal		voltage	
E12	5	Ground	Approx. 5 V	

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 3.

# 3.check app sensor 2 power supply circuit-ii

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

APP s	ensor	EC	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E12	5	E16	102	Existed

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 4. CHECK SENSOR POWER SUPPLY CIRCUIT

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

EC	M	Sensor		
Connector	Terminal	Name	Connector	Terminal
	74	Refrigerant pressure sensor	E17	3
F11 75 76		CKP sensor (POS)	F15	1
		EVAP control system pressure sensor	B104	3
E16	102	APP sensor	E12	5

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair short to ground or short to power in harness or connectors.

#### 5. CHECK COMPONENTS

#### Check the following.

- Crankshaft position sensor (POS) (Refer to EC-267, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-314, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-458, "Diagnosis Procedure".)

#### Is the inspection result normal?

YES >> GO TO 10.

>> Replace malfunctioning component. NO

#### $oldsymbol{\circ}$ .CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

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APP s	ensor	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E12	1	E16	104	Existed

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

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 7.CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP s	sensor	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E12	6	E16	103	Existed

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

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 8. CHECK APP SENSOR

Refer to EC-406, "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. Perform EC-407, "Special Repair Requirement".

#### >> INSPECTION END

# 10. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

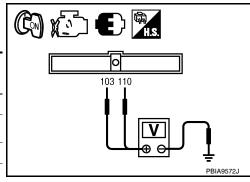
# Component Inspection

INFOID:0000000004780326

# 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- Reconnect all harness connectors disconnected.
- Turn ignition switch ON.
- Check the voltage between ECM harness connector and ground.

ECM		Ground	Ground Condition		Voltage	
Connector	Terminal	Ground	Condition		voltage	
	110			Fully released	0.6 - 0.9 V	
E16	(APP sensor 1 signal) 103	Ground	Accelerator	Fully depressed	3.9 - 4.7 V	
LIO		Ground	pedal	Fully released	0.3 - 0.6 V	
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4 V	



Is the inspection result normal?

# **P2127, P2128 APP SENSOR**

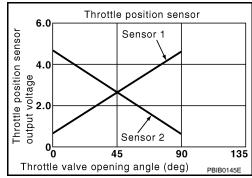
P2127, P2128 APP SENSOR	
< COMPONENT DIAGNOSIS > [HR16DE]	
YES >> INSPECTION END NO >> GO TO 2.	А
2.REPLACE ACCELERATOR PEDAL ASSEMBLY	
<ol> <li>Replace accelerator pedal assembly.</li> <li>Perform <u>EC-407, "Special Repair Requirement"</u>.</li> </ol>	EC
>> INSPECTION END	C
Special Repair Requirement	
1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING	D
Refer to EC-31, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".	
>> GO TO 2.	Е
2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	
Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".	F
>> GO TO 3.  3. PERFORM IDLE AIR VOLUME LEARNING	G
Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".	
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#### P2135 TP SENSOR

Description INFOID:0000000004780448

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

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



**DTC Logic** 

INFOID:0000000004780329

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-358, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135	Throttle position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	Harness or connector     (TP sensor 1 or 2 circuit is open or shorted.)     Electric throttle control actuator     (TP sensor 1 or 2)

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YES >> Go to EC-409, "Diagnosis Procedure".

NO >> INSPECTION END

Wiring Diagram

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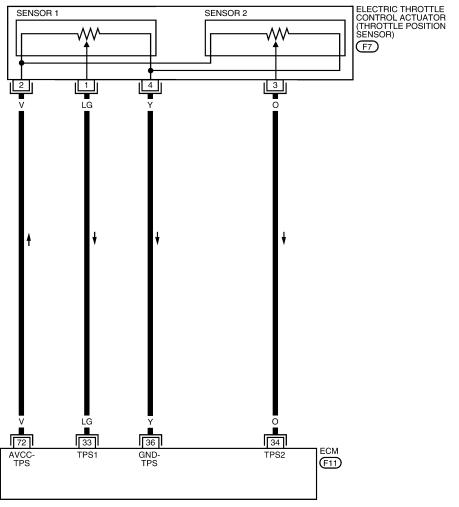
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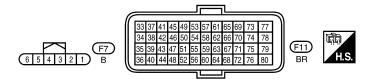
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#### EC-TPS3-01







BBWA2657E

INFOID:0000000004780330

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

Is the inspection result normal?

#### < COMPONENT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

- Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle co	Ground	Voltage	
Connector	Connector Terminal		voltage
F7	2	Ground	Approx. 5 V

# 6 5 4 3 2 1 PBIB3311E

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 3.check throttle position sensor ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between electric throttle control actuator harness connector and ground.

Electric throttle c	EC	М	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F7	4	F11	36	Existed	

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ground.

Electric throttle of	EC	M	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F7	1	F11	33	Existed
1-7	3	1 11	34	LAISIEU

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 5. CHECK THROTTLE POSITION SENSOR

Refer to EC-411, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

#### $\mathsf{6}.\mathsf{REPLACE}$ ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace electric throttle control actuator.
- Perform <u>EC-411</u>, "Special Repair Requirement".

#### >> INSPECTION END

# $\overline{7}$ .check intermittent incident

Refer to EC-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004780449

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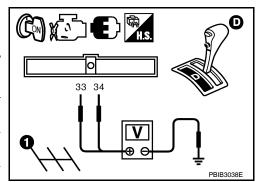
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# 1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform EC-411, "Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set selector lever to D (A/T) or 1st (M/T) position.
- 6. Check the voltage between ECM harness connector and ground.

ECM		Ground Con		ndition	Voltage	
Connector	Terminal	Ground	001	Condition		
	33 (TP sensor			Fully released	More than 0.36V	
F11	1 signal)	Ground	Accelerator	Fully de- pressed	Less than 4.75V	
	34	Oround	pedal	Fully released	Less than 4.75V	
	2 signal)	(TP sensor 2 signal)		Fully de- pressed	More than 0.36V	



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.replace electric throttle control actuator

- 1. Replace electric throttle control actuator.
- 2. Perform EC-411, "Special Repair Requirement".

#### >> INSPECTION END

# Special Repair Requirement

INFOID:0000000004780450

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# 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

EC-411

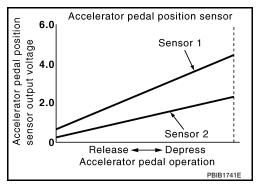
#### P2138 APP SENSOR

Description INFOID:000000004780333

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-358, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal position sensor circuit range/per-formance	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.)     [Crankshaft position sensor (POS) circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     (EVAP control system sensor circuit is shorted.)     Accelerator pedal position sensor (APP sensor 1 or 2)     Crankshaft position sensor (POS)     Refrigerant pressure sensor     EVAP control system pressure sensor

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YES >> Go to EC-413, "Diagnosis Procedure".

NO >> INSPECTION END

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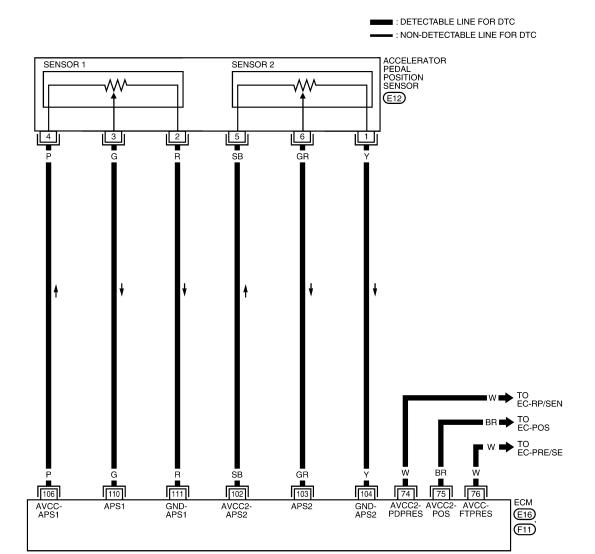
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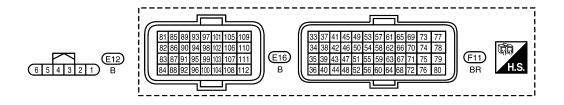
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Wiring Diagram

INFOID:0000000004780704

#### EC-APPS3-01





BBWA3075E

INFOID:0000000004780335

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connections E15, E24. Refer to <u>EC-125, "Ground Inspection"</u>.

Is the inspection result normal?

PBIA9606J

#### < COMPONENT DIAGNOSIS >

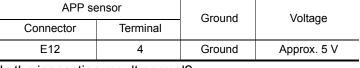
YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

APP se	ensor	Ground	Voltage
Connector Terminal		Oround	voltage
E12	4	Ground	Approx. 5 V



#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

# 3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage
Connector	Connector Terminal		voltage
E12	5	Ground	Approx. 5 V

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

# PBIA9607J

654321

# f 4 .CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

APP se	PP sensor ECM Continuit		ECM	
Connector	Terminal	Connector Terminal		Continuity
E12	4	E16	106	Existed

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

#### 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	
	74	Refrigerant pressure sensor	E17	3	
F11 75 CKP sensor (POS)		CKP sensor (POS)	F15	1	
	76	EVAP control system pressure sensor	B104	3	
E16	102	APP sensor	E12	5	

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

# 6. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-267, "Component Inspection"</u>.)
  EVAP control system pressure sensor (Refer to <u>EC-314, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to EC-458, "Diagnosis Procedure".)

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning component.

# 7.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector as per the following.

APP :	APP sensor		ECM	
Connector	Terminal	Connector Terminal		Continuity
F12	2	E16	111	Existed
1		E10	104	Existed

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

#### Is the inspection result normal?

>> GO TO 8. YES

NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

#### f 8 .CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between APP sensor harness connector and ECM harness connector as per the following.

Continuity	ECM		APP sensor	
Continuity	Terminal	Connector	Terminal	Connector
Existed	110	E16	3	F12
LAISIEU	103	L 10	6	LIZ

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

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

#### 9. CHECK APP SENSOR

Refer to EC-416, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

# 10.REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- 2. Perform EC-416, "Special Repair Requirement".

#### >> INSPECTION END

# 11. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

>> INSPECTION END

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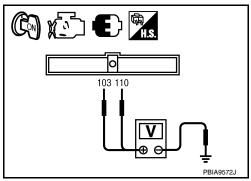
# **Component Inspection**

INFOID:0000000004780336

# 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

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

ECM		Ground		ondition	Voltage	
Connector	Terminal	Ground	Condition		voltage	
	110			Fully released	0.6 - 0.9 V	
E16	(APP sensor 1 signal)	Ground	Accelerator	Fully depressed	3.9 - 4.7 V	
	103		pedal	Fully released	0.3 - 0.6 V	
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4 V	



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Perform EC-416, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004780337

# 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-31, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 2.

# 2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-31, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".

>> GO TO 3.

# 3. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-32, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

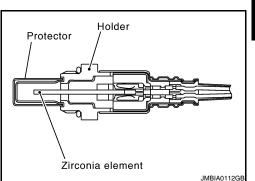
#### P2A00 A/F SENSOR 1

Description INFOID:0000000004780338

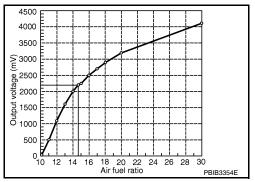
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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



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



**DTC Logic** INFOID:0000000004780339

#### DTC DETECTION LOGIC

To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not to be shifted to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P2A00	Air fuel ratio (A/F) sensor 1 circuit range/performance	<ul> <li>The output voltage computed by ECM from the A/F sensor 1 signal is shifted to the lean side for a specified period.</li> <li>The A/F signal computed by ECM from the A/F sensor 1 signal is shifted to the rich side for a specified period.</li> </ul>	<ul> <li>A/F sensor 1</li> <li>A/F sensor 1 heater</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

#### **TESTING CONDITION:**

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Clear the mixture ratio self-learning value. Refer to EC-33, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- 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 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.

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#### 6. Check 1st trip DTC.

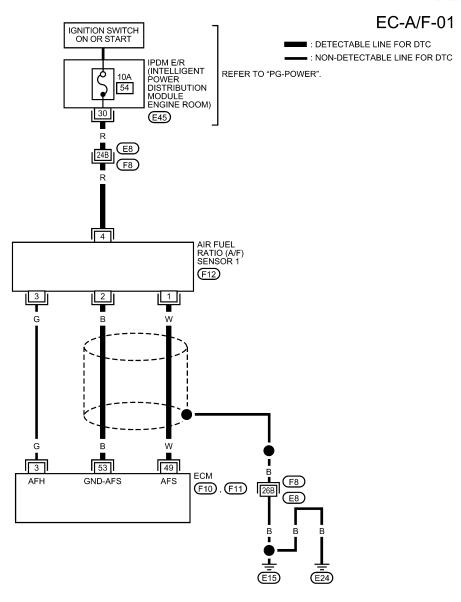
#### Is 1st trip DTC detected?

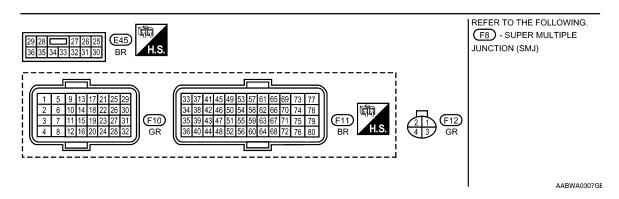
YES >> Go to EC-419, "Diagnosis Procedure".

NO >> INSPECTION END

#### Wiring Diagram

INFOID:0000000004780722





# Diagnosis Procedure

INFOID:0000000004780340

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK HARNESS CONNECTOR

- 1. Disconnect A/F sensor 1 harness connector.
- Check harness connector for water.

#### Water should not exit.

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

# 3. RETIGHTEN A/F SENSOR 1

1. Loosen and retighten the A/F sensor 1. Refer to EM-31, "Exploded View".

>> GO TO 4.

# f 4.CHECK FOR INTAKE AIR LEAK

- 1. Reconnect A/F sensor 1 harness connector.
- 2. Start engine and run it at idle.
- 3. Listen for an intake air leak after the mass air flow sensor.

#### Is intake air leak detected?

YES >> GO TO 5.

NO >> Repair or replace.

# 5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to <u>EC-33, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement"</u>.
- Run engine for at least 10 minutes at idle speed.

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

YES >> Perform trouble diagnosis for DTC P0171or P0172. Refer to <u>EC-229, "DTC Logic"</u> or <u>EC-235, "DTC Logic"</u>.

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.
- Check the voltage between A/F sensor 1 harness connector and ground.

A/F ser	A/F sensor 1		Voltage
Connector	Terminal	Ground	voltage
F12	4	Ground	Battery voltage

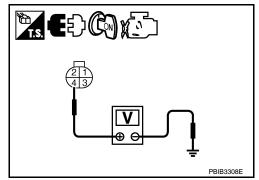
#### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

# 7. DETECT MALFUNCTIONING PART

Check the following.



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#### < COMPONENT DIAGNOSIS >

- · Harness connectors E8. F8
- IPDM E/R harness connector E45
- 10 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and fuse
  - >> Repair or replace harness or connectors.

# $8. \mathsf{CHECK}$ A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

A/F ser	nsor 1 ECM		ECM	
Connector	Terminal	Connector	Terminal	Continuity
F12	1	F11	49	Existed
112	2	1 11	53	LAISIEU

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

A/F ser	nsor 1	Ground	Continuity	
Connector	Terminal	Giodila		
F12	1	Ground	Not existed	
1 12	2	Ground	NOI EXISIEU	

EC	М	Ground	Continuity
Connector	Connector Terminal		Continuity
F11	49	Ground	Not existed
FII	53	Giouria	NOI EXISIEU

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 9. CHECK A/F SENSOR 1 HEATER

Refer to EC-139, "Component Inspection".

#### Is the inspection result normal?

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

# 10. CHECK INTERMITTENT INCIDENT

Perform EC-120, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair or replace.

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

#### Replace air fuel ratio (A/F) sensor 1.

#### CALITION

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

# P2A00 A/F SENSOR 1

PZAUU A/F SENSUR 1	
< COMPONENT DIAGNOSIS > [HR16DE]	
Do you have CONSULT-III?	
YES >> GO TO 12. NO >> GO TO 13.	Α
12.confirm a/f adjustment data	
	EC
With CONSULT-III  1. Turn ignition switch ON.	
<ol><li>Select "A/F ADJ-B1" in "DATA MONITOR" mode with CONSULT-III.</li></ol>	С
<ol> <li>Make sure that "0.000" is displayed on CONSULT-III screen.</li> <li>Is "0.000" displayed?</li> </ol>	
YES >> INSPECTION END	
NO >> GO TO 13.	D
13.clear the mixture ratio self-learning value	
Clear the mixture ratio self-learning value. Refer to EC-33, "MIXTURE RATIO SELF-LEARNING VALUE	E
CLEAR : Special Repair Requirement".  Do you have CONSULT-III?	
YES >> GO TO 14.	F
NO >> INSPECTION END	
14.CONFIRM A/F ADJUSTMENT DATA	
With CONSULT-III	G
<ol> <li>Turn ignition switch ON.</li> <li>Select "A/F ADJ-B1" in "DATA MONITOR" mode with CONSULT-III.</li> </ol>	
3. Make sure that "0.000" is displayed on CONSULT-III screen.	Н
>> INSPECTION END	I
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#### **COOLING FAN**

Description INFOID:000000004780349

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

#### COOLING FAN MOTOR

#### Models without A/C

The cooling fan operates at each speed when the current flows in the cooling fan motor as prt the following.

Cooling fan Speed	Cooling fan motor terminals		
Cooling lan Speed	(+)	(-)	
	1	3 and 4	
Low (LOW)	2	3 and 4	
Low (LOW)	1 and 2	3	
	1 and 2	4	
High (HI)	1 and 2	3 and 4	

#### Models with A/C

The cooling fan operates at high (HI) speed when the current flows, and operates at low (LOW) speed when cooling fan motor and the resistor are circuited in series.

# Component Function Check

INFOID:0000000004780350

# 1. CHECK COOLING FAN FUNCTION

#### With CONSULT-III

- Turn ignition switch ON.
- 2. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Touch "LOW" and "Hi" on the CONSULT-III screen.
- 4. Check that cooling fan operates at each speed.

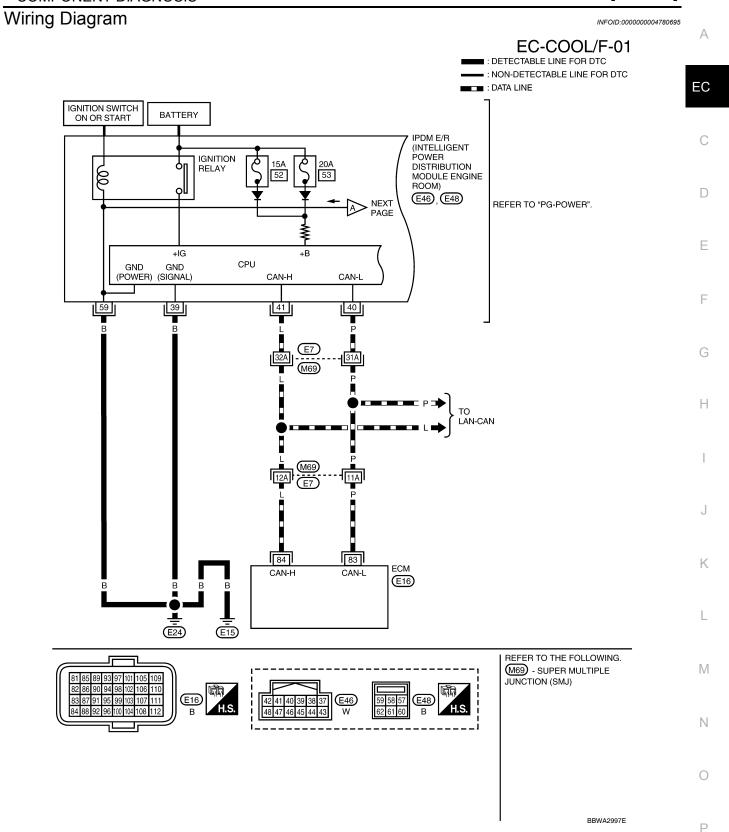
#### Without CONSULT-III

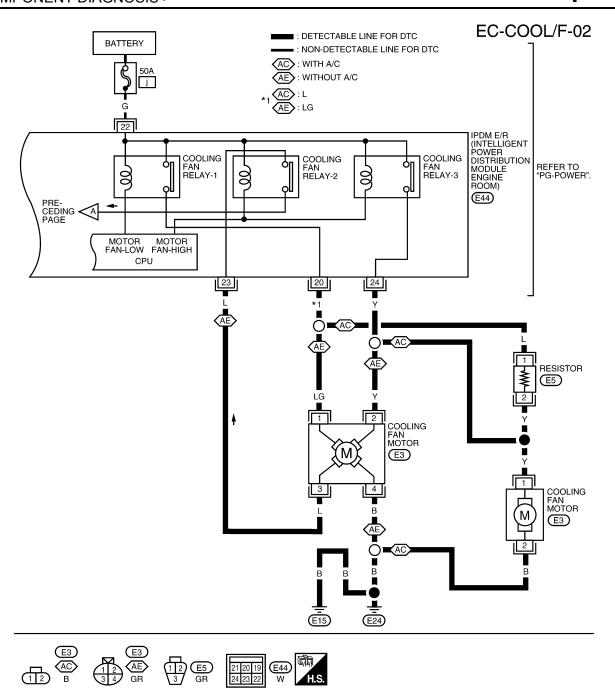
- Perform IPDM E/R auto active test and check cooling fan motor operation. Refer to <u>PG-19</u>, "Auto Active <u>Test"</u>.
- 2. Check that cooling fan operates at each speed.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Refer to EC-424, "Diagnosis Procedure".





# Diagnosis Procedure

1.CHECK IPDM E/R POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect IPDM E/R harness connector E44.

BBWA3001E

INFOID:0000000004780351

#### < COMPONENT DIAGNOSIS >

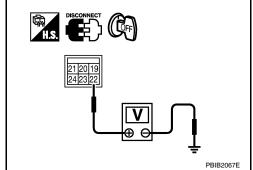
[HR16DE]

Check the voltage between IPDM E/R harness connector and ground.

IPDI	M E/R	Ground Voltage	
Connector	Terminal	Oround	voltage
E44	22	Ground	Battery voltage

#### OK or NG

OK >> GO TO 3. >> GO TO 2. NG



# 2.DETECT MALFUNCTIONING PART

Check the following.

- 50 A fusible link (letter J)
- Harness for open or short between IPDM E/R and battery

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

# ${f 3.}$ CHECK IPDM E/R GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connectors E46 and E48.
- Check the continuity between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Continuity
Connector	Terminal	Olouliu	Continuity
E46	39	Ground	Existed
E48	59	Giodila	LAISIGU

4. Also check harness for short to power.

#### OK or NG

OK (Models with A/C)>>GO TO 4.

OK (Models without Á/C)>>GO TO 6.

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

# 4. CHECK COOLING FAN MOTOR CIRCUIT

- Disconnect cooling fan motor harness connector.
- Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector. 2.

IPDN	Λ E/R	Cooling fan motor				Continuity
Connector	Terminal	Connector Terminal		Continuity		
E44	20	F3 1		F3 1 F	Existed	
L <del>44</del>	24	LJ	'	LAISIEU		

Check the continuity between cooling fan motor harness connector and ground.

Cooling	fan motor	Ground	Continuity	
Connector	Terminal	Ground	Continuity	
E3	2	Ground	Existed	

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

#### OK or NG

OK >> GO TO 8.

NG >> GO TO 5.

#### ${f 5}$ . DETECT MALFUNCTIONING PART

Check the following.

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#### < COMPONENT DIAGNOSIS >

- · Harness for open or short between cooling fan motor and IPDM E/R
- Harness for open or short between cooling fan motor and ground
- Resistor E5

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

# 6. CHECK COOLING FAN MOTOR CIRCUIT

- 1. Disconnect cooling fan motor harness connector.
- 2. Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector.

	IPDN	/I E/R	Cooling fan motor		Cooling fan motor		Continuity
-	Connector	Terminal	Connector Terminal		Continuity		
		20		1			
	E44	23	E3	3	Existed		
		24		2			

3. Check the continuity between cooling fan motor harness connector and ground.

Cooling fa	n motor	Ground	Continuity	
Connector Terminal		Giodila	Continuity	
E3	4	Ground	Existed	

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 for open or short between cooling fan motor and IPDM E/R
- · Harness for open or short between cooling fan motor and ground

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

#### 8.CHECK COOLING FAN MOTOR

Refer to EC-426, "Component Inspection".

#### OK or NG

OK >> GO TO 9.

NG >> Replace cooling fan motor.

#### 9. CHECK INTERMITTENT INCIDENT

Perform EC-120, "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 connector.

#### Component Inspection

INFOID:0000000004780696

#### COOLING FAN MOTOR

Model with A/C

#### **COOLING FAN**

#### < COMPONENT DIAGNOSIS >

[HR16DE]

SEF888V

Cooling fan motor connector

FUSE

- 1. Disconnect cooling fan motor harness connectors.
- 2. Supply cooling fan motor terminals with battery voltage and check operation.

	(+) (-)			
Cooling fan motor	1	2		

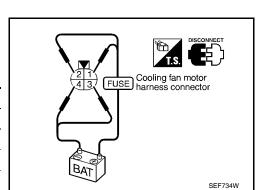
#### Cooling fan motor should operate.

If NG, replace cooling fan motor.

#### Models without A/C

- 1. Disconnect cooling fan motor harness connectors.
- 2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	terminals		
	Speed	(+)	(–)	
Cooling fan motor	Low	1	4	
	LOW	2	3	
	High	1 and 2	3 and 4	



#### Cooling fan motor should operate.

If NG, replace cooling fan motor.

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#### **ELECTRICAL LOAD SIGNAL**

Description INFOID:000000004780354

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication line.

#### Component Function Check

INFOID:0000000004780355

# 1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

- 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
	rteal willdow delogger switch	OFF	OFF

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-428, "Diagnosis Procedure".

# 2. CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

Monitor item	Co	Indication	
LOAD SIGNAL	Lighting switch	ON at 2nd position	ON
	Lighting switch	OFF	OFF

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to EC-428, "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
	ricater lair control switch	OFF	OFF

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-428, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004780356

# 1. INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>EC-428, "Component Function Check"</u>.

#### 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

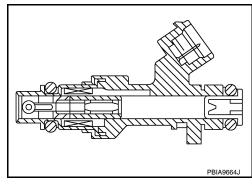
Refer to GW-55, "Work Flow".

ELECTRICAL LOAD SIGNAL	
< COMPONENT DIAGNOSIS > [HR16DE]	
>> INSPECTION END	_
3.CHECK HEADLAMP SYSTEM	Α
Refer to LT-11, "How to Perform Trouble Diagnosis" (For USA) or LT-33, "How to Perform Trouble Diagnosis"	<del>-</del>
(For Canada).	EC
>> INSPECTION END	
4. CHECK HEATER FAN CONTROL SYSTEM	С
Refer to MTC-22, "How to Perform Trouble Diagnosis for Quick and Accurate Repair".	-
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>> INSPECTION END	D
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#### **FUEL INJECTOR**

Description INFOID:000000004780357

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:0000000004780358

# 1. INSPECTION START

Turn ignition switch to START.

#### Is any cylinder ignited?

YES >> GO TO 2.

NO >> Go to EC-431, "Diagnosis Procedure".

# 2. CHECK FUEL INJECTOR FUNCTION

#### With CONSULT-III

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

#### Without CONSULT-III

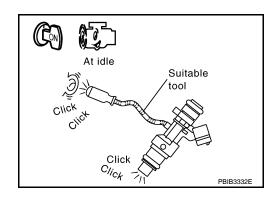
- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

#### Clicking noise should be heard.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-431, "Diagnosis Procedure".



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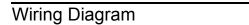
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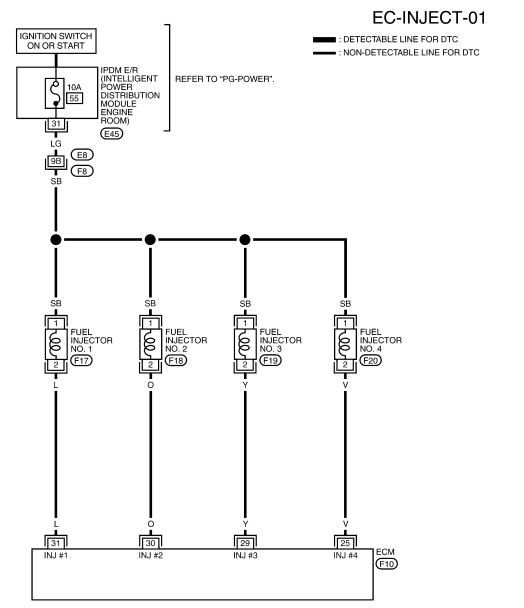
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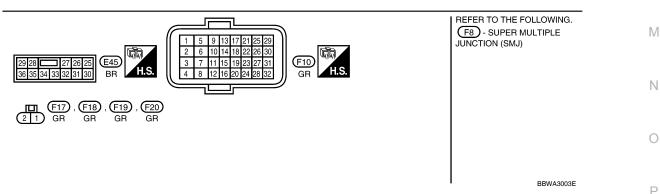
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INFOID:0000000004780359



INFOID:0000000004780705





# Diagnosis Procedure

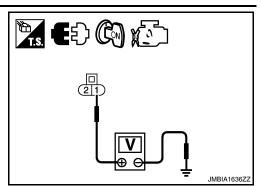
1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector.
- 3. Turn ignition switch ON.

#### < COMPONENT DIAGNOSIS >

Check the voltage between fuel injector harness connector and ground.

Fuel injector			Ground	Voltage
Cylinder	Connector	Terminal	Giodila	voltage
1	F17	1		
2	F18	1	Ground	Potton voltage
3	F19	1		Battery voltage
4	F20	1		



#### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

# 2.DETECT MALFUNCTIONING PART

#### Check the following.

- IPDM E/R harness connector E45
- 10 A fuse (No. 55)
- · 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.

# ${f 3.}$ 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		EC	Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F17	2		31	
2	F18	2	F10	30	Existed
3	F19	2		29	Existed
4	F20	2		25	

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

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 4. CHECK FUEL INJECTOR

Refer to EC-432, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning fuel injector.

#### 5. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# Component Inspection

INFOID:0000000004780360

# 1. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.

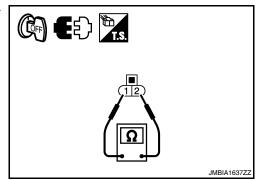
- 2. Disconnect fuel injector harness connector.
- 3. Check resistance between fuel injector terminals as per the following.

Terminals	Resistance
1 and 2	11.1 - 14.5 Ω [at 10 - 60°C (50 - 140°F)]

## Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning fuel injector.



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## **FUEL PUMP**

Description INFOID:000000004780361

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

<sup>\*:</sup> 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 Function Check

INFOID:0000000004780362

# 1. CHECK FUEL PUMP FUNCTION

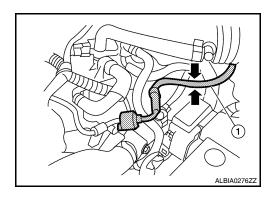
- 1. Turn ignition switch ON.
- 2. Pinch fuel feed hose (1) with two fingers.

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-435, "Diagnosis Procedure".



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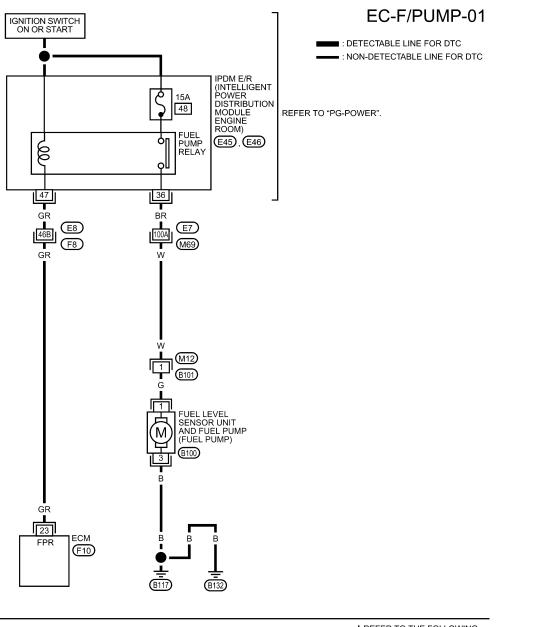
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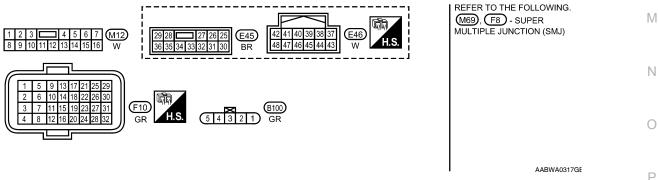
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# Diagnosis Procedure

gnosis procedure

# 1. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.

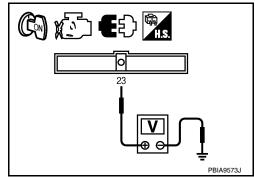
## < COMPONENT DIAGNOSIS >

Check the voltage between ECM harness connector and ground.

EC	M	Ground	Voltage	
Connector	Connector Terminal		voitage	
F10	23	Ground	Battery voltage	

## Is the inspection result normal?

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



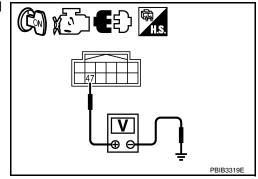
# 2. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect IDPDM E/R harness connector E46.
- Turn ignition switch ON.
- 4. Check the voltage between IPDM E/R harness connector and around.

IPDM E/R		Ground	Voltage
Connector	Terminal	Giouna	voltage
E46	47	Ground	Battery voltage

#### Is the inspection result normal?

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



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness or connectors E8, F8.
- 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 FUEL PUMP POWER SUPPLY CIRCUIT-III

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- Turn ignition switch ON.
- 5. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage	
Connector	Terminal			
B100	1	Ground	Battery voltage should exist 1 second after ignition switch is turn ON.	

#### Is the inspection result normal?

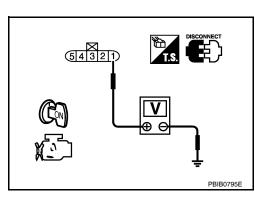
YES >> GO TO 8. NO >> GO TO 5.

# 5.CHECK FUSE

- Turn ignition switch OFF.
- Disconnect 15 A fuse (No. 48) from IPDM E/R.
- Check 15 A fuse.

#### Is the inspection result normal?

>> GO TO 6. YES



#### **FUEL PUMP** [HR16DE] < COMPONENT DIAGNOSIS > NO >> Replace15 A fuse. Α $oldsymbol{6}$ .CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV Disconnect IPDM E/R harness connector E45. Check the continuity between IPDM E/R harness connector and "fuel level sensor unit and fuel pump" EC harness connector. Fuel level sensor unit and IPDM F/R fuel pump Continuity Connector Terminal Connector Terminal E45 36 B100 Existed 3. Also check harness for short to ground and short to power. Is the inspection result normal? Е YES >> GO TO 10. NO >> GO TO 7. 7.DETECT MALFUNCTIONING PART Check the following. Harness connectors E7, M69 Harness connectors M12, B101 Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump" >> Repair open circuit or short to power in harness or connectors. Н 8.CHECK FUEL PUMP GROUND CIRCUIT Check the continuity between "fuel level sensor unit and fuel pump" and ground. Fuel level sensor unit and fuel pump Ground Continuity Connector Terminal B100 3 Ground Existed 2. Also heck harness for short to power. Is the inspection result normal? YES >> GO TO 9. NO >> Repair open circuit or short to power in harness or connectors. 9.CHECK FUEL PUMP Refer to EC-437, "Component Inspection". Is the inspection result normal? YES >> GO TO 10. NO >> Replace "fuel level sensor unit and fuel pump". Ν 10. CHECK INTERMITTENT INCIDENT Refer to EC-120, "Diagnosis Procedure". Is the inspection result normal? YES >> Replace IPDM E/R. >> Repair or replace harness or connectors. NO Р

## Component Inspection

# 1. CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- Disconnect "fuel level sensor unit and fuel pump" harness connector.

INFOID:0000000004780364

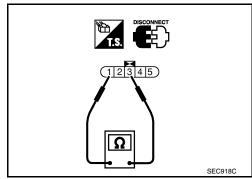
3. Check resistance between "fuel level sensor unit and fuel pump" terminals as per the following.

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".



INFOID:0000000004780367

## **IGNITION SIGNAL**

Description INFOID:0000000004780366

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.

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# **Component Function Check**

# 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 <u>EC-441, "Diagnosis Procedure"</u>.

# 2. IGNITION SIGNAL FUNCTION

#### With CONSULT-III

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

## Is the inspection result normal?

YES >> INSPECTION END

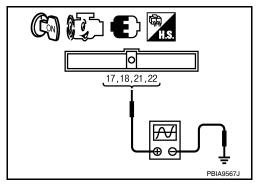
NO >> Go to EC-441, "Diagnosis Procedure".

# 3. IGNITION SIGNAL FUNCTION

## Without CONSULT-III

- 1. Let engine idle.
- Read the voltage signal between ECM harness connector and ground.

ECM		Ground	Voltage signal	
Connector	Terminal	Ground	voltage signal	
	17			
F10 -	18	Ground		
	21			
	22		>> 2.0 V/Div 50 ns/Div T	
			PBIA9265J	



NOTE:

The pulse cycle changes depending on rpm at idle.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-441, "Diagnosis Procedure".

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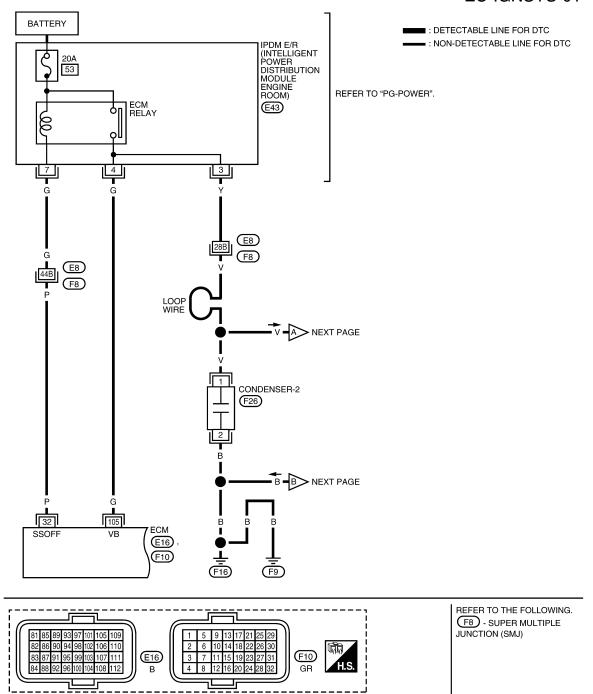
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Wiring Diagram

INFOID:0000000004780707

## EC-IGNSYS-01

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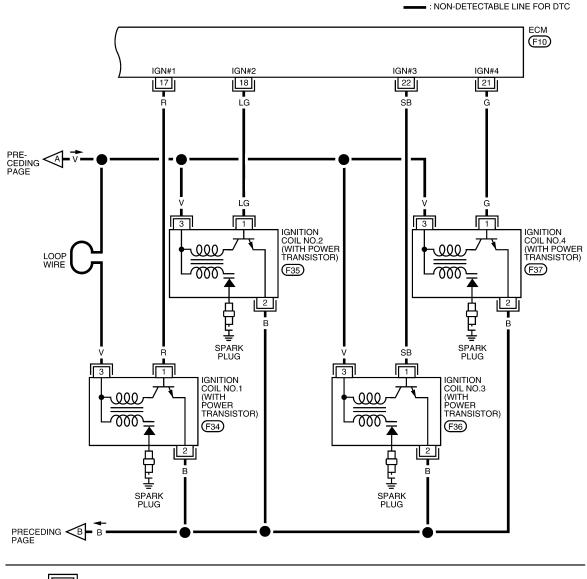
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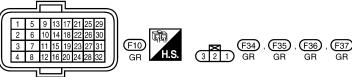
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## EC-IGNSYS-02

■ : DETECTABLE LINE FOR DTC





BBWA2659E

INFOID:0000000004780368

# Diagnosis Procedure

# 1. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

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

#### < COMPONENT DIAGNOSIS >

Check the voltage between ECM harness connector and ground.

EC	M	Ground	Voltage
Connector Terminal		Giodila	voltage
E16	105	Ground	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-121, "Diagnosis Procedure".

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# 2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

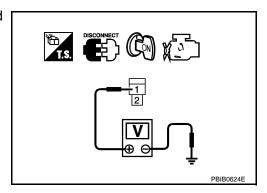
- 1. Turn ignition switch OFF.
- 2. Disconnect condenser-2 harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between condenser-2 harness connector and ground.

Condenser-2		Ground	Voltage
Connector Terminal			
F26	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 E43.
- 3. Check the continuity between IPDM E/R harness connector and condenser-2 harness connector.

IPDM	IPDM E/R		Condenser-2	
Connector	Terminal	Connector Terminal		Continuity
E43	3	F26	1	Existed

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

#### Is the inspection result normal?

YES >> Go to EC-121, "Diagnosis Procedure".

NO >> GO TO 4.

## 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E8, F8
- IPDM E/R harness connector E43
- · Harness for open or short between IPDM E/R and condenser-2

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

# $5. \mathsf{CHECK}$ CONDENSER-2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Check the continuity between condenser-2 harness connector and ground.

Conder	iser-2	Ground	Continuity
Connector	Connector Terminal		Continuity
F26	2	Ground	Existed

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3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 6.CHECK CONDENSER

Refer to EC-445, "Component Inspection (Condenser-2)".

#### Is the inspection result normal?

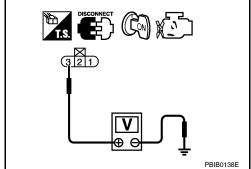
YES >> GO TO 7.

NO >> Replace condenser.

# 7.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

- 1. Reconnect all harness connectors disconnected.
- 2. Disconnect ignition coil harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ignition coil harness connector and ground.

	Ignition coil		Ground	Voltage
Cylinder	Connector	Terminal	Glound	voltage
1	F34	3		Battery voltage
2	F35	3	Ground	
3	F36	3		
4	F37	3		



#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 8.CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between ignition coil harness connector and ground.

	Ignition coil		Ground	Continuity
Cylinder	Connector	Terminal	Ground	Continuity
1	F34	2	Ground	Existed
2	F35	2		
3	F36	2		
4	F37	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 ground or short to power in harness or connectors.

# 9.CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check the continuity between ECM harness connector and ignition coil harness connector.

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**EC-443** 

## **IGNITION SIGNAL**

Ignition coil		ECM		Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F34	1		17	
2	F35	1	F14	18	Existed
3	F36	1		22	LAISIEU
4	F37	1		21	

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

## Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

# 10. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-444, "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-120, "Diagnosis Procedure".

#### >> INSPECTION END

# Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000004780369

# 1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

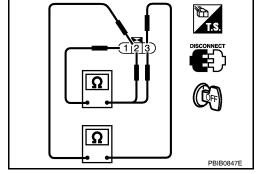
- Turn ignition switch OFF.
- 2. Disconnect ignition coil harness connector.
- 3. Check resistance between ignition coil terminals as per the following.

Terminals	Resistance [Ω at 25°C (77°F)]	
1 and 2	Except 0 or ∞	
1 and 3	Except 0	
2 and 3	Except 0	

# Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor.



# 2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

#### **CAUTION:**

#### Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Remove fuel pump fuse in IPDM E/R to release fuel pressure.

#### NOTE:

Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- 4. Start engine.
- 5. After engine stalls, crank it two or three times to release all fuel pressure.
- 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.

#### < COMPONENT DIAGNOSIS >

- 10. Connect spark plug and harness connector to ignition coil.
- 11. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

## Spark should be generated.

#### **CAUTION:**

- During the operation, always stay 0.5 cm (19.7 in) away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

## Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning ignition coil with power transistor.

# Component Inspection (Condenser-2)

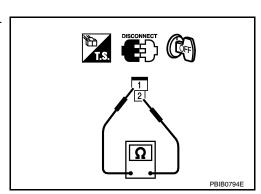
# 1. CHECK CONDENSER-2

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

Terminals	Resistance
1 and 2	Above 1 M $\Omega$ [at 25°C (77°F)]

#### Is the inspection result normal?

YES >> INSPECTION END NO >> Replace condenser-2.



13 - 17 mm
(0.52-0.66 in)
Grounded metal portion
(Cylinder head, cylinder block, etc.)

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# MALFUNCTION INDICATOR LAMP

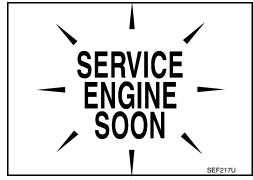
Description INFOID:000000004780371

The Malfunction Indicator Lamp (MIL) is located on the combination meter.

The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

When the engine is started, the MIL should go off. If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.

For details, refer to EC-90, "Diagnosis Description".



# Component Function Check

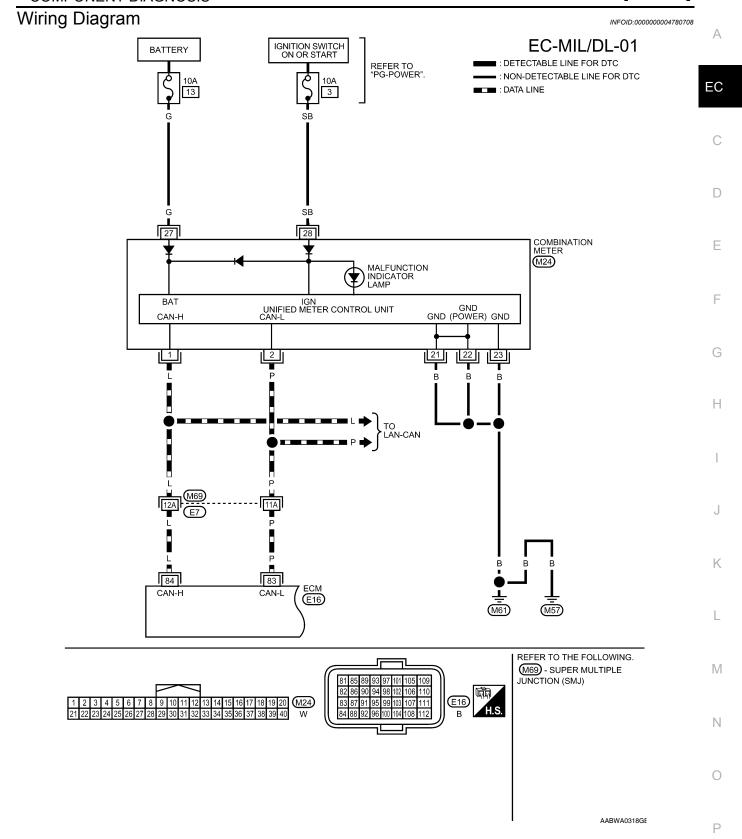
# 1. CHECK MIL FUNCTION

- 1. Turn ignition switch ON.
- 2. Make sure that MIL lights up.

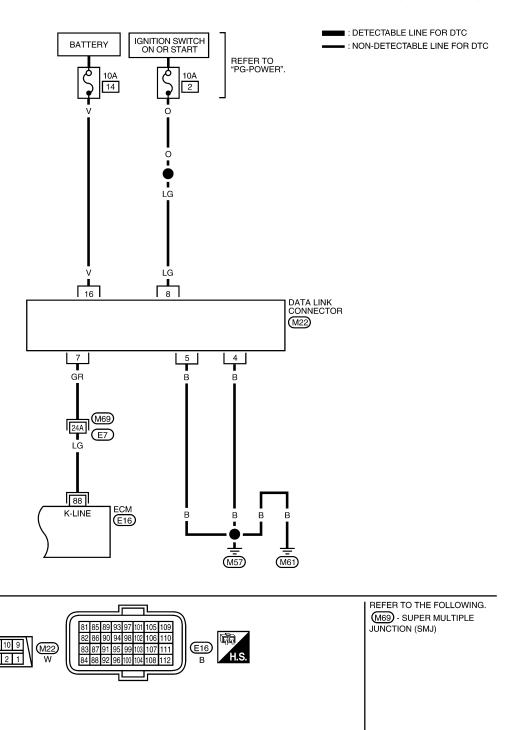
## Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-448, "Diagnosis Procedure".



## EC-MIL/DL-02



# Diagnosis Procedure

INFOID:0000000004780373

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# 1. CHECK DTC

Check that DTC UXXXX is not displayed.

## Is the inspection result normal?

YES >> GO TO 2.

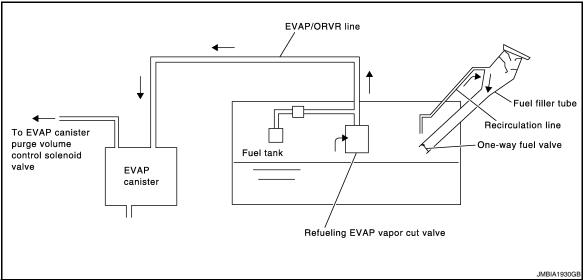
NO >> Perform trouble diagnosis for DTC UXXXX.

# **MALFUNCTION INDICATOR LAMP**

MALFUNCTION INDICATOR LAMP	
< COMPONENT DIAGNOSIS >	[HR16DE]
2.CHECK DTC WITH METER	A
Refer to <u>DI-12, "CONSULT-III Function (METER/M&amp;A)"</u> . <u>Is the inspection result normal?</u>	
YES >> GO TO 3.	EC
NO >> Repair or replace.	
3.CHECK INTERMITTENT INCIDENT	С
Refer to <u>EC-120, "Diagnosis Procedure"</u> . <u>Is the inspection result normal?</u>	O .
YES >> Replace combination meter.	D
NO >> Repair or replace.	D
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# ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Description INFOID:000000004780374



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.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to furnish the workshop with a CO2 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 FL-4, "Checking Fuel Line".
- Disconnect battery ground cable.
- · Always replace O-ring when the fuel gauge retainer is removed.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose and clamps excessively to avoid damaging hoses.
- · After installation, run engine and check for fuel leaks at connection.
- Do not 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:0000000004780375

# 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.

#### Is any symptom present?

YES >> Go to EC-450, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004780376

# 1.INSPECTION START

Check whether the following symptoms are present.

A: Fuel odor from EVAP canister is strong.

# < COMPONENT DIAGNOSIS >

B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Which symptom is present?

>> GO TO 2. Α

>> GO TO 8. В

# 2.CHECK EVAP CANISTER

- 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 1.9 kg (4.2 lb).

#### Is the inspection result normal?

>> GO TO 3. YES

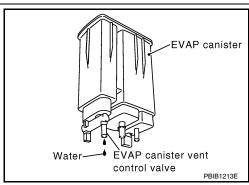
NO >> GO TO 4.

# 3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister.

#### Does water drain from the EVAP canister?

YES >> GO TO 4. NO >> GO TO 7.



# 4. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 5.

# 5.CHECK DRAIN FILTER

Refer to EC-455, "Component Inspection (Drain filter)".

#### Is the inspection result normal?

OK >> GO TO 6.

NO >> Replace drain filter.

## 6.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

## .CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-453, "Component Inspection (Refueling EVAP vapor cut valve)".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

## 8.CHECK EVAP CANISTER

- 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor

The weight should be less than 1.9 kg (4.2 lb).

Is the inspection result normal?

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## < COMPONENT DIAGNOSIS >

[HR16DE]

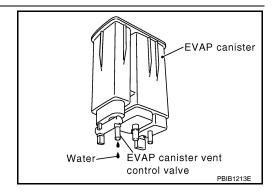
YES >> GO TO 9. NO >> GO TO 10.

## 9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

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



# 10. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 11.

# 11. CHECK DRAIN FILTER

Refer to EC-455, "Component Inspection (Drain filter)".

Is the inspection result normal?

OK >> GO TO 12.

NO >> Replace drain filter.

# 12. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

# 13. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kink, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 14.

NO >> Repair or replace hoses and tubes.

# 14. CHECK RECIRCULATION LINE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube.

# 15. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-453, "Component Inspection (Refueling EVAP vapor cut valve)".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

# 16. CHECK FUEL FILLER TUBE

Check fuel filler tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace fuel filler tube.

< COMPONENT DIAGNOSIS >

[HR16DE]

# 17. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

#### Is the inspection result normal?

YES >> GO TO 18.

NO >> Repair or replace one-way fuel valve with fuel tank.

# 18.check one-way fuel valve-ii

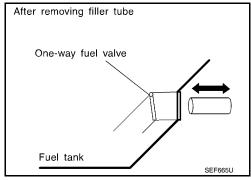
- Make sure that fuel is drained from the tank.
- Remove fuel filler tube and hose.
- 3. Check one-way fuel valve for operation as per the following. When a stick is inserted, the valve should open, when removing stick it should close.

## 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 (Refueling EVAP vapor cut valve)

INFOID:0000000004780377

# 1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.CHECK REFUELING EVAP VAPOR CUT VALVE

#### With CONSULT-III

- 1. Remove fuel tank. Refer to FL-9, "Removal and Installation".
- 2. 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.
- 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.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

#### Always replace O-ring with new one.

- Put fuel tank upside down.
- Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm<sup>3</sup>, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.

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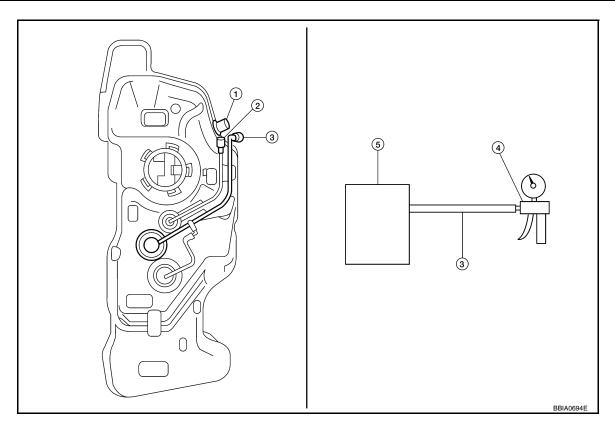
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1. Filler tube

- 2. Recirculation line
- 5. Fuel tank

3. EVAP/ORVR line

#### Is the inspection result normal?

Vacuum/pressure handy pump

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

3.CHECK REFUELING EVAP VAPOR CUT VALVE

#### Without CONSULT-III

- 1. Remove fuel tank. Refer to FL-9, "Removal and Installation".
- 2. 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.
- 3. Check refueling EVAP vapor cut valve for being stuck to close as per the following.

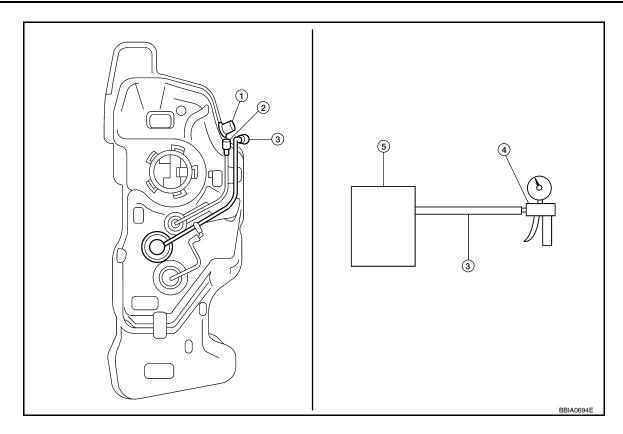
  Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- 4. Check refueling ÉVAP vapor cut valve for being stuck to open as per the following.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

#### Always replace O-ring with new one.

- Put fuel tank upside down.
- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm<sup>3</sup>, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.

< COMPONENT DIAGNOSIS >

[HR16DE]



- Filler tube
- 4. Vacuum/pressure handy pump
- 2. Recirculation line
- 5. Fuel tank

3. EVAP/ORVR line

# Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

# Component Inspection (Drain filter)

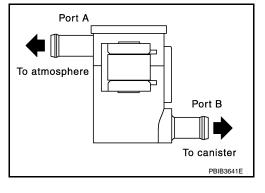
# 1. CHECK DRAIN FILTER

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- Block port B.
- Blow air into port A and check that there is no leakage.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace drain filter.



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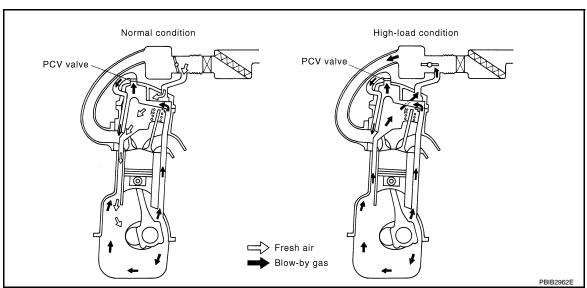
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## POSITIVE CRANKCASE VENTILATION

Description INFOID:000000004780378



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.

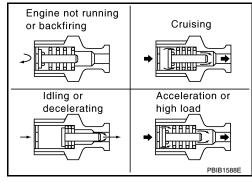
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

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.



INFOID:0000000004780379

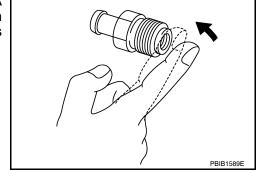
# **Component Inspection**

# 1. CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

#### Is the inspection result normal?

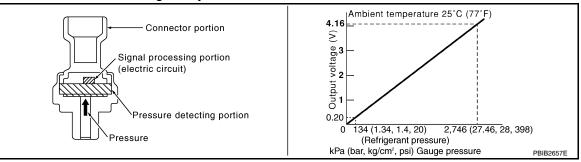
YES >> INSPECTION END NO >> Replace PCV valve.



## REFRIGERANT PRESSURE SENSOR

Description INFOID:000000004780380

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

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

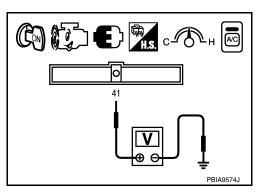
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal	Ground	voilage
F11	41 (Refrigerant pressure sensor signal)	Ground	1.0 - 4.0V

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-458, "Diagnosis Procedure".



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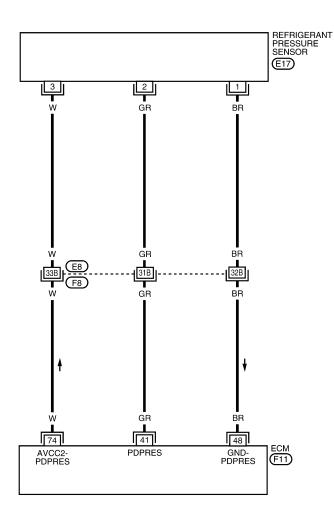
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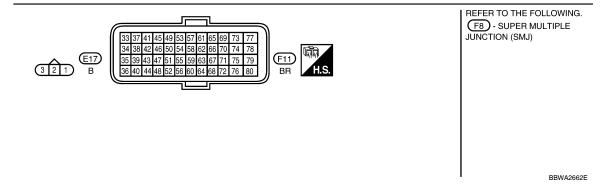
Wiring Diagram INFOID:0000000004780709

## EC-RP/SEN-01

[HR16DE]

: DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC





# Diagnosis Procedure

< COMPONENT DIAGNOSIS >

INFOID:0000000004780382

# 1. CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF.
- 2. Stop engine.
- Turn ignition switch OFF.

#### REFRIGERANT PRESSURE SENSOR

## < COMPONENT DIAGNOSIS >

[HR16DE]

Check ground connections E15, E24. Refer to EC-125, "Ground Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

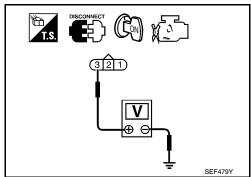
- Disconnect refrigerant pressure sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pre	ssure sensor	Ground	Voltage
Connector	Connector Terminal		voitage
E17	3	Ground	Approx. 5 V

#### Is the inspection result normal?

>> GO TO 4. YES

NO >> GO TO 3.



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors F8, E8
- · 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.

# f 4.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between refrigerant pressure sensor harness connector and ECM harness connec-

Refrigerant pre	ssure sensor	EC	М	Continuity
Connector	Terminal	Connector Terminal		Continuity
E17	1	F11	48	Existed

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

#### Is the inspection result normal?

>> GO TO 6. YES

NO >> GO TO 5.

# DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F8, E8
- 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.

# $oldsymbol{6}$ .CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between ECM harness connector and refrigerant pressure sensor harness connector.

Refrigerant pre	ssure sensor	ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E17	2	F11	41	Existed

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

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## REFRIGERANT PRESSURE SENSOR

## < COMPONENT DIAGNOSIS >

[HR16DE]

## Is the inspection result normal?

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

# 7.DETECT MALFUNCTIONING PART

## Check the following.

- Harness connectors F8, E8
- · Harness for open or short between ECM and refrigerant pressure sensor
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 8. CHECK INTERMITTENT INCIDENT

Refer to EC-120, "Diagnosis Procedure".

## Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.

NO >> Repair or replace.

[HR16DE] < ECU DIAGNOSIS >

# **ECU DIAGNOSIS**

# **ECM**

Reference Value INFOID:0000000004780383

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#### VALUES ON THE DIAGNOSIS TOOL

#### Remarks:

- · Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- \*Specification data may not be directly related to their components signals/values/operations.

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

Monitor Item	C	ondition	Values/Status
ENG SPEED	Run engine and compare CONSU	Almost the same speed as the tachometer indication.	
MAS A/F SE-B1	See EC-113, "Diagnosis Procedure"		
B/FUEL SCHDL	See EC-113, "Diagnosis Procedure"		
A/F ALPHA-B1	See EC-113, "Diagnosis Procedure"		
COOLAN TEMP/S	Engine: After warming up		More than 70°C (158F)
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
HO2S2 (B1)	are met.	00 rpm quickly after the following conditions	0 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1)	Engine: After warming up     After keeping engine speed between idle for 1 minute under no load	en 3,500 and 4,000 rpm for 1 minute and at	LEAN ←→ RICH
VHCL SPEED SE	Turn drive wheels and compare C dication.	ONSULT-III value with the speedometer in-	Almost the same speed as speedometer indication
BATTERY VOLT	Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	Ignition switch: ON     (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9 V
ACCEL SEN 1		Accelerator pedal: Fully depressed	4.0 - 4.8 V
ACCEL SEN 2 • Ignition switch: ON	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9 V
ACCLL SLIV 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8 V
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
TP SEN 1-B1	<ul><li>(Engine stopped)</li><li>Selector lever position: D (A/T) or 1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
TP SEN 2-B1	<ul><li>(Engine stopped)</li><li>Selector lever position: D (A/T) or 1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V
START SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow C$	ON	$OFF \to ON \to OFF$
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Fully released	ON
CLOD THE PUO	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF
	Engine: After warming up, idle the	Air conditioner switch: OFF	OFF
AIR COND SIG	engine	Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	Ignition switch: ON	Selector lever position: P or N (A/T) or Neutral (M/T)	ON
		Selector lever position: Except above	OFF

Monitor Item	C	ondition	Values/Status
PW/ST SIGNAL	Engine: After warming up, idle the	Steering wheel: Not being turned	OFF
FW/31 SIGNAL	engine	Steering wheel: Being turned	ON
LOAD SIGNAL	legition switch. ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$		$ON \rightarrow OFF \rightarrow ON$
HEATER FAN SW	Engine: After warming up, idle the	Heater fan switch: ON	ON
HEATER FAIN SW	engine	Heater fan switch: OFF	OFF
BRAKE SW	Ignition switch: ON	Brake pedal: Fully released	OFF
DIVARL SW	ignition switch. On	Brake pedal: Slightly depressed	ON
	Engine: After warming up	Idle	2.0 - 3.0 msec
INJ PULSE-B1	<ul> <li>Selector lever position: P or N (A/T) or Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	1.9 - 2.9 msec
	Engine: After warming up	Idle	10 - 20°BTDC
IGN TIMING	<ul> <li>Selector lever position: P or N (A/T) or Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	25 - 45°BTDC
	Engine: After warming up	Idle	10 - 35%
CAL/LD VALUE	<ul> <li>Selector lever position: P or N (A/T) or Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,500 rpm	10 - 35%
MASS AIRFLOW	Engine: After warming up     Selector lever position: P or N (A/	Idle	1.0 - 4.0 g·m/s
	<ul><li>T) or Neutral (M/T)</li><li>Air conditioner switch: OFF</li><li>No load</li></ul>	2,500 rpm	2.0 - 10.0 g·m/s
	Engine: After warming up	Idle	0%
PURG VOL C/V	<ul> <li>Selector lever position: P or N (A/T) or Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	0 - 50%
	Engine: After warming up	Idle	−5 - 5°CA
INT/V TIM (B1)	<ul> <li>Selector lever position: P or N (A/T) or Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	Approx. 0 - 40°CA
	Engine: After warming up	Idle	0 - 2%
INT/V SOL (B1)	<ul> <li>Selector lever position: P or N (A/T) or Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	Approx. 0 - 90%
		Air conditioner switch: OFF	OFF
AIR COND RLY	Engine: After warming up, idle the engine	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
THRTL RELAY	Ignition switch: ON		ON

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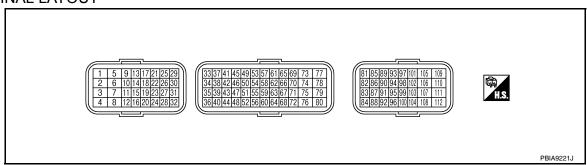
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Monitor Item	Condition		Values/Status
COOLING FAN	<ul> <li>Engine: After warning up, idle the engine</li> <li>Air conditioner switch: OFF</li> </ul>	Engine coolant temperature is 98°C (208°F) or less	OFF
		Engine coolant temperature is between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH
HO2S2 HTR (B1)	<ul> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>		ON
VEHICLE SPEED	Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
IDL A/V LEARN	Engine: running	Idle air volume learning has not been performed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	Ignition switch: ON	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 miles)
A/F S1 HTR (B1)	Engine: After warming up, idle the engine		40 - 100%
AC PRESS SEN	Engine: Idle     Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0 V

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

## TERMINAL LAYOUT



## PHYSICAL VALUES

#### NOTE:

- ECM is located in the engine room left side near battery.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT-III.

#### **CAUTION:**

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

**EC-463** 

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	L	Throttle control motor (Open)	[Ignition switch: ON]  • Engine stopped  • Selector lever position: D (A/T), 1st (M/T)  • Accelerator pedal: Fully depressed	Approximately 3.2 V  → 5V/Div 1ms/Div T  PBIA8150J
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8 V  ⇒ 10.0V/Div 50ms/Div T  PBIA8148J
4	Р	Throttle control motor (Close)	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever position: D (A/T), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	0 - 14 V
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10 V
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	BATTERY VOLTAGE (11 - 14 V)

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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	Α
9 P		EVAP canister purge volume	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Accelerator pedal: Not depressed even slightly, after engine starting.</li> </ul>	BATTERY VOLTAGE  (11 - 14 V)  >> 10.0V/Div 50 ms/Div  PBIB0050E	EC C
	control solenoid valve	<ul> <li>[Engine is running]</li> <li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li> </ul>	BATTERY VOLTAGE  (11 - 14 V)  ⇒ 10.0 V/Div 50 ms/Div T  PBIB0520E	E	
10 11	B B	ECM ground	[Engine is running] • Idle speed	Body ground	G
15	Y	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V) 0 - 1.0 V	Н
17 R 18 LG 21 G 22 SB	Ignition signal No. 1	[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle.	0 - 0.3 V	J	
	G	G Ignition signal No. 4	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm.</li></ul>	0.2 - 0.5 V	K L M
23	GR	GR Fuel pump relay	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running] [Ignition switch: ON]	0 - 1.0 V	N
			More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14 V)	0

TERMI- NAL	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25 V	V	Fuel injector No. 4 Fuel injector No. 3 Fuel injector No. 2 Fuel injector No. 1	[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle.	BATTERY VOLTAGE  (11 - 14 V)  >> 10.0 V/Div 50 ms/Div T  PBIB0529E
30 31	30 O 31 L		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	BATTERY VOLTAGE  (11 - 14 V)  Market 10.0 V/Div 50 ms/Div T  PBIA4943J
28	W	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
32 P	Р	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0 V
			<ul><li>[Ignition switch: OFF]</li><li>More than a few seconds after turning ignition switch OFF</li></ul>	BATTERY VOLTAGE (11 - 14 V)
33 LG	1.G	.G Throttle position sensor 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever position: D (A/T), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36 V
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever position: D (A/T), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75 V
34 O	0	O Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever position: D (A/T), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	Less than 4.75 V
	0		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever position: D (A/T), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36 V
36	Y	Sensor ground (Throttle position sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0 V
37	W	Knock sensor	[Engine is running] • Idle speed	Approximately 2.5 V
38	Р	Engine coolant temperature sensor	[Engine is running]	Approximately 0 - 4.8 V Output voltage varies with engine coolant temperature.
40	_	Sensor ground (Knock sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V

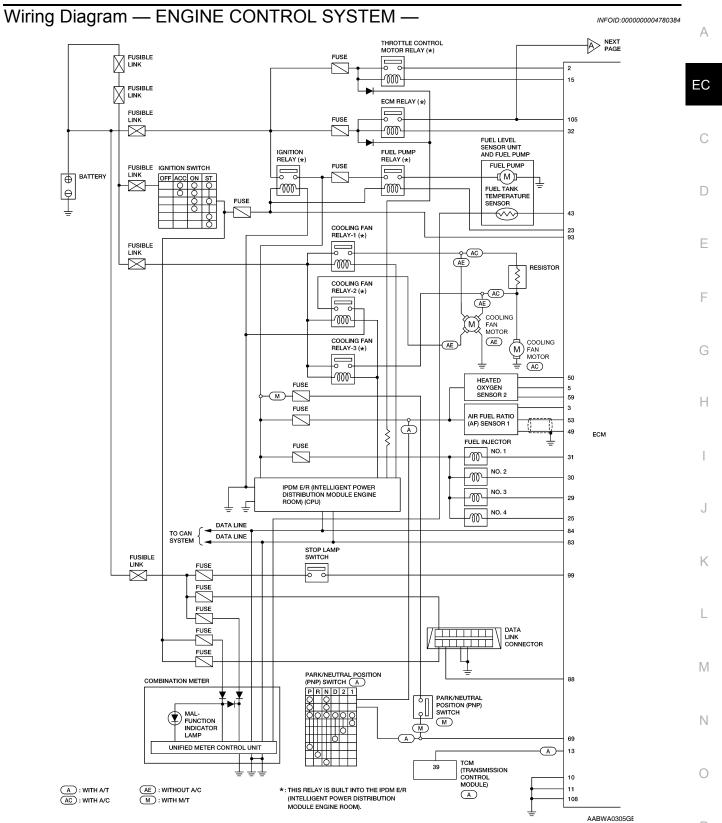
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	GR	Refrigerant pressure sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan switch: ON (Compressor operates.)</li> </ul>	1.0 - 4.0 V
42	V	EVAP control system pressure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8 V
43	Р	Fuel tank temperature sensor	[Engine is running]	Approximately 0 - 4.8 V Output voltage varies with fuel tank temperature
44	В	Sensor ground (Engine coolant temperature sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0 V
45 G	Mass air flow sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0.9 - 1.3 V	
		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.9 V	
46	V	Intake air temperature sensor	[Engine is running]	Approximately 0 - 4.8 V Output voltage varies with intake air temperature.
48	BR	Sensor ground (Refrigerant pressure sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V
49	W	A/F sensor 1	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	Approximately 1.8 V Output voltage varies with air fuel ratio.
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - 1.0 V
51	0	Sensor ground (EVAP control system pressure sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V
52	LG	Sensor ground (Mass air flow sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2 V
55	0	Sensor ground (Intake air temperature sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V
59	0	Sensor ground (Heated oxygen sensor 2)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V

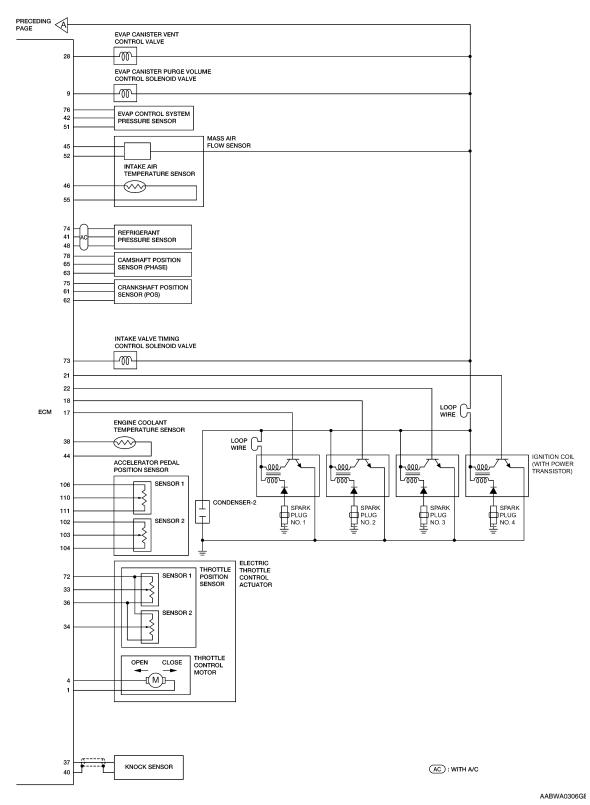
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
61	W	Crankshaft position sensor (POS)	[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle.	Approximately 4.0 V  5mSec/div  2V/div  JMBIA2185GB
			[Engine is running] • Engine speed: 2,000 rpm	Approximately 4.0 V  5mSec/div  2V/div  JMBIA2186GB
62	R	Sensor ground [Crankshaft position sensor (POS)]	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V
63	BR	Sensor ground [Camshaft position sensor (PHASE)]	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0 V
65	G	Camshaft position sensor (PHASE)	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	Approximately 3.6  10mSec/div  2V/div  JMBIA2183GB
			[Engine is running] • Engine speed: 2,000 rpm.	Approximately 3.6 V  10mSec/div  2V/div  JMBIA2184GB
69	L	Park/neutral position (PNP) switch	[Ignition switch: ON] • Selector lever position: P or N (A/T), Neutral (M/T)	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch: ON] • Except above	Approximately 0 V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5 V

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
			[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
73	P	Intake valve timing control solenoid valve	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	7 - 10 V
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5 V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5 V
76	W	EVAP control system pressure sensor power supply	[Ignition switch: ON]	Approximately 5 V
78	0	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5 V
83	Р	CAN communication line	_	_
84	L	CAN communication line	_	_
88	LG	DATA link connector	_	_
			[Ignition switch: OFF]	0V
93	0	Ignition switch	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
99	R	Ston Jamp switch	[Ignition switch: OFF]  • Brake pedal: Fully released	Approximately 0 V
ਬਬ	K	Stop lamp switch	[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5 V
103	GR	Accelerator pedal position	[Ignition switch: ON]	0.3 - 0.6 V
100		sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4 V
104	Y	Sensor ground (Accelerator pedal position sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0 V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
106	Р	Sensor power supply (Accelerator pedal position sensor 1)	[Ignition switch: ON]	Approximately 5 V
108	В	ECM ground	[Engine is running] • Idle speed	Body ground

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
110	മ	Accelerator pedal position	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully released</li></ul>	0.6 - 0.9 V
110	G	sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7 V
111	R	Sensor ground (Accelerator pedal position sensor 1)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0 V

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





Fail Safe

NON DTC RELATED ITEM

 $\mathsf{D}$ 

Detected items	Engine operating condition in fail-safe mode	Remarks	Α
Malfunction indicator lamp circuit	Engine speed will not rise more than 2,500 rpm due to the fuel cut	When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting up MIL when there is malfunction on engine control system.  Therefore, when electrical controlled throttle and part of ECM related diagnoses	EC
		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.	С

### DTC RELATED ITEM

DTC No.	Detected items	Engine opera	ating condition in fail-safe mode			
P0011	Intake valve timing control	The signal is not energized to the in control does not function.	ntake valve timing control solenoid valve and the valve			
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more that	an 2,400 rpm due to the fuel cut.			
P0117 P0118	Engine coolant tempera- ture sensor circuit		determined by ECM based on the following condition coolant temperature decided by ECM.			
		Condition	Engine coolant temperature decided (CONSULT-III display)			
		Just as ignition switch is turned ON or START	40°C (104°F)			
		More than approx. 4 minutes after 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 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.  The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.  So, the acceleration will be poor.				
P0643	Sensor power supply	ECM stops the electric throttle confixed opening (approx. 5 degrees) I	trol actuator control, throttle valve is maintained at a by the return spring.			
P0605	ECM	(When ECM calculation function is ECM stops the electric throttle conf fixed opening (approx. 5 degrees)	trol actuator control, throttle valve is maintained at a			
P1805	Brake switch	ECM controls the electric throttle control actuator by regulating the throttle opening small range.  Therefore, acceleration will be poor.				
		Vehicle condition	Driving condition			
		When engine is idling	Normal			
		When accelerating	Poor acceleration			
P2100 P2103	Throttle control motor relay	ECM stops the electric throttle confixed opening (approx. 5 degrees) I	trol actuator control, throttle valve is maintained at a by the return spring.			
P2101	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.				
P2118	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.				

DTC No.	Detected items	Engine operating condition in fail-safe mode
P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:)  ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
		(When ECM detects the throttle valve is stuck open:) While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P (A/T), Neutral (M/T) position, and engine speed will not exceed 1,000 rpm or more.
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.  The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.  So, the acceleration will be poor.

# DTC Inspection Priority Chart

INFOID:0000000004780386

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

Detected items (DTC)
<ul> <li>U0101 U0140 U1001 CAN communication line</li> <li>P0101 P0102 P0103 Mass air flow sensor</li> <li>P0112 P0113 P0127 Intake air temperature sensor</li> <li>P0116 P0117 P0118 P0125 Engine coolant temperature sensor</li> <li>P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor</li> <li>P0128 Thermostat function</li> <li>P0181 P0182 P0183 Fuel tank temperature sensor</li> <li>P0327 P0328 Knock sensor</li> <li>P0335 Crankshaft position sensor (POS)</li> <li>P0340 Camshaft position sensor (PHASE)</li> <li>P0460 P0461 P0462 P0463 Fuel level sensor</li> <li>P0500 Vehicle speed sensor</li> <li>P0605 P0607 ECM</li> <li>P0643 Sensor power supply</li> <li>P0705 P0850 Park/neutral position (PNP) switch</li> <li>P1610 - P1615 NATS</li> <li>P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor</li> </ul>

Priority	Detected items (DTC)	^
2	P0031 P0032 Air fuel ratio (A/F) sensor 1 heater     P0037 P0038 Heated oxygen sensor 2 heater	A
	<ul> <li>P0075 Intake valve timing control solenoid valve</li> <li>P0130 P0131 P0132 P0133 P2A00 Air fuel ratio (A/F) sensor 1</li> <li>P0137 P0138 P0139 Heated oxygen sensor 2</li> </ul>	EC
	<ul> <li>P0441 EVAP control system purge flow monitoring</li> <li>P0443 P0444 P0445 EVAP canister purge volume control solenoid valve</li> <li>P0447 P0448 EVAP canister vent control valve</li> <li>P0451 P0452 P0453 EVAP control system pressure sensor</li> <li>P0603 ECM power supply</li> </ul>	С
	<ul> <li>P0710 P0720 P0725 P0731 P0732 P0733 P0734 P0740 P0744 P0745 P0750 P0755 P1705 P1760 A/T related sensors, solenoid valves and switches</li> <li>P1217 Engine over temperature (OVERHEAT)</li> <li>P1805 Brake switch</li> </ul>	D
	P2100 P2103 Throttle control motor relay P2101 Electric throttle control function P2118 Throttle control motor	Е
3	P0011 Intake valve timing control P0171 P0172 Fuel injection system function P0300 - P0304 Misfire P0420 Three way catalyst function	F
	<ul> <li>P0442 P0456 EVAP control system (SMALL LEAK, VERY SMALL LEAK)</li> <li>P0455 EVAP control system (GROSS LEAK)</li> <li>P0506 P0507 Idle speed control system</li> </ul>	G
	<ul> <li>P1148 Closed loop control</li> <li>P1421 Cold start control</li> <li>P1715 Primary speed sensor</li> <li>P2119 Electric throttle control actuator</li> </ul>	Н

DTC Index

×:Applicable —: Not applicable

CONSULT-III  GST*2	ECM* <sup>3</sup>	ltems (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
U0101	0101*4	LOST COMM (TCM)	_	1	×	EC-126
U0140	0140*4	LOST COMM (BCM)	_	1	×	EC-128
U1001	1001*4	CAN COMM CIRCUIT	_	2	_	EC-126
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	_	_	Flashing* <sup>7</sup>	_
P0011	0011	INT/V TIM CONT-B1	_	2	×	EC-132
P0031	0031	A/F SEN1 HTR (B1)	_	2	×	EC-136
P0032	0032	A/F SEN1 HTR (B1)	_	2	×	EC-136
P0037	0037	HO2S2 HTR (B1)	_	2	×	EC-140
P0038	0038	HO2S2 HTR (B1)	_	2	×	EC-140
P0075	0075	INT/V TIM V/CIR-B1	_	2	×	EC-144
P0101	0101	MAF SEN/CIRCUIT-B1	_	2	×	EC-148
P0102	0102	MAF SEN/CIRCUIT-B1	_	1	×	EC-156
P0103	0103	MAF SEN/CIRCUIT-B1	_	1	×	EC-156
P0112	0112	IAT SEN/CIRCUIT-B1	_	2	×	EC-162
P0113	0113	IAT SEN/CIRCUIT-B1	_	2	×	EC-162
P0116	0116	ECT SEN/CIRC	_	2	×	EC-165
P0117	0117	ECT SEN/CIRC	_	1	×	EC-167

DTC	;* <sup>1</sup>	Items				
CONSULT-III GST* <sup>2</sup>	ECM*3	(CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
P0118	0118	ECT SEN/CIRC	_	1	×	EC-167
P0122	0122	TP SEN 2/CIRC-B1	_	1	×	EC-171
P0123	0123	TP SEN 2/CIRC-B1	_	1	×	EC-171
P0125	0125	ECT SENSOR	_	2	×	EC-175
P0127	0127	IAT SENSOR-B1	_	2	×	EC-178
P0128	0128	THERMSTAT FNCTN	_	2	×	EC-180
P0130	0130	A/F SENSOR1 (B1)	_	2	×	EC-182
P0131	0131	A/F SENSOR1 (B1)	_	2	×	EC-188
P0132	0132	A/F SENSOR1 (B1)	_	2	×	EC-193
P0133	0133	A/F SENSOR1 (B1)	×	2	×	EC-198
P0137	0137	HO2S2 (B1)	×	2	×	EC-204
P0138	0138	HO2S2 (B1)	×	2	×	EC-212
P0139	0139	HO2S2 (B1)	×	2	×	EC-221
P0171	0171	FUEL SYS-LEAN-B1	_	2	×	EC-229
P0172	0172	FUEL SYS-RICH-B1	_	2	×	EC-235
P0181	0181	FTT SENSOR	_	2	×	EC-240
P0182	0182	FTT SEN/CIRCUIT	_	2	×	EC-245
P0183	0183	FTT SEN/CIRCUIT	_	2	×	EC-245
P0222	0222	TP SEN 1/CIRC-B1	_	1	×	EC-249
P0223	0223	TP SEN 1/CIRC-B1	_	1	×	EC-249
P0300	0300	MULTI CYL MISFIRE	_	1 or 2	×	EC-253
P0301	0301	CYL 1 MISFIRE	_	1 or 2	×	EC-253
P0302	0302	CYL 2 MISFIRE	_	1 or 2	×	EC-253
P0303	0303	CYL 3 MISFIRE	_	1 or 2	×	EC-253
P0304	0304	CYL 4 MISFIRE	_	1 or 2	×	EC-253
P0327	0327	KNOCK SEN/CIRC-B1	_	2	_	EC-259
P0328	0328	KNOCK SEN/CIRC-B1	_	2	_	EC-259
P0335	0335	CKP SEN/CIRCUIT	_	2	×	EC-263
P0340	0340	CMP SEN/CIRC-B1	_	2	×	EC-268
P0420	0420	TW CATALYST SYS-B1	×	2	×	EC-273
P0441	0441	EVAP PURG FLOW/MON	×	2	×	EC-278
P0442	0442	EVAP SMALL LEAK	×	2	×	EC-284
P0443	0443	PURG VOLUME CONT/V	_	2	×	EC-291
P0444	0444	PURG VOLUME CONT/V	_	2	×	EC-297
P0445	0445	PURG VOLUME CONT/V	_	2	×	EC-297
P0447	0447	VENT CONTROL VALVE	_	2	×	EC-301
P0448	0448	VENT CONTROL VALVE	_	2	×	EC-306
P0451	0451	EVAP SYS PRES SEN	_	2	×	EC-312
P0452	0452	EVAP SYS PRES SEN	_	2	×	EC-315
P0453	0453	EVAP SYS PRES SEN	_	2	×	EC-322
P0455	0455	EVAP GROSS LEAK		2		EC-322 EC-329
1 0400	0400	LVAI GROOD LLAR	_	2	×	EC-329 EC-335

[HR16DE] < ECU DIAGNOSIS >

ECO DIAGNOSIS >							
DTC'	<sub>*</sub> 1						
CONSULT-III GST* <sup>2</sup>	ECM*3	Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page	Α
P0460	0460	FUEL LEV SEN SLOSH	_	2	×	EC-342	EC
P0461	0461	FUEL LEVEL SENSOR	_	2	×	EC-343	
P0462	0462	FUEL LEVL SEN/CIRC	_	2	×	EC-345	
P0463	0463	FUEL LEVL SEN/CIRC	_	2	×	EC-345	
P0500	0500	VEH SPEED SEN/CIRC*5	_	2	×	EC-347	
P0506	0506	ISC SYSTEM	_	2	×	EC-349	
P0507	0507	ISC SYSTEM	_	2	×	EC-351	
P0603	0603	ECM BACK UP/CIRCUIT	_	2	×	EC-353	
P0605	0605	ECM	_	1 or 2	× or —	EC-355	Е
P0607	0607	ECM	_	1 (A/T) 2 (M/T)	× (A/T) — (M/T)	EC-357	
P0643	0643	SENSOR POWER/CIRC	_	1	×	EC-358	F
P0705	0705	PNP SW/CIRC	_	2	×	<u>AT-91</u>	
P0710	0710	ATF TEMP SEN/CIRC*8	_	2	×	<u>AT-96</u>	
P0720	0720	VEH SPD SEN/CIR AT*5	_	2	×	AT-101	
P0725	0725	ENGINE SPEED SIG	_	2	×	AT-106	
P0731	0731	A/T 1ST GR FNCTN*8	_	2	×	AT-110	ŀ
P0732	0732	A/T 2ND GR FNCTN*8	_	2	×	AT-113	
P0733	0733	A/T 3RD GR FNCTN*8	_	2	×	AT-116	
P0734	0734	A/T 4TH GR FNCTN*8	_	2	×	AT-119	
P0740	0740	TCC SOLENOID/CIRC	_	2	×	AT-124	
P0744	0744	A/T TCC S/V FNCTN	_	2	×	AT-129	
P0745	0745	L/PRESS SOL/CIRC	_	2	×	AT-134	
P0750	0750	SFT SOL A/CIRC	_	1	×	AT-139	
P0755	0755	SFT SOL B/CIRC	_	 1	×	AT-144	
P0850	0850	P-N POS SW/CIRCUIT	_	2	×	EC-362	
P1148	1148	CLOSED LOOP-B1	_	1	×	EC-367	
P1217	1217	ENG OVER TEMP	_	1	×	EC-368	
P1225	1225	CTP LEARNING-B1	_	2	_	EC-372	1
P1226	1226	CTP LEARNING-B1	_	2	_	EC-374	
P1421	1421	COLD START CONTROL	_	2	×	EC-376	1
P1610	1610	LOCK MODE	_	2	_	BL-259	
P1611	1611	ID DISCORD, IMMU-ECM	_	2	_	BL-259	
P1612	1612	CHAIN OF ECM-IMMU	_	2	_	BL-259	(
P1614	1614	CHAIN OF IMMU-KEY	_	2	_	BL-259	
P1615	1615	DIFFERENCE OF KEY	_	2	_	BL-259	
P1715	1715	IN PULY SPEED	_	2	_	EC-378	F
P1760	1760	O/R CLTCH SOL/CIRC	_	2	×	AT-149	
P1805	1805	BRAKE SW/CIRCUIT	_	2	_	EC-380	
P2100	2100	ETC MOT PWR-B1	_	1	×	EC-384	
P2101	2101	ETC FNCTN/CIRC-B1	_	1	×	EC-388	
P2103	2103	ETC MOT PWR	_	1	×	EC-384	

DTC*1		Items				
CONSULT-III GST* <sup>2</sup>	ECM*3	(CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
P2118	2118	ETC MOT-B1	_	1	×	EC-393
P2119	2119	ETC ACTR-B1	_	1	×	EC-397
P2122	2122	APP SEN 1/CIRC	_	1	×	EC-399
P2123	2123	APP SEN 1/CIRC	_	1	×	EC-399
P2127	2127	APP SEN 2/CIRC	_	1	×	EC-403
P2128	2128	APP SEN 2/CIRC	_	1	×	EC-403
P2135	2135	TP SENSOR-B1	_	1	×	EC-408
P2138	2138	APP SENSOR	_	1	×	EC-412
P2A00	2A00	A/F SENSOR1 (B1)	_	2	×	EC-417

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

#### How to Set SRT Code

INFOID:0000000004780388

To set all SRT codes, self-diagnoses for the SRT items must be performed one or more times. Refer to <u>EC-90</u>, <u>"Diagnosis Description"</u>, "SYSTEM READINESS TEST (SRT) CODE", "SRT Item".

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.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*4:</sup> The troubleshooting for this DTC needs CONSULT-III.

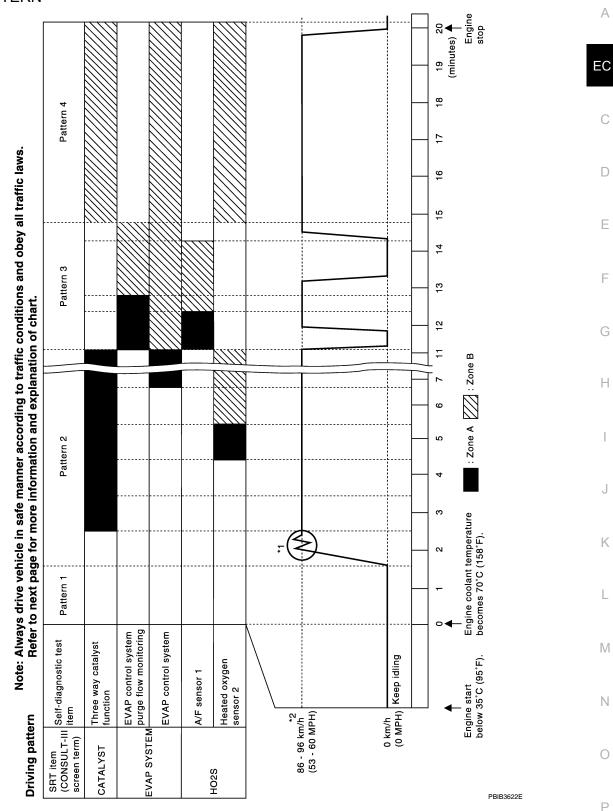
<sup>\*5:</sup> When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

<sup>\*6:</sup> SRT code will not be set if the self-diagnostic result is NG.

<sup>\*7:</sup> When the ECM is in the mode that displays SRT status, MIL may flash. For the details, refer to "How to Display SRT Status" in <u>EC-90. "Diagnosis Description"</u>.

<sup>\*8:</sup> When erasing this DTC, always use CONSULT-III or GST.

## DRIVING PATTERN



• The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

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

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

\*: Normal conditions refer to the following:

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

#### Pattern 1:

- The engine is started at the engine coolant temperature of –10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 38 and ground is 3.0 4.3 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 38 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 43 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 decelerating 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 steadystate 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 in the D position.

#### Suggested Upshift Speeds for M/T Models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

		on in low altitude areas 9 m (4,000 ft)]:	For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift position [km/h (MPH)]	km/h (MPH)	
1st to 2nd	15 (9)	21 (13)	15 (9)
2nd to 3rd	25 (16)	38 (24)	30 (19)
3rd to 4th	40 (25)	55 (34)	45 (28)
4th to 5th	45 (28)	74 (46)	50 (31)

### Test Value and Test Limit

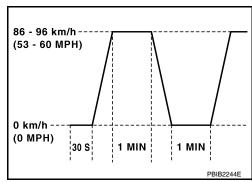
INFOID:0000000004780389

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. (eq., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)



[HR16DE] < ECU DIAGNOSIS >

14	OBD-	Calf diamentis to at its an	DTC	li	ie and Test mit display)	Description		
Item	MID	Self-diagnostic test item	ыс	TID	Unitand Scaling ID	Becomption		
			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		
	Air fuel ratio (A/F) sensor 1	P0130	86H	0BH	Maximum sensor output voltage for test cycle			
	01H	(Bank 1)	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
HO2S			P0130	8BH	0BH	Difference in sensor output voltage		
			P0133	8CH	83H	Response gain at the limited frequency		
			P0138	07H	0CH	Minimum sensor output voltage for test cycle		
	02H	Heated oxygen sensor 2 (Bank 1)	P0137	08H	0CH	Maximum sensor output voltage for test cycle		
			P0138	80H	0CH	Sensor output voltage		
			P0139	81H	0CH	Difference in sensor output voltage		
			P0143	07H	0CH	Minimum sensor output voltage for test cycle		
	03H	Heated oxygen sensor 3 (Bank 1)	P0144	08H	0CH	Maximum sensor output voltage for test cycle		
		(==:::::/	P0146	80H	0CH	Sensor output voltage		
			P0145	81H	0CH	Difference in sensor output voltage		

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					e and Test mit	
Item	OBD-	Self-diagnostic test item	DTC		display)	Description
item	MID	och diagnostic test tem	510	TID	Unitand Scaling ID	Description
			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
		Air fuel ratio (A/E) concer 1	P0150	86H	0BH	Maximum sensor output voltage for test cycle
	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	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
HO2S			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
			P0158	07H	0CH	Minimum sensor output voltage for test cycle
	06H	Heated oxygen sensor 2 (Bank 2)	P0157	08H	0CH	Maximum sensor output voltage for test cycle
		,	P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
			P0163	07H	0CH	Minimum sensor output voltage for test cycle
	07H	Heated oxygen sensor 3 (Bank2)	P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
			P0420	80H	01H	O2 storage index
	2411	Three way catalyst function	P0420	82H	01H	Switching time lag engine exhaust index value
	21H	(Bank1)	P2423	83H	0CH	Difference in 3rd O2 sensor output voltage
CATA-			P2423	84H	84H	O2 storage index in HC trap catalyst
LYST			P0430	80H	01H	O2 storage index
	വ	Three way catalyst function	P0430	82H	01H	Switching time lag engine exhaust index value
	(Bank2)	P2424	83H	0CH	Difference in 3rd O2 sensor output voltage	
		P2424	84H	84H	O2 storage index in HC trap catalyst	

	000			li	e and Test mit display)		P
Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description	E
			P0400	80H	96H	Low Flow Faults: EGR temp change rate (short term)	
			P0400	81H	96H	Low Flow Faults: EGR temp change rate (long term)	
EGR SYSTEM	31H	EGR function	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	- - E
			P1402	84H	96H	High Flow Faults: EGR temp increase rate	
			P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)	F
	35H	VV/T Monitor (Poplet)	P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)	
	ээп	VVT Monitor (Bank1)	P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)	- (
VVT			P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)	-
SYSTEM			P0021	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)	_
	0011	NA/T Maritan (Banko)	P0024	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)	-
	36H	VVT Monitor (Bank2)	P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)	
			P0024	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)	=
	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down	- k
	3ВН	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)	L
EVAP SYSTEM	2011	EVAP control system leak	P0456	80H	05H	Leak area index (for more than 0.02 inch)	=
OTOTEM	3CH	(Very small leak)	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	N
	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	_
O2 SEN-	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of Heater electric current to voltage	F
SOR HEATER	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	=

ltem	OBD-	Self-diagnostic test item	DTC	liı	e and Test mit display)	Description
цеп	MID		ыс	TID	Unit and Scaling ID	Description
			P0411	80H	01H	Secondary Air Injection System Incor- rect Flow Detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary Air Injection System Insufficient Flow
			P2445	82H	01H	Secondary Air Injection System Pump Stuck Off
SEC- OND- ARY AIR	71H	Secondary Air system	P2448	83H	01H	Secondary Air Injection System High Airflow
7			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
	81H	Fuel injection system function	P0171 or P0172	80H	2FH	Long term fuel trim
FUEL	0111	(Bank 1)	P0171 or P0172	81H	24H	The number of lambda control clamped
SYSTEM	82H	Fuel injection system function	P0174 or P0175	80H	2FH	Long term fuel trim
	0211	(Bank 2)	P0174 or P0175	81H	24H	The number of lambda control clamped

lto an	OBD-	Calf diamenti atautitan	DTO	li	e and Test mit display)	Doorieking
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			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
MOCIDE	0.411	NA diala Calinda Niatina	P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder
IISFIRE	A1H	Multiple Cylinder Misfires	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

				Test valu	e and Test	
	ODD				mit display)	
Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
	A2H	No. 1 Cylinder Misfire	P0301	ОВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current driving cycles
	АЗН	No. 2 Cylinder Misfire	P0302	ОВН	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	ОВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
MISFIRE			P0304	0CH	24H	Misfire counts for last/current driving cycles
MIGFIRE	A6H	No. 5 Cylinder Misfire	P0305	ОВН	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
	А9Н	No. 8 Cylinder Misfire	P0308	ОВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0308	0CH	24H	Misfire counts for last/current driving cycles

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# SYMPTOM DIAGNOSIS

## **ENGINE CONTROL SYSTEM SYMPTOMS**

Symptom Table INFOID:0000000004780390 EC

SYSTEM — BASIC ENGINE CONTROL SYSTEM

							S	YMPT	OM							С
		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)	Reference page	D E F
																Н
	y symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА		
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-435	
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-498	I
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-431	
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-74	J
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-456	
	Incorrect idle speed adjustment						1	1	1	1		1			EC-30	K
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-388 EC-397	1
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-30	ı
	Ignition circuit	1	1	2	2	2		2	2			2			EC-441	_
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			EC-121	
Mass air	flow sensor circuit	4			2										EC-148 EC-148	V
Engine of	coolant temperature sensor circuit	1				-	3			3					EC-167 EC-175	N
Air fuel r	ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-182 EC-188 EC-193 EC-198 EC-417	O
Throttle	position sensor circuit						2			2					EC-171 EC-249 EC-372 EC-374 EC-408	Р
Accelera	ator pedal position sensor circuit			3	2	1									EC-399 EC-403 EC-412	
Knock s	ensor circuit			2								3			EC-259	

		SYMPTOM												
	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)	Reference page
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	
Crankshaft position sensor (POS) circuit	2	2												EC-263
Camshaft position sensor (PHASE) circuit	3	2												EC-268
Vehicle speed signal circuit		2	3		3						3			EC-347
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-353 EC-355
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-144
PNP switch circuit			3		3		3	3			3			EC-362
Refrigerant pressure sensor circuit		2				3			3		4			EC-457
Electrical load signal circuit							3							EC-428
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	MTC-22
ABS actuator and electric unit (control unit)			4											BRC-8

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next table)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM												А		
		HA				ATION					RE HIGH					EC
		ART (EXCP.		FLAT SPOT	ATION	RACCELER				IDLE	EMPERATUI	SUMPTION	CONSUMPTION	R CHARGE		С
		rart/rest/	1	/SURGING/	CK/DETON/	WER/POOF	OW IDLE	E/HUNTING	ATION	ETURN TO	S/WATER TE	FUEL CON		EAD (UNDE	Reference page	D
		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	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE	BATTERY DEAD (UNDER CHARGE)		Е
Warranty	symptom code	A A	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА		F
Fuel	Fuel tank	-													<u>FL-9</u>	
	Fuel piping	5		5	5	5		5	5			5			FL-4	G
	Vapor lock		5												_	
	Valve deposit														_	ш
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_	Н
Air	Air duct															1
	Air cleaner														EM 26	
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			<u>EM-26</u>	J
	Electric throttle control actuator	5			5		5			5					EM-28	K
	Air leakage from intake mani- fold/Collector/Gasket															17
Cranking	Battery	1	1	1		1		1	1					1	<u>SC-5</u>	L
	Generator circuit														SC-21	
	Starter circuit	3										1			<u>SC-9</u>	
	Signal plate	6													EM-96	M
	PNP switch	4													MT-12 (M/T) AT-95 (A/T)	
Engine	Cylinder head	5	5	5	5	5		5	5			5			<u>EM-79</u>	Ν
	Cylinder head gasket	5	5	5	5	5		5	5		4		3		<u> </u>	
	Cylinder block															0
	Piston												4			
	Piston ring	6	6	6	6	6		6	6			6			<u>EM-96</u>	
	Connecting rod															Р
	Bearing															
	Crankshaft															

							S'	YMPT	ОМ						
		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)	Reference page
Warranty	symptom code	A A	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Valve	Timing chain														EM-49
mecha- nism	Camshaft	-													EM-58
1115111	Intake valve timing control	5	5	5	5	5		5	5			5			EM-49
	Intake valve												2		EM 92
	Exhaust valve												3		<u>EM-82</u>
Exhaust	Exhaust manifold/Tube/Muf- fler/Gasket	5	5	5	5	5		5	5			5			EM-31
	Three way catalyst														<u>EX-4</u>
Lubrica- tion	Oil pan/Oil strainer/Oil pump/ Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-39 EM-42 LU-7 LU-9
	Oil level (Low)/Filthy oil														LU-7
Cooling	Radiator/Hose/Radiator filler cap														CO-14 CO-14
	Thermostat									5					<u>CO-23</u>
	Water pump	5	5	5	5	5		5	5		4	5			<u>CO-21</u>
	Water gallery	3	3	3	3	J		3	3		_	J			<u>CO-9</u>
	Cooling fan														<u>CO-19</u>
	Coolant level (Low)/Contami- nated coolant									5					<u>CO-9</u>
NVIS (NIS	SSAN Vehicle Immobilizer Sys- ATS)	1	1												BL-257

<sup>1 - 6:</sup> The numbers refer to the order of inspection.

## **NORMAL OPERATING CONDITION**

< SYMPTOM DIAGNOSIS > [HR16DE]

## NORMAL OPERATING CONDITION

Description INFOID:000000004780391

### FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,500 rpm under no load (for example, the selector lever position is neutral and engine speed is over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 2,000 rpm, then fuel cut will be cancelled.

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, <u>EC-42.</u> "System Description".

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< PRECAUTION > [HR16DE]

## **PRECAUTION**

## **PRECAUTIONS**

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

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

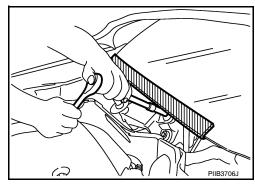
#### **WARNING:**

- When working near the Airbag Diagnosis Sensor Unit or other Airbag 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:0000000004786988

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:0000000004780394

The ECM has an on board diagnostic system. It will light up 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 light up.
- Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to <a href="PG-64">PG-64</a>, "Description"</a>.

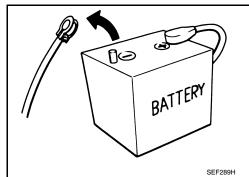
< PRECAUTION > [HR16DE]

• 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 light up due to the short circuit.

- Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube
  may cause the MIL to light up due to the malfunction of the EVAP system or fuel injection system,
  etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

General Precautions

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



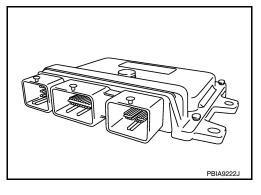
- Do not disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.

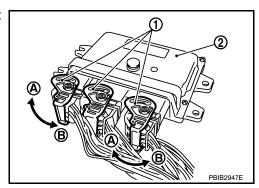
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

- If the battery is disconnected, the following emission-related diagnostic information will be 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 (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.



A. Loosen

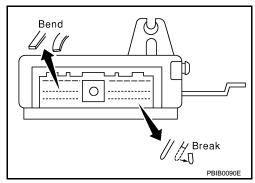




 When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

- Securely connect ECM harness connectors.
  - A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system mal-



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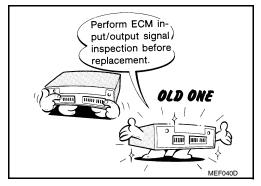
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< PRECAUTION > [HR16DE]

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

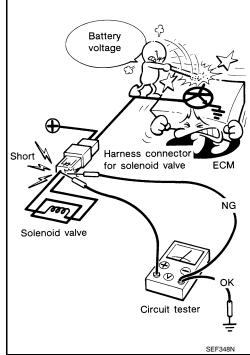
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-461, "Reference Value".
- · Handle mass air flow sensor carefully to avoid damage.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).



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



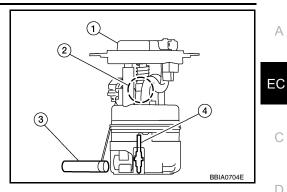
- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  - Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



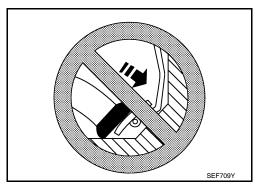
## **PRECAUTIONS**

[HR16DE] < PRECAUTION >

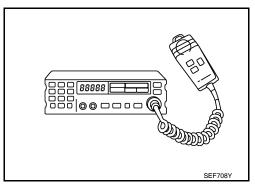
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.
- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel level sensor (3)
- Fuel tank temperature sensor (4)



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



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



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< PREPARATION > [HR16DE]

# **PREPARATION**

## **PREPARATION**

# **Special Service Tools**

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## 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
(J-44321-6) Fuel pressure adapter	LBIA0376E	Connects fuel pressure gauge to quick connector type fuel lines.
KV10118400 Fuel tube adapter	PBIB3043E	Measures fuel pressure

## **Commercial Service Tools**

INFOID:0000000004780397

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

## **PREPARATION**

< PREPARATION > [HR16DE]

PREPARATION >		[HR16DE]
Tool name (Kent-Moore No.)		Description
Fuel filler cap adapter i.e.: (MLR-8382)		Checks fuel tank vacuum relief valve opening pressure
Socket wrench	S-NT815	Removes and installs engine coolant temperature sensor
	19 mm (0.75 in) More than 32 mm (1.26 in)	
Oxygen sensor thread cleaner .e.: (J-43897-18)	a b Mating	Reconditions the exhaust system threads before installing a new oxygen sensor. Use with antiseize lubricant shown below.
(J-43897-12)	surface shave cylinder Flutes  AEM488	a: 18 mm diameter with pitch 1.5 mm for Zirco- nia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Tita- nia Oxygen Sensor
Anti-seize lubricant i.e.: (Permatex <sup>TM</sup> 133AR or equivalent meeting MIL specifica- tion MIL-A-907)		Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.
	S-NT779	

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# **ON-VEHICLE MAINTENANCE**

## **FUEL PRESSURE**

Inspection INFOID:0000000004780398

#### **FUEL PRESSURE RELEASE**

#### With CONSULT-III

- 1. Turn ignition switch ON.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-III.
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.

#### Without CONSULT-III

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

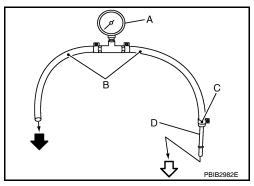
#### FUEL PRESSURE CHECK

#### **CAUTION:**

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

#### NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because C11 models do not have fuel return system.
- The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.
- Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains seal ability with O-rings inside.
- Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.
- Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
- 2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
  - : To quick connector
  - To fuel tube (engine side)
  - C: Clamp
  - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
  - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
  - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
  - Use Pressure Gauge to check fuel pressure.
- 3. Remove fuel hose. Refer to EM-156, "Removal and Installation".
  - Do not twist or kink fuel hose because it is plastic hose.



#### **FUEL PRESSURE**

### < ON-VEHICLE MAINTENANCE >

[HR16DE]

- 4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
  - No.2 spool (5)
  - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
  - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
  - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
  - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
  - · When reconnecting fuel line, always use new clamps.
  - Use a torque driver to tighten clamps.
  - Install hose clamp to the position within 1 2 mm (0.04 0.08 in).

### Tightening torque: 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

- Make sure that clamp screw does not contact adjacent parts.
- 5. Connect fuel tube adapter to guick connector.
  - · A: Fuel pressure gauge
  - · B: Fuel hose for fuel pressure check
- 6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
- 7. Turn ignition switch ON and check for fuel leakage.
- Start engine and check for fuel leakage.
- 9. Read the indication of fuel pressure gauge.
  - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
  - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

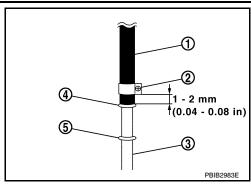
## At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 51 psi)

- 10. If result is unsatisfactory, go to next step.
- 11. Check the following.
  - Fuel hoses and fuel tubes for clogging
  - · Fuel filter for clogging
  - Fuel pump
  - · Fuel pressure regulator for clogging

If OK, replace fuel pressure regulator.

If NG, repair or replace.

12. Before disconnecting Fuel Pressure Gauge and Fuel Pressure Adapter J-44321-6, release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".



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## **EVAP LEAK CHECK**

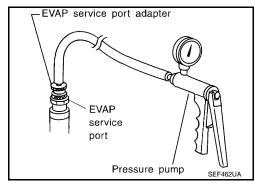
Inspection INFOID:000000004780399

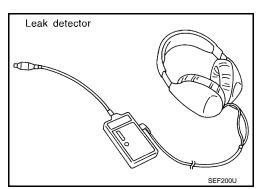
#### **CAUTION:**

- Do not use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in EVAP system. NOTE:
- Do not start engine.
- Improper installation of EVAP service port adapter [commercial service tool: (J-41413-OBD)] to the EVAP service port may cause a leak.

### **■ WITH CONSULT-III**

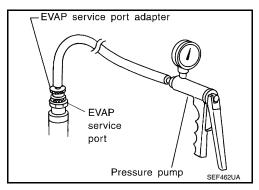
- Install EVAP service port adapter [commercial service tool: (J-41413-OBD)] and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-III.
- 4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
- Remove EVAP service port adapter [commercial service tool: (J-41413-OBD)] and hose with pressure pump.
- 7. Locate the leak using a leak detector [commercial service tool: (J-41416)]. Refer to <u>EC-74</u>, "System Description".





#### WITHOUT CONSULT-III

- 1. Install EVAP service port adapter [commercial service tool: (J-41413-OBD)] 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.
- 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<sup>2</sup>, 0.2 to 0.4 psi).
- 4. Remove EVAP service port adapter [commercial service tool: (J-41413-OBD)] and hose with pressure pump.

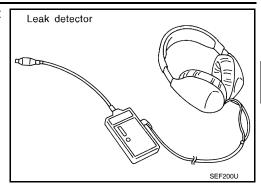


## **EVAP LEAK CHECK**

## < ON-VEHICLE MAINTENANCE >

[HR16DE]

5. Locate the leak using a leak detector [commercial service tool: (J-41416)]. Refer to <u>EC-74, "System Description"</u>.



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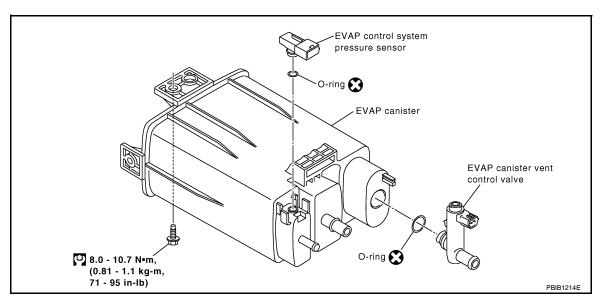
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## **ON-VEHICLE REPAIR**

## **EVAP CANISTER**

Exploded View



### Removal and Installation

INFOID:0000000004780401

#### **REMOVAL**

- 1. Lift up the vehicle.
- 2. Remove EVAP canister fixing bolt.
- 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**

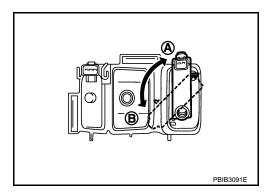
Install in the reverse order of removal.

### NOTE:

Tighten EVAP canister fixing bolt to the specified torque.

#### DISASSEMBLY

- 1. Turn EVAP canister vent control valve counterclockwise.
- Lock (A)
- · Unlock (B)
- 2. Remove the EVAP canister vent control valve.



#### **ASSEMBLY**

Assemble in the reverse order of disassembly.

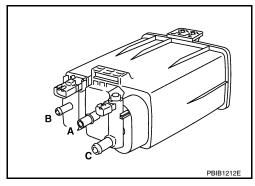
**CAUTION:** 

Always replace O-ring with a new one.

Inspection INFOID:0000000004780402

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.



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## **SERVICE DATA AND SPECIFICATIONS (SDS)**

< SERVICE DATA AND SPECIFICATIONS (SDS)

[HR16DE]

# SERVICE DATA AND SPECIFICATIONS (SDS)

# SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

Transmission	Condition	Specification
A/T	No load* (in P or N position)	700 ± 50 rpm
M/T	No load* (in Neutral position)	650 ± 50 rpm

<sup>\*:</sup> 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:0000000004780404

Transmission	Condition	Specification
A/T	No load* (in P or N position)	6 ± 5°BTDC
M/T	No load* (in Neutral position)	6 ± 5°BTDC

<sup>\*:</sup> 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:0000000004780405

Condition	Specification (Using CONSULT-III or GST)
At idle	10 – 35 %
At 2,500 rpm	10 – 35 %

## Mass Air Flow Sensor

INFOID:0000000004780406

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.9 – 1.3V*
Mass air flow (Using CONSULT-III or GST)	1.0 – 4.0 g·m/sec at idle* 2.0 – 10.0 g·m/sec at 2,500 rpm*

<sup>\*:</sup> Engine is warmed up to normal operating temperature and running under no load.

# **APPLICATION NOTICE**

[MR TYPE 1] < SERVICE INFOMATION >

# SERVICE INFOMATION

# **APPLICATION NOTICE**

# How to Check Vehicle Type

Check the vehicle serial number to confirm the service information in EC section.

Vehicle serial number	Service information
Up to serial 386333	MR TYPE 1
From serial 386334	MR TYPE 2

INFOID:0000000004539412 EC

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# **INDEX FOR DTC**

U1000-U1010

DTC*1		Items	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	(CONSULT-III screen terms)	Reference page
U1000	1000* <sup>4</sup>	CAN COMM CIRCUIT	EC-633
U1001	1001* <sup>4</sup>	CAN COMM CIRCUIT	EC-633
U1010	1010	CONTROL UNIT(CAN)	EC-635

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0011-P0075

DTC	C*1	Itama	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page
P0011	0011	INT/V TIM CONT-B1	EC-636
P0031	0031	A/F SEN1 HTR (B1)	EC-640
P0032	0032	A/F SEN1 HTR (B1)	EC-640
P0037	0037	HO2S2 HTR (B1)	EC-645
P0038	0038	HO2S2 HTR (B1)	EC-645
P0075	0075	INT/V TIM V/CIR-B1	EC-650

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0101-P0128

DTC*1		ltomo	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	ltems (CONSULT-III screen terms)	Reference page
P0101	0101	MAF SEN/CIRCUIT-B1	EC-655
P0102	0102	MAF SEN/CIRCUIT-B1	<u>EC-663</u>
P0103	0103	MAF SEN/CIRCUIT-B1	EC-663
P0112	0112	IAT SEN/CIRCUIT-B1	EC-670
P0113	0113	IAT SEN/CIRCUIT-B1	EC-670
P0117	0117	ECT SEN/CIRC	EC-674
P0118	0118	ECT SEN/CIRC	EC-674
P0122	0122	TP SEN 2/CIRC-B1	EC-679
P0123	0123	TP SEN 2/CIRC-B1	<u>EC-679</u>
P0125	0125	ECT SENSOR	EC-684
P0127	0127	IAT SENSOR-B1	EC-687
P0128	0128	THERMSTAT FNCTN	<u>EC-690</u>

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*4:</sup> The troubleshooting for this DTC needs CONSULT-III.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

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P0130-P0183

DTC	C*1	Homo	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page
P0130	0130	A/F SENSOR1 (B1)	EC-692
P0131	0131	A/F SENSOR1 (B1)	EC-698
P0132	0132	A/F SENSOR1 (B1)	EC-704
P0133	0133	A/F SENSOR1 (B1)	EC-710
P0137	0137	HO2S2 (B1)	EC-717
P0138	0138	HO2S2 (B1)	EC-724
P0139	0139	HO2S2 (B1)	EC-733
P0171	0171	FUEL SYS-LEAN-B1	EC-740
P0172	0172	FUEL SYS-RICH-B1	EC-746
P0181	0181	FTT SENSOR	<u>EC-752</u>
P0182	0182	FTT SEN/CIRCUIT	EC-756
P0183	0183	FTT SEN/CIRCUIT	EC-756

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0222-P0420

DTC	:*1		
CONSULT-III GST* <sup>2</sup>	ECM*3	Items (CONSULT-III screen terms)	Reference page
P0222	0222	TP SEN 1/CIRC-B1	EC-760
P0223	0223	TP SEN 1/CIRC-B1	EC-760
P0300	0300	MULTI CYL MISFIRE	EC-765
P0301	0301	CYL 1 MISFIRE	EC-765
P0302	0302	CYL 2 MISFIRE	EC-765
P0303	0303	CYL 3 MISFIRE	EC-765
P0304	0304	CYL 4 MISFIRE	EC-765
P0327	0327	KNOCK SEN/CIRC-B1	EC-771
P0328	0328	KNOCK SEN/CIRC-B1	EC-771
P0335	0335	CKP SEN/CIRCUIT	EC-775
P0340	0340	CMP SEN/CIRC-B1	EC-781
P0420	0420	TW CATALYST SYS-B1	EC-787

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

**EC-507** 

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

INFOID:0000000004804745

P0441-P0463

DTC*1		W	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page
P0441	0441	EVAP PURG FLOW/MON	EC-792
P0442	0442	EVAP SMALL LEAK	EC-797
P0443	0443	PURG VOLUME CONT/V	EC-804
P0444	0444	PURG VOLUME CONT/V	EC-811
P0445	0445	PURG VOLUME CONT/V	EC-811
P0447	0447	VENT CONTROL VALVE	EC-817
P0448	0448	VENT CONTROL VALVE	EC-823
P0451	0451	EVAP SYS PRES SEN	EC-829
P0452	0452	EVAP SYS PRES SEN	EC-832
P0453	0453	EVAP SYS PRES SEN	EC-839
P0455	0455	EVAP GROSS LEAK	EC-847
P0456	0456	EVAP VERY SML LEAK	EC-853
P0460	0460	FUEL LEV SEN SLOSH	EC-860
P0461	0461	FUEL LEVEL SENSOR	EC-862
P0462	0462	FUEL LEVL SEN/CIRC	<u>EC-864</u>
P0463	0463	FUEL LEVL SEN/CIRC	EC-864

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0500-P0643

DTC*1		Itama	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page
P0500	0500	VEH SPEED SEN/CIRC	EC-866
P0506	0506	ISC SYSTEM	EC-868
P0507	0507	ISC SYSTEM	EC-870
P0605	0605	ECM	EC-872
P0643	0643	SENSOR POWER/CIRC	EC-874

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0705-P0734

DTC*1		Items	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	(CONSULT-III screen terms)	Reference page
P0705	0705	PNP SW/CIRC	AT-91 (A/T), CVT-244 (CVT)
P0710	0710	ATF TEMP SEN/CIRC	<u>AT-96</u> (A/T), <u>CVT-249</u> (CVT)

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

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DTC*1		Hama	
CONSULT-III GST* <sup>2</sup>	ECM*3	Items (CONSULT-III screen terms)	Reference page
P0715	0715	INPUT SPD SEN/CIRC	<u>CVT-254</u>
P0720	0720	VEH SPD SEN/CIR AT*5	<u>AT-101</u> (A/T), <u>CVT-258</u> (CVT)
P0725	0725	ENGINE SPEED SIG	<u>AT-106</u>
P0731	0731	A/T 1ST GR FNCTN	<u>AT-110</u>
P0732	0732	A/T 2ND GR FNCTN	<u>AT-113</u>
P0733	0733	A/T 3RD GR FNCTN	<u>AT-116</u>
P0734	0734	A/T 4TH GR FNCTN	<u>AT-119</u>

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0740-P0845

DTC\*1 Items Reference page **CONSULT-III** (CONSULT-III screen terms) ECM\*3 GST\*2 P0740 0740 TCC SOLENOID/CIRC AT-124 AT-129 (A/T), P0744 0744 A/T TCC S/V FNCTN **CVT-271** (CVT) P0745 0745 L/PRESS SOL/CIRC **CVT-273** PRS CNT SOL/A FCTN P0746 0746 **CVT-278** P0750 0750 SFT SOL A/CIRC AT-139 P0755 0755 SFT SOL B/CIRC AT-144 CVT-280 P0776 0776 PRS CNT SOL/B FCTN P0778 0778 PRS CNT SOL/B CIRC CVT-282 P0840 0840 TR PRS SENS/A CIRC **CVT-287** P0845 0845 TR PRS SENS/B CIRC **CVT-119** 

P0850-P1574

DTC*1			
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page
P0850	0850	P-N POS SW/CIRCUIT	EC-879
P1148	1148	CLOSED LOOP-B1	EC-885
P1217	1217	ENG OVER TEMP	EC-886
P1225	1225	CTP LEARNING-B1	EC-895
P1226	1226	CTP LEARNING-B1	EC-897
P1421	1421	COLD START CONTROL	EC-899
P1564	1564	ASCD SW	EC-901

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

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DTC*1		Items	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	(CONSULT-III screen terms)	Reference page
P1572	1572	ASCD BRAKE SW	EC-907
P1574	1574	ASCD VHL SPD SEN	EC-916

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P1610-P1615

DTG	C*1	lt	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page
P1610	1610	LOCK MODE	<u>BL-259</u>
P1611	1611	ID DISCORD,IMMU-ECM	<u>BL-259</u>
P1612	1612	CHAIN OF ECM-IMMU	BL-259
P1614	1614	CHAIN OF IMMU-KEY	BL-259
P1615	1615	DIFFERENCE OF KEY	<u>BL-259</u>

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P1705-P1805

DTC*1		ltama		
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page	
P1705	1705	TP SEN/CIRC CVT	CVT-299	
P1715	1715	IN PULY SPEED	<u>EC-918</u> (A/T), <u>EC-919</u> (CVT)	
P1740	1740	LU-SLCT SOL/CIRC	<u>CVT-306</u>	
P1760	1760	O/R CLTCH SOL/CIRC	<u>AT-149</u>	
P1777	1777	STEP MOTR CIRC	<u>CVT-311</u>	
P1778	1778	STEP MOTR FNC	<u>CVT-315</u>	
P1805	1805	BRAKE SW/CIRCUIT	EC-921	

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P2100-P2A00

DTC*1		Itomo		
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference page	
P2100	2100	ETC MOT PWR-B1	EC-925	
P2101	2101	ETC FNCTN/CIRC-B1	EC-929	
P2103	2103	ETC MOT PWR	EC-925	

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

# **INDEX FOR DTC**

# < SERVICE INFOMATION >

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DTC	<b>;</b> *1			
CONSULT-III GST* <sup>2</sup>	ECM*3	Items (CONSULT-III screen terms)	Reference page	A
P2118	2118	ETC MOT-B1	EC-935	EC
P2119	2119	ETC ACTR-B1	EC-940	
P2122	2122	APP SEN 1/CIRC	EC-942	=
P2123	2123	APP SEN 1/CIRC	EC-942	С
P2127	2127	APP SEN 2/CIRC	EC-947	=
P2128	2128	APP SEN 2/CIRC	EC-947	
P2135	2135	TP SENSOR-B1	EC-954	- D
P2138	2138	APP SENSOR	<u>EC-959</u>	-
P2A00	2A00	A/F SENSOR1 (B1)	<u>EC-966</u>	Е

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

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<sup>\*2:</sup> This number is prescribed by SAE J2012.

<sup>\*3:</sup> 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"

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.

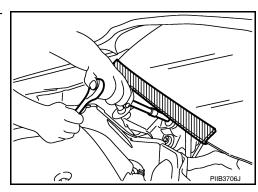
PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

#### **WARNING:**

- When working near the Airbag Diagnosis Sensor Unit or other Airbag 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

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



INFOID:0000000004537014

INFOID:0000000004537015

# On Board Diagnosis (OBD) System of Engine and A/T, CVT

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

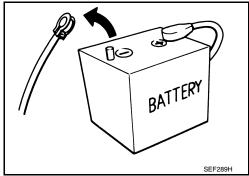
#### **CAUTION:**

- Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.
- Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will
  cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease,
  dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-64, "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 light up due to the short circuit.

- Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the fuel injection system, etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

Precaution INFOID:0000000004537016

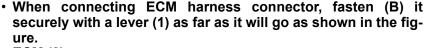
- Always use a 12 volt battery as power source.
- · Do not attempt to disconnect battery cables while engine is running.
- · Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery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



- Do not disassemble ECM.
- If battery cable is disconnected, the memory will return to the initial ECM values.

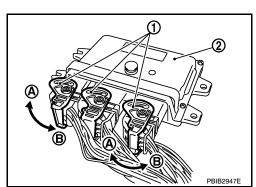
The ECM will now start to self-control at its initial values. Engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values



- ECM (2)
- Loosen (A)

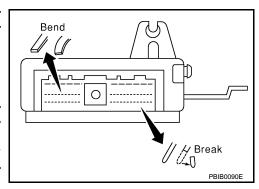
age to ICs.



· When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in dam-
- 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.



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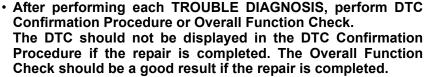
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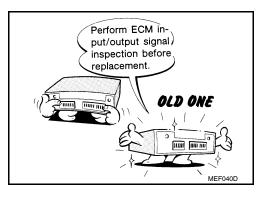
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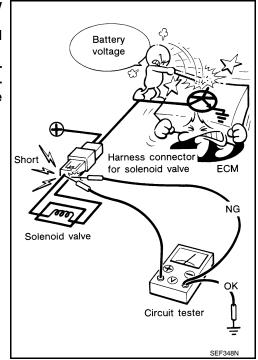
- · Keep engine control system parts and harness dry.
- Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-597, "ECM Terminal and Reference Value".
- Handle mass air flow sensor carefully to avoid damage.
- · Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).







- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  - Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

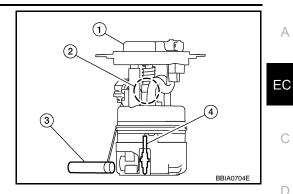


### **PRECAUTIONS**

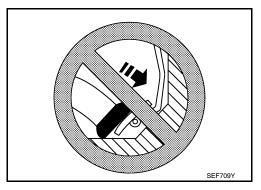
#### < SERVICE INFOMATION >

[MR TYPE 1]

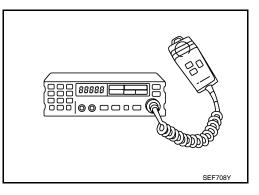
- · Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.
- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel level sensor (3)
- Fuel tank temperature sensor (4)



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



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



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# **PREPARATION**

# Special Service Tool

INFOID:0000000004537017

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	Checking fuel pressure
(J-44321-6) Fuel pressure adapter	LBIA0376E	Connecting fuel pressure gauge to quick connector type fuel lines.
KV10118400 Fuel tube adapter	PBIB3043E	Measuring fuel pressure

# **Commercial Service Tool**

INFOID:0000000004537018

Tool number (Kent-Moore No.) Tool name		Description
Leak detector i.e.: (J-41416)	S-NT703	Locating the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBD)		Applying positive pressure through EVAP service port
	S-NT704	

< SERVICE INFOMATION > [MR TYPE 1]

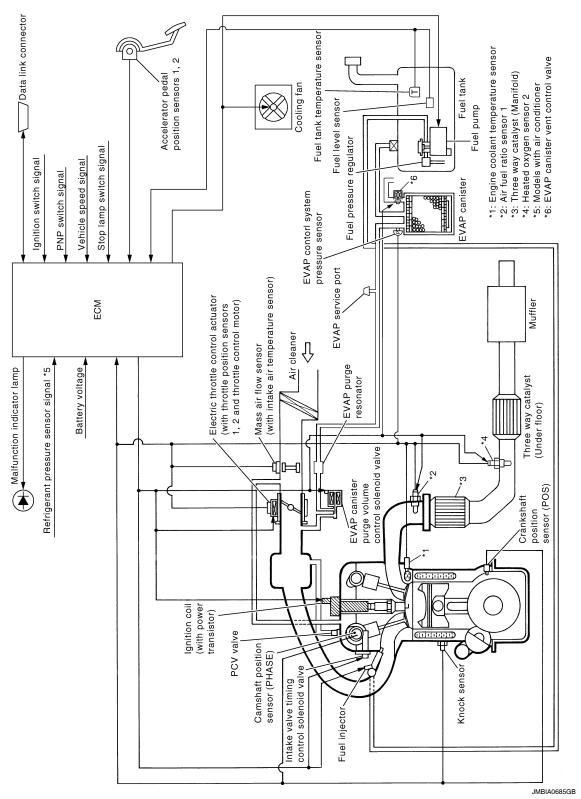
SERVICE INFOMATION		[#11 2 1]	_
Tool number (Kent-Moore No.) Tool name		Description	Α
Fuel filler cap adapter i.e.: (MLR-8382)		Checking fuel tank vacuum relief valve opening pressure	EC
			С
Socket wrench	S-NT815	Removing and installing engine coolant temperature sensor	
	19 mm (0.75 in) More than 32 mm		Е
	32 mm (1.26 in) s-NT705		F
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	a Mating b surface shave	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with antiseize lubricant shown below.  a: 18 mm diameter with pitch 1.5 mm for Zirconic Oxygen 2 Property 1.5 mm for Zirconic Oxygen 2 Pr	G
	Flutes AEM488	nia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Tita- nia Oxygen Sensor	Н
Anti-seize lubricant i.e.: (Permatex <sup>TM</sup> 133AR or equivalent		Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.	- 
meeting MIL specifica- tion MIL-A-907)			J
	S-NT779		K

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# **ENGINE CONTROL SYSTEM**

Schematic



Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL CHART

INFOID:0000000004537020

Sensor	Input Signal to ECM	ECM function	Actuator	_
Crankshaft position sensor (POS)	Engine speed*3			
Camshaft position sensor (PHASE)	Piston position			
Mass air flow sensor	Amount of intake air			
Engine coolant temperature sensor	Engine coolant temperature			
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas			
Throttle position sensor	Throttle position			
Accelerator pedal position sensor	Accelerator pedal position			
Park/neutral position (PNP) switch	Gear position	Fuel injection & mixture ratio	Fuel injector	
Battery	Battery voltage*3	control		
Knock sensor	Engine knocking condition			
EPS control unit	Power steering operation*2			
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas			
Air conditioner switch	Air conditioner operation* <sup>2</sup>			
ABS actuator and electric unit (control unit)				
Combination meter	─ Vehicle speed* <sup>2</sup>			

<sup>\*1:</sup> This sensor is not used to control the engine system under normal conditions.

#### SYSTEM DESCRIPTION

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

#### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

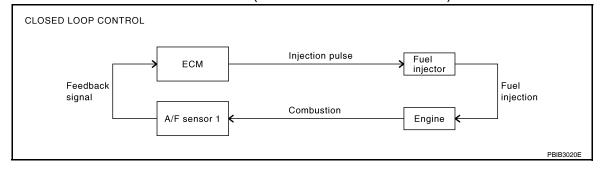
#### <Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D (A/T and CVT models)
- · High-load, high-speed operation

#### <Fuel decrease>

- · During deceleration
- During high engine speed operation

#### MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



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EC-519

<sup>\*2:</sup> This signal is sent to the ECM through CAN communication line.

<sup>\*3:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

#### < SERVICE INFOMATION >

The mixture ratio feedback system provides the best air/fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses air fuel ratio (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 air fuel ratio (A/F) sensor 1, refer to EC-698. 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 air fuel ratio (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 air fuel ratio (A/F) sensor 1 or its circuit
- Insufficient activation of air fuel ratio (A/F) sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D (A/T and CVT models)
- When starting the engine

#### MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from air fuel ratio (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.

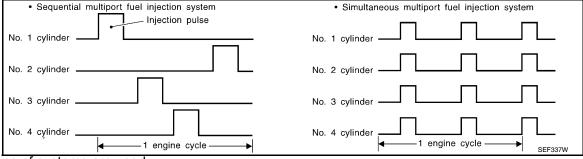
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"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 air fuel ratio (A/F) sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

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

#### FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The four fuel injectors will then receive the signals two times for each engine cycle.

[MR TYPE 1]

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:0000000004537021

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	Engine speed*2			
Camshaft position sensor (PHASE)	Piston position			
Mass air flow sensor	Amount of intake air			
Engine coolant temperature sensor	Engine coolant temperature			
Throttle position sensor	Throttle position			
Accelerator pedal position sensor	Accelerator pedal position	Ignition timing control	Power transistor	
Battery	Battery voltage*2	Control		
Knock sensor	Engine knocking			
Park/neutral position (PNP) switch	Gear position			
ABS actuator and electric unit (control unit)	Val: 2-1 1*1			
Combination meter	Vehicle speed*1			

<sup>\*1:</sup> This signal is sent to the ECM through CAN communication line.

#### SYSTEM DESCRIPTION

Firing order: 1 - 3 - 4 - 2

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

The ECM receives information such as the injection pulse width and camshaft position sensor (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:0000000004537022

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Park/neutral position (PNP) switch	Neutral position			
Accelerator pedal position sensor	Accelerator pedal position			
Engine coolant temperature sensor	Engine coolant temperature	Fuel cut control	Fuel injector	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed			
ABS actuator and electric unit (control unit)	Vehicle speed*			
Combination meter	verilide speed			

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<sup>\*2:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

### **ENGINE CONTROL SYSTEM**

#### < SERVICE INFOMATION >

[MR TYPE 1]

#### SYSTEM DESCRIPTION

If the engine speed is above 2,000 rpm under no load [for example, the shift lever position is P or N (A/T, CVT), Neutral (M/T) and engine speed is over 2,000 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 <u>EC-518</u>, "Multiport Fuel Injection (MFI) System".

<sup>\*:</sup> This signal is sent to the ECM through CAN communication line.

[MR TYPE 1]

# AIR CONDITIONING CUT CONTROL

# Input/Output Signal Chart

INFOID:0000000004537023

				_
Sensor	Input Signal to ECM	ECM function	Actuator	
Air conditioner switch	Air conditioner ON signal*1			_
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	Air conditioner		[
Battery	Battery voltage*2	cut control	Air conditioner relay	
Refrigerant pressure sensor	Refrigerant pressure			[
EPS control unit	Power steering operation*1			
ABS actuator and electric unit (control unit)	V-1-1-1-1-1-1			
Combination meter	Vehicle speed*1			ı

<sup>\*1:</sup> This signal is sent to the ECM through CAN communication line.

# System Description

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

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

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<sup>\*2:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

[MR TYPE 1]

# AUTOMATIC SPEED CONTROL DEVICE (ASCD)

# System Description

INFOID:0000000004537025

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation		
Stop lamp switch	Brake pedal operation		
ASCD clutch switch (M/T models)	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation	ASCD vehicle speed control	Electric throttle control actuator
Park/neutral position (PNP) switch	Gear position		
Combination meter	Vehicle speed*		
TCM (A/T and CVT models)	Powertrain revolution*		

<sup>\*:</sup> 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 indicator and SET indicator in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.

#### NOTE:

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

#### **SET OPERATION**

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

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

#### ACCELERATE OPERATION

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

#### **CANCEL OPERATION**

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

- CANCEL switch is pressed
- More than two switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- · Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to the neutral position (M/T models)
- Selector lever is changed to N, P, R position (A/T and CVT models)
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed

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

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

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

#### COAST OPERATION

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

# **AUTOMATIC SPEED CONTROL DEVICE (ASCD)**

[MR TYPE 1] < SERVICE INFOMATION >

#### RESUME OPERATION

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

- Brake pedal is released.
- Clutch pedal is released (M/T models)
- Selector lever is in other than P and N positions (A/T and CVT models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

### Component Description

ASCD STEERING SWITCH

Refer to EC-901.

ASCD BRAKE SWITCH

Refer to EC-907 and EC-973.

ASCD CLUTCH SWITCH

Refer to EC-907 and EC-973.

STOP LAMP SWITCH

Refer to <u>EC-907</u>, <u>EC-921</u> and <u>EC-973</u>.

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EC-925, EC-929, EC-935 and EC-940.

ASCD INDICATOR

Refer to EC-981.

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### **CAN COMMUNICATION**

< SERVICE INFOMATION >

[MR TYPE 1]

# CAN COMMUNICATION

# System Description

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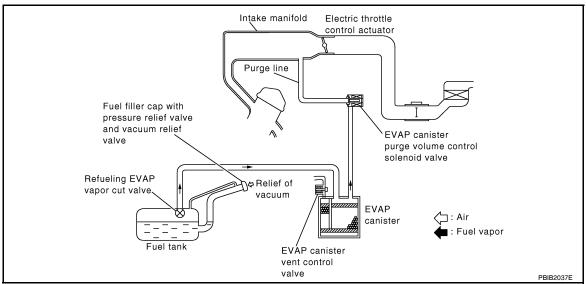
CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information 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-26, "CAN Communication Signal Chart", about CAN communication for detail.

# **EVAPORATIVE EMISSION SYSTEM**

**Description** 

#### 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

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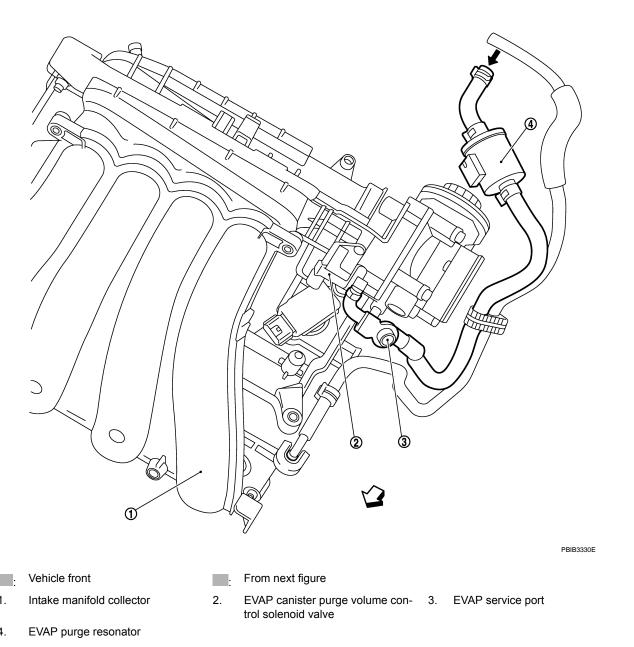
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NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

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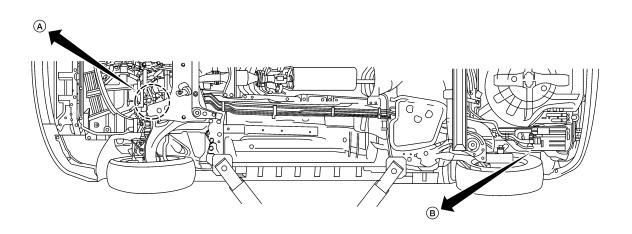
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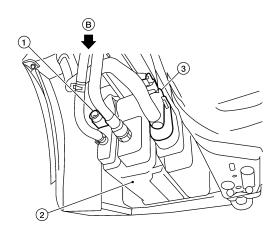
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(A): To previous figure

1. EVAP control system pressure sensor 2. EVAP canister

3. EVAP canister vent control valve

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

# Component Inspection

INFOID:0000000004537029

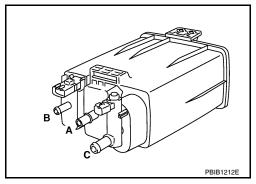
**EVAP CANISTER** 

# [MR TYPE 1]

#### < SERVICE INFOMATION >

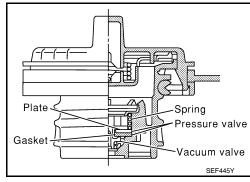
Check EVAP canister as follows:

- 1. Block port **B**.
- Blow air into port Aand check that it flows freely out of port C.
- 3. Release blocked port B.
- 4. Apply vacuum pressure to port Band 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<sup>2</sup>, 2.22 - 2.90 psi)

-6.0 to -3.4 kPa Vacuum:

 $(-0.061 \text{ to } -0.035 \text{ kg/cm}^2, -0.87 \text{ to } -0.48 \text{ psi})$ 

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 come on.



Refer to EC-815, "Component Inspection".

FUEL TANK TEMPERATURE SENSOR

Refer to EC-759, "Component Inspection".

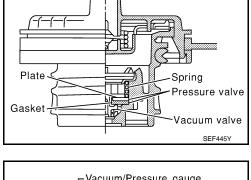
EVAP CANISTER VENT CONTROL VALVE

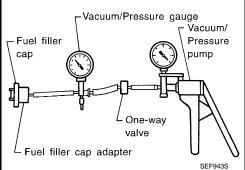
Refer to EC-821, "Component Inspection".

**EVAP CONTROL SYSTEM PRESSURE SENSOR** 

Refer to EC-838, "Component Inspection".

**EVAP SERVICE PORT** 



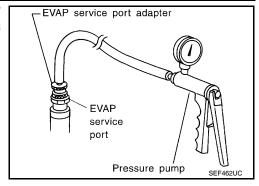


### **EVAPORATIVE EMISSION SYSTEM**

#### < SERVICE INFOMATION >

[MR TYPE 1]

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 leak.

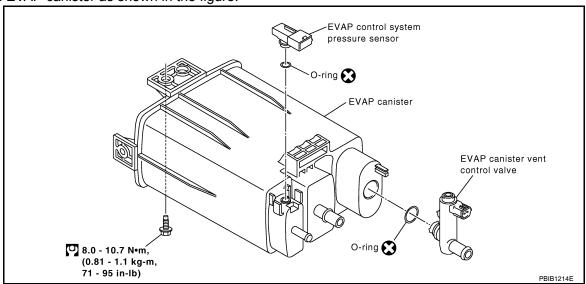


### Removal and Installation

INFOID:0000000004537030

#### **EVAP CANISTER**

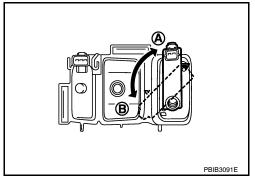
Tighten EVAP canister as shown in the figure.



#### EVAP CANISTER VENT CONTROL VALVE

- 1. Turn EVAP canister vent control valve counterclockwise.
- Lock (A)
- · Unlock (B)
- Remove the EVAP canister vent control valve.

Always replace O-ring with a new one.



# How to Detect Fuel Vapor Leakage

INFOID:0000000004537031

#### **CAUTION:**

- · Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in EVAP system.
   NOTE:
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

#### WITH CONSULT-III

- 1. Attach the EVAP service port adapter securely to the EVAP service port.
- Also attach the pressure pump and hose to the EVAP service port adapter.

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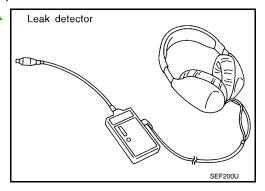
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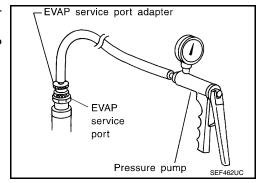
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- 3. Turn ignition switch ON.
- 4. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-III.
- 5. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
- 7. Remove EVAP service port adapter and hose with pressure pump.
- 8. Locate the leak using a leak detector. Refer to <u>EC-527</u>. "Description".

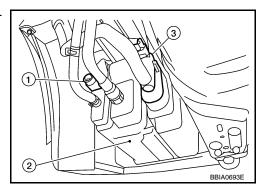


#### ■ WITHOUT CONSULT-III

- 1. Attach the EVAP service port adapter securely to the EVAP service port.
- 2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.

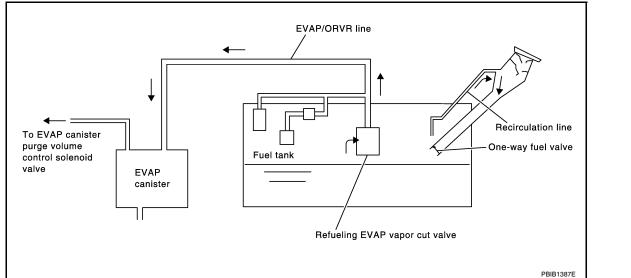


- 3. Apply battery voltage to the terminal of EVAP canister vent control valve (3) to make a closed EVAP system.
  - EVAP control system pressure sensor (1)
  - EVAP canister (2)



- 4. 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<sup>2</sup>, 0.2 to 0.4 psi).
- 5. Remove EVAP service port adapter and hose with pressure pump.
- 6. Locate the leak using a leak detector. Refer to EC-527, "Description".

System Description



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.
- · Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to furnish the workshop with a CO2 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-574, "Fuel Pressure Check".
- Disconnect negative battery cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose and clamps excessively to avoid damaging hoses.
- · After installation, run engine and check for fuel leaks at connection.
- Do not 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

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INFOID:0000000004537032

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.
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 1.9 kg (4.2 lb).

#### OK or NG

OK >> GO TO 2. NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

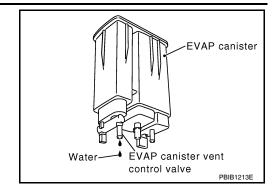
### < SERVICE INFOMATION >

[MR TYPE 1]

Does water drain from the EVAP canister?

#### 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-535, "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 1.9 kg (4.2 lb).

#### OK or NG

OK >> GO TO 2.

NG >> GO TO 3.

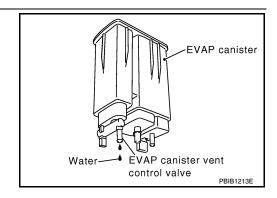
# 2.CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

#### Yes or No

Yes >> GO TO 3.

No >> GO TO 5.



# 3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

**IMR TYPE 11** < SERVICE INFOMATION >

>> 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 EVAP vapor cut valve for clogging, kink, looseness and improper connection.

#### OK or NG

OK >> GO TO 6.

NG >> Repair or replace hoses and tubes.

### 6.CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

#### OK or NG

OK >> GO TO 7.

NG >> Replace filler neck tube.

# 7.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-535, "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 filler neck 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.

>> Repair or replace one-way fuel valve with fuel tank. NG

# 10.CHECK ONE-WAY FUEL VALVE-II

- Make sure that fuel is drained from the tank.
- 2. Remove fuel filler tube and hose.
- 3. Check one-way fuel valve for operation as follows. When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

#### OK or NG

OK >> INSPECTION END

NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.

# After removing filler tube One-way fuel valve Fuel tank

Component Inspection

REFUELING EVAP VAPOR CUT VALVE

With CONSULT-III

**EC-535** 

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INFOID:0000000004537034

[MR TYPE 1]

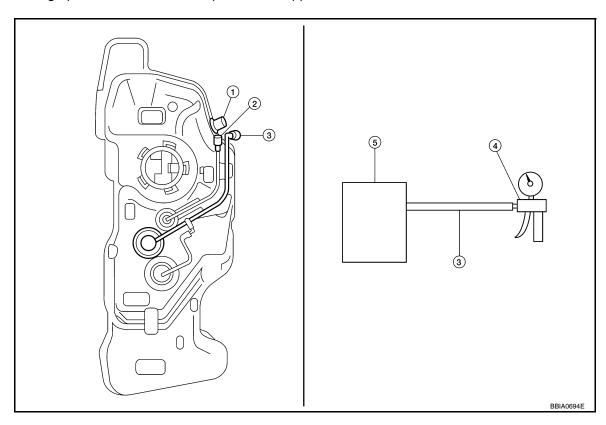
Remove fuel tank. Refer to FL-9.

< SERVICE INFOMATION >

- Drain fuel from the tank as follows:
- Remove fuel feed hose located on the fuel gauge retainer.
- Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
- Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT-III. C.
- Check refueling EVAP vapor cut valve for being stuck to close as follows. Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- Check refueling EVAP vapor cut valve for being stuck to open as follows.
- a. Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

#### Always replace O-ring with new one.

- c. Put fuel tank upside down.
- Apply vacuum pressure to hose end [-13.3 kPa (-100 mmHg, -3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Filler tube

- Recirculation line
- **EVAP/ORVR line**
- Vacuum/pressure handy pump
- 5. Fuel tank

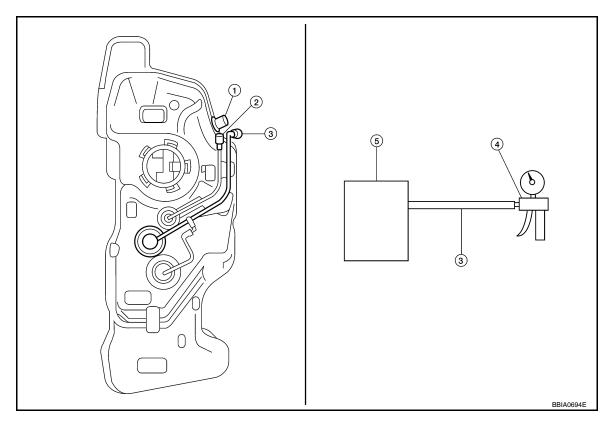
#### Without CONSULT-III

- Remove fuel tank. Refer to FL-9.
- 2. Drain fuel from the tank as follows:
- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container. b.
- Check refueling EVAP vapor cut valve for being stuck to close as follows. Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- 4. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- Connect vacuum pump to hose end.

< SERVICE INFOMATION > [MR TYPE 1]

Remove fuel gauge retainer with fuel gauge unit.
 Always replace O-ring with new one.

- c. Put fuel tank upside down.
- d. Apply vacuum pressure to hose end [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



- 1. Filler tube
- 4. Vacuum/pressure handy pump
- 2. Recirculation line
- 5. Fuel tank

3. EVAP/ORVR line

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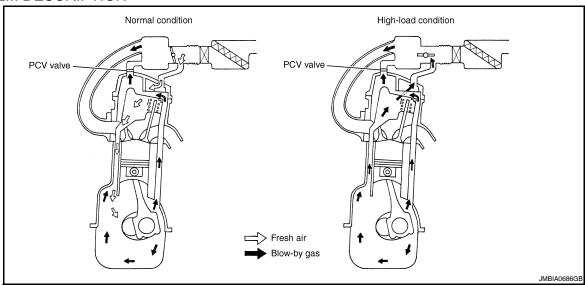
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# POSITIVE CRANKCASE VENTILATION

Description INFOID.000000004537035

#### SYSTEM DESCRIPTION

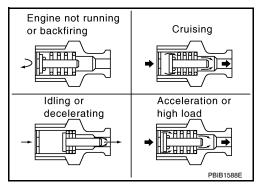


This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

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

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

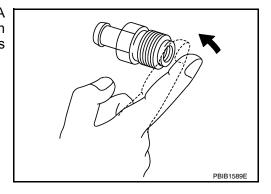


INFOID:0000000004537036

# Component Inspection

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.



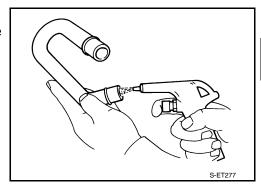
# **POSITIVE CRANKCASE VENTILATION**

< SERVICE INFOMATION >

[MR TYPE 1]

### PCV VALVE VENTILATION HOSE

- 1. Check hoses and hose connections for leaks.
- 2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



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# **NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM-NATS)**

< SERVICE INFOMATION > [MR TYPE 1]

# NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM-NATS)

Description INFOID:000000004560766

 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 <u>EC-506</u>, "<u>U1000-U1010"</u>.

- 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-571, "Procedure After Replacing ECM".

[MR TYPE 1]

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## ON BOARD DIAGNOSTIC (OBD) SYSTEM

Introduction INFOID:0000000004537038

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.

						x: Applicable	—: Not applicable
	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	SRT status	Test value
CONSULT-III	×	×	×	×	×	×	_
GST	×	×	×	_	×	X	×
ECM	×	×*	_	_	_	×	_

<sup>\*:</sup> 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 lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to <a href="EC-582">EC-582</a>, "Fail-Safe Chart".)

## 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 light up at this stage. <1st trip>

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

x: Applicable —: Not applicable

INFOID:0000000004537039

		MIL				DTC		1st trip DTC	
Items	1st trip		2nd trip		1st trip	0	1 at tria	2nd trip	
.como	Blinking	Lighting up	Blinking	Lighting up	displaying	2nd trip displaying	1st trip displaying	display- ing	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	_	_	_	_	_	×	_	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	_	_	×	_	_	×	_	_	
One trip detection diagnoses (Refer to <u>EC-542</u> , " <u>Emission-related Diagnostic Information</u> ".)	_	×	_	_	×	_	_	_	
Except above	_	_	_	×	_	×	×	_	

When there is an open circuit on MIL circuit, the ECM cannot warn the driver by MIL lighting up when there is malfunction on engine control system.

**EC-541** 

## < SERVICE INFOMATION >

[MR TYPE 1]

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

## **Emission-related Diagnostic Information**

INFOID:0000000004537040

## EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

x: Applicable —: Not applicable

					x. Applicable	—. Not applicable
	DTC	<sub>*</sub> 1				
Items (CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	SRT code	Trip	MIL lighting up	Reference page
CAN COMM CIRCUIT	U1000	1000*4	_	1 (CVT) 1 (A/T) 2 (M/T)	× (CVT) × (A/T) — (M/T)	EC-633
CAN COMM CIRCUIT	U1001	1001*4	_	2	_	EC-633
CONTROL UNIT(CAN)	U1010	1010	_	1 (CVT) 1 (A/T) 2 (M/T)	× (CVT) × (A/T) — (M/T)	EC-635
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	0000	_	_	Flashing* <sup>5</sup>	EC-557
INT/V TIM CONT-B1	P0011	0011	_	2	×	EC-636
A/F SEN1 HTR (B1)	P0031	0031	_	2	×	EC-640
A/F SEN1 HTR (B1)	P0032	0032	_	2	×	EC-640
HO2S2 HTR (B1)	P0037	0037	_	2	×	EC-645
HO2S2 HTR (B1)	P0038	0038	_	2	×	EC-645
INT/V TIM V/CIR-B1	P0075	0075	_	2	×	EC-650
MAF SEN/CIRCUIT-B1	P0101	0101	_	2	×	EC-655
MAF SEN/CIRCUIT-B1	P0102	0102	_	1	×	EC-663
MAF SEN/CIRCUIT-B1	P0103	0103	_	1	×	EC-663
IAT SEN/CIRCUIT-B1	P0112	0112	_	2	×	EC-670
IAT SEN/CIRCUIT-B1	P0113	0113	_	2	×	EC-670
ECT SEN/CIRC	P0117	0117	_	1	×	EC-674
ECT SEN/CIRC	P0118	0118	_	1	×	EC-674
TP SEN 2/CIRC-B1	P0122	0122	_	1	×	EC-679
TP SEN 2/CIRC-B1	P0123	0123	_	1	×	EC-679
ECT SENSOR	P0125	0125	_	1	×	EC-684
IAT SENSOR-B1	P0127	0127	_	2	×	EC-687
THERMSTAT FNCTN	P0128	0128	_	2	×	EC-690
A/F SENSOR1 (B1)	P0130	0130	_	2	×	EC-692
A/F SENSOR1 (B1)	P0131	0131	_	2	×	EC-698
A/F SENSOR1 (B1)	P0132	0132	_	2	×	EC-704
A/F SENSOR1 (B1)	P0133	0133	×	2	×	EC-710
HO2S2 (B1)	P0137	0137	×	2	×	EC-717
HO2S2 (B1)	P0138	0138	×	2	×	EC-724
HO2S2 (B1)	P0139	0139	×	2	×	EC-733

# ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SERVICE INFOMATION >

[MR TYPE 1]

Items	DTC	)* <sup>1</sup>				
(CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM*3	SRT code	Trip	MIL lighting up	Reference page
FUEL SYS-LEAN-B1	P0171	0171	_	2	×	EC-740
FUEL SYS-RICH-B1	P0172	0172	_	2	×	EC-746
FTT SENSOR	P0181	0181	_	2	×	EC-752
FTT SEN/CIRCUIT	P0182	0182	_	2	×	EC-756
FTT SEN/CIRCUIT	P0183	0183	_	2	×	EC-756
TP SEN 1/CIRC-B1	P0222	0222	_	1	×	EC-760
TP SEN 1/CIRC-B1	P0223	0223	_	1	×	EC-760
MULTI CYL MISFIRE	P0300	0300	_	2	×	EC-765
CYL 1 MISFIRE	P0301	0301	_	2	×	EC-765
CYL 2 MISFIRE	P0302	0302	_	2	×	EC-765
CYL 3 MISFIRE	P0303	0303	_	2	×	EC-765
CYL 4 MISFIRE	P0304	0304	_	2	×	EC-765
KNOCK SEN/CIRC-B1	P0327	0327	_	2	_	EC-771
KNOCK SEN/CIRC-B1	P0328	0328	_	2	_	EC-771
CKP SEN/CIRCUIT	P0335	0335	_	2	×	EC-775
CMP SEN/CIRC-B1	P0340	0340	_	2	×	EC-781
TW CATALYST SYS-B1	P0420	0420	×	2	×	EC-787
EVAP PURG FLOW/MON	P0441	0441	×	2	×	EC-792
EVAP SMALL LEAK	P0442	0442	×	2	×	EC-797
PURG VOLUME CONT/V	P0443	0443	_	2	×	EC-804
PURG VOLUME CONT/V	P0444	0444	_	2	×	EC-811
PURG VOLUME CONT/V	P0445	0445	_	2	×	EC-811
VENT CONTROL VALVE	P0447	0447	_	2	×	EC-817
VENT CONTROL VALVE	P0448	0448	_	2	×	EC-823
EVAP SYS PRES SEN	P0451	0451	_	2	×	EC-829
EVAP SYS PRES SEN	P0452	0452	_	2	×	EC-832
EVAP SYS PRES SEN	P0453	0453	_	2	×	EC-839
EVAP GROSS LEAK	P0455	0455	_	2	×	EC-847
EVAP VERY SML LEAK	P0456	0456	×*6	2	×	EC-853
FUEL LEV SEN SLOSH	P0460	0460	_	2	×	EC-860
FUEL LEVEL SENSOR	P0461	0461	_	2	×	EC-862
FUEL LEVL SEN/CIRC	P0462	0462	_	2	×	EC-864
FUEL LEVL SEN/CIRC	P0463	0463	_	2	×	EC-864
VEH SPEED SEN/CIRC*7	P0500	0500	_	2	×	EC-866
ISC SYSTEM	P0506	0506	_	2	×	EC-868
ISC SYSTEM	P0507	0507	_	2	×	EC-870
ECM	P0605	0605	_	1 or 2	— or ×	EC-872
SENSOR POWER/CIRC	P0643	0643	_	1	×	EC-874
PNP SW/CIRC	P0705	0705	_	2	×	AT-91 (A/T), CVT-244 (CVT)
ATF TEMP SEN/CIRC	P0710	0710	_	1(CVT) 2(A/T)	×	AT-96 (A/T), CVT-249 (CVT)
INPUT SPD SEN/CIRC	P0715	0715	_	2	×	CVT-254

## < SERVICE INFOMATION >

	DTC	;*1				
Items (CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM*3	SRT code	Trip	MIL lighting up	Reference page
VEH SPD SEN/CIR AT* <sup>7</sup>	P0720	0720	_	2	×	AT-101 (A/T), CVT-258 (CVT)
ENGINE SPEED SIG	P0725	0725	_	2	×	<u>CVT-263</u>
A/T 1ST GR FNCTN	P0731	0731	_	2	×	<u>AT-110</u>
A/T 2ND GR FNCTN	P0732	0732	_	2	×	<u>AT-113</u>
A/T 3RD GR FNCTN	P0733	0733	_	2	×	<u>AT-116</u>
A/T 4TH GR FNCTN	P0734	0734	_	2	×	<u>AT-119</u>
TCC SOLENOID/CIRC	P0740	0740	_	2	×	<u>AT-124</u>
A/T TCC S/V FNCTN	P0744	0744	_	2	×	<u>AT-129</u> (A/T), <u>CVT-271</u> (CVT)
L/PRESS SOL/CIRC	P0745	0745	_	2	×	<u>CVT-273</u>
PRS CNT SOL/A FCTN	P0746	0746	_	1	×	<u>CVT-278</u>
SFT SOL A/CIRC	P0750	0750	_	1	×	<u>AT-139</u>
SFT SOL B/CIRC	P0755	0755	_	1	×	<u>AT-144</u>
PRS CNT SOL/B FCTN	P0776	0776	_	2	×	<u>CVT-280</u>
PRS CNT SOL/B CIRC	P0778	0778	_	2	×	<u>CVT-282</u>
TR PRS SENS/A CIRC	P0840	0840	_	2	×	<u>CVT-287</u>
TR PRS SENS/B CIRC	P0845	0845	_	2	×	<u>CVT-119</u>
P-N POS SW/CIRCUIT	P0850	0850	_	2	×	EC-879
CLOSED LOOP-B1	P1148	1148	_	1	×	EC-885
ENG OVER TEMP	P1217	1217	_	1	×	EC-886
CTP LEARNING-B1	P1225	1225	_	2	_	EC-895
CTP LEARNING-B1	P1226	1226	_	2	_	EC-897
COLD START CONTROL	P1421	1421	_	2	×	EC-899
ASCD SW	P1564	1564	_	1	_	EC-901
ASCD BRAKE SW	P1572	1572	_	1	_	EC-907
ASCD VHL SPD SEN	P1574	1574	_	1	_	EC-916
LOCK MODE	P1610	1610	_	2	_	BL-259
ID DISCORD,IMMU-ECM	P1611	1611	_	2	_	BL-259
CHAIN OF ECM-IMMU	P1612	1612	_	2	_	BL-259
CHAIN OF IMMU-KEY	P1614	1614	_	2	_	BL-259
DIFFERENCE OF KEY	P1615	1615	_	2	_	BL-259
TP SEN/CIRC A/T	P1705	1705	_	1	×	<u>CVT-299</u>
IN PULY SPEED	P1715	1715	_	2	_	<u>EC-918</u> (A/T), <u>EC-919</u> (CVT)
LU-SLCT SOL/CIRC	P1740	1740	_	2	×	CVT-306
O/R CLTCH SOL/CIRC	P1760	1760	_	2	×	<u>AT-149</u>
STEP MOTR CIRC	P1777	1777	_	1	×	CVT-311
STEP MOTR FNC	P1778	1778	_	2	×	<u>CVT-315</u>
BRAKE SW/CIRCUIT	P1805	1805	_	2	_	EC-921
ETC MOT PWR-B1	P2100	2100	_	1	×	EC-925
ETC FNCTN/CIRC-B1	P2101	2101	_	1	×	EC-929
ETC MOT PWR	P2103	2103	_	1	×	EC-925

[MR TYPE 1]

Items	DTC	DTC*1				
(CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	SRT code	Trip	MIL lighting up	Reference page
ETC MOT-B1	P2118	2118	_	1	×	EC-935
ETC ACTR-B1	P2119	2119	_	1	×	EC-940
APP SEN 1/CIRC	P2122	2122	_	1	×	EC-942
APP SEN 1/CIRC	P2123	2123	_	1	×	EC-942
APP SEN 2/CIRC	P2127	2127	_	1	×	EC-947
APP SEN 2/CIRC	P2128	2128	_	1	×	EC-947
TP SENSOR-B1	P2135	2135	_	1	×	EC-954
APP SENSOR	P2138	2138	_	1	×	EC-959
A/F SENSOR1 (B1)	P2A00	2A00	_	2	×	EC-966

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

### 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 stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

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 INFOR-MATION 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-577, "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

## WITH GST

CONSULT-III or GST (Generic Scan Tool) Examples: P0340, P0850, P1148, etc.

These DTCs are prescribed by SAE J2012.

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

### **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.

**EC-545** 

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<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*4:</sup> The troubleshooting for this DTC needs CONSULT-III.

<sup>\*5:</sup> When the ECM in the mode of displaying SRT status, MIL may flash. For the details, refer to "How to Display SRT Status".

<sup>\*6:</sup> SRT code will not be set if the self-diagnostic result is NG.

<sup>\*7:</sup> When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

- · 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.

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

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

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

## 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 <u>EC-604</u>, "CONSULT-III Function (ENGINE)".

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 - P0304 Fuel Injection System Function — DTC: P0171, P0172			
2		Except the above items (Includes A/T or CVT 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 "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS".

## 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 indica- tion)	Perfor- mance Priority*	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
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
		Heated oxygen sensor 2	P0137
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139

<sup>\*:</sup> 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.

				Example			
Self-diagnosis result		Diagnosis	← ON → O		on cycle $\leftarrow$ ON $\rightarrow$ 0	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.

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

When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result.  $\rightarrow$  Case 2 above

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<sup>-:</sup> Self-diagnosis is not carried out.

If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT".  $\rightarrow$  Case 3 above

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

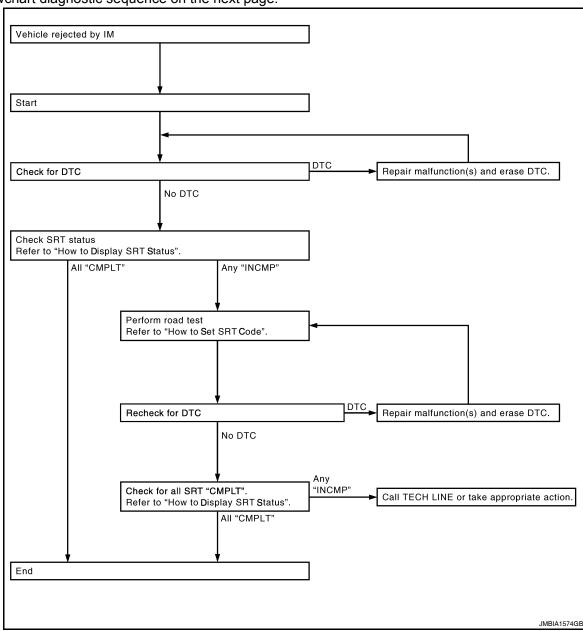
- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis
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

#### NOTE:

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

#### SRT Service Procedure

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



How to Display SRT Status

< SERVICE INFOMATION > [MR TYPE 1]

Selecting "SRT STATUS" in "DTC & SRT ONFIRMATION" mode with CONSULT-III.

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

#### NOTE:

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

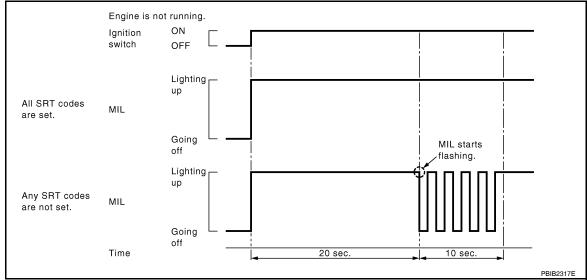
#### WITH GST

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

### NO TOOLS

A SRT code itself can not be displayed while only SRT status can be.

- 1. Turn ignition switch ON and wait 20 seconds.
- 2. SRT status is indicated as shown below.
  - When all SRT codes are set, MIL lights up continuously.
  - When any SRT codes are not set, MIL will flash 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 on the next page. The driving pattern should be performed one or more times to set all SRT codes.

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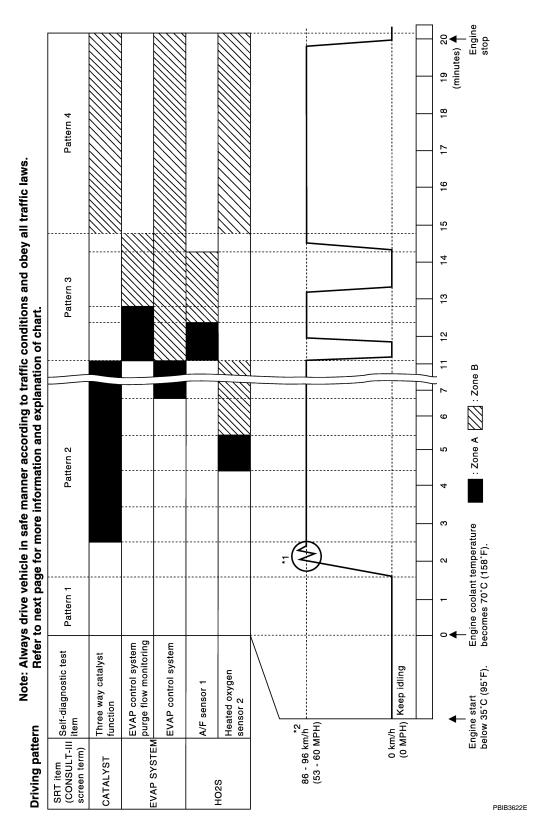
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**Driving Pattern** 



- 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

< SERVICE INFOMATION >

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

Pattern 1:

- The engine is started at the engine coolant temperature of –10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 38 and ground is 3.0 - 4.3V).
- The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 38 and ground is lower than 1.4V).
- The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 43 and ground is less than 4.1V).

Pattern 2:

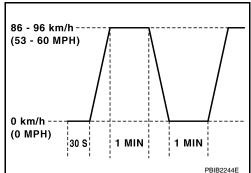
 When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during decelerating 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 steadystate driving.
- If the accelerator pedal is moved, the test must be conducted all over 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 and CVT Models

Set the selector lever in the D position (CVT), D position with the overdrive switch turned ON (A/T).

## Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:	For quick acceleration in low altitude areas	For high attitude areas [over 1,219m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	km/h (MPH)	km/h (MPH)
1st to 2nd	13 (8)	24 (15)	24 (15)
2nd to 3rd	27 (17)	40 (25)	40 (25)
3rd to 4th	40 (25)	53 (33)	65 (40)
4th to 5th	58 (36)	71 (44)	73 (45)
5th to 6th	82 (51)	82 (51)	82 (51)

### Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.

Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits and drive according to the road conditions to ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

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Gear	km/h (MPH)
1st	50 (30)
2nd	90 (55)
3rd	_
4th	_
5th	_
6th	_

## 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-	Self-diagnostic test item	DTC	li	e and Test mit display)	Description
item	MID	Gen-diagnostic test item	Dic	TID	Unit and Scaling ID	
			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
		Air fuel ratio (A/F) sensor 1 (Bank 1)	P0130	86H	0BH	Maximum sensor output voltage for test cycle
	01H		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
HO2S			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited frequency
		Heated oxygen sensor 2 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle
	02H		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

[MR TYPE 1]

	OBD-	Self-diagnostic test item		li	e and Test mit display)	
Item MIC	MID		DTC	TID	Unitand Scaling ID	Description
			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
		Air fuel ratio (A/F) sensor 1	P0150	86H	0BH	Maximum sensor output voltage for test cycle
	05H	(Bank 2)	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
HO2S			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
		Heated oxygen sensor 2 (Bank 2)	P0158	07H	0CH	Minimum sensor output voltage for test cycle
	06H		P0157	08H	0CH	Maximum sensor output voltage for test cycle
			P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
		Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
	07H		P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
			P0420	80H	01H	O2 storage index
21H	21⊔	Three way catalyst function (Bank1)	P0420	82H	01H	Switching time lag engine exhaust index value
	Δ1Π		P2423	83H	0CH	Difference in 3rd O2 sensor output voltage
CATA-			P2423	84H	84H	O2 storage index in HC trap catalyst
YST			P0430	80H	01H	O2 storage index
	22H	Three way catalyst function (Bank2)	P0430	82H	01H	Switching time lag engine exhaust index value
	22П		P2424	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2424	84H	84H	O2 storage index in HC trap catalyst

## < SERVICE INFOMATION >

					e and Test mit	
Item	OBD-		DTC		display)	Description
item	MID	och diagnostic test tem		TID	Unitand Scaling ID	2000,
			P0400	80H	96H	Low Flow Faults: EGR temp change rate (short term)
			P0400	81H	96H	Low Flow Faults: EGR temp change rate (long term)
EGR SYSTEM	31H	EGR function	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
	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down
	3ВН	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04inch)
EVAP SYSTEM	3СН	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
	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
O2 SEN- SOR	43H	Heated oxygen sensor 3 (Bank 1)	P0043	80H	0CH	Converted value of Heater electric current to voltage
HEATER	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
			P0411	80H	01H	Secondary Air Injection System Incor- rect Flow Detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary Air Injection System Insufficient Flow
050		71H Secondary Air system	P2445	82H	01H	Secondary Air Injection System Pump Stuck Off
SEC- OND- ARY AIR	71H		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

[MR TYPE 1]

		Self-diagnostic test item		li	e and Test mit				
Item	OBD- MID		DTC	(GST display)  Unitand  TID Scaling ID		Description			
		Fuel injection system function	P0171 or P0172	80H	2FH	Long term fuel trim			
FUEL	81H	(Bank 1)	P0171 or P0172	81H	24H	The number of lambda control clamped			
SYSTEM		Fuel injection system function	P0174 or P0175	80H	2FH	Long term fuel trim			
	82H	(Bank 2)	P0174 or P0175	81H	24H	The number of lambda control clamped			
			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			
	RE A1H					P0300	88H	24H	Misfiring counter at 1000rev of the multiple cylinders
MISFIRE		Multiple Cylinder Misfire	P0301	89H	24H	Misfiring counter at 200rev of the first cylinder			
WIOI IICE	AIII	Multiple Cylinder Mistire	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			

## < SERVICE INFOMATION >

		Self-diagnostic test item			e and Test mit	
Item	OBD-		DTC		display)	Description
	MID	och diagnostic test tem		TID	Unit and Scaling ID	
	A2H	No.1 Cylinder Misfire	P0301	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles
			P0301	0CH	24H	Misfire counts for last/current driving cycles
	АЗН	No.2 Cylinder Misfire	P0302	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles
			P0302	0CH	24H	Misfire counts for last/current driving cycles
	A4H	No.3 Cylinder Misfire	P0303	ОВН	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	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
MICEIDE		-	P0304	0CH	24H	Misfire counts for last/current driving cycles
MISFIRE	A6H No.5 Cylinder Misfire	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
	А7Н	,	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		P0307	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles
			P0307	0CH	24H	Misfire counts for last/current driving cycles
	А9Н	No.8 Cylinder Misfire	P0308	ОВН	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 or CVT related items (see EC-506), skip step 1.
- 1. Erase DTC in TCM.
- Select "ENGINE" with CONSULT-III.
- Select "SELF-DIAG RESULTS".

## ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SERVICE INFOMATION > [MR TYPE 1]

4. Touch "ERASE". (The DTC in the 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.

Select Service \$04 with GST.

## 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 lost within 24 hours.
- The following data are cleared when the ECM memory is erased.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

## Malfunction Indicator Lamp (MIL)

INFOID:0000000004537041

### DESCRIPTION

The MIL is located on the instrument panel.

- The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, refer to DI-20 or see EC-1010.
- When the engine is started, the MIL should go off.
  If the MIL remains on, the on board diagnostic system has
  detected an engine system malfunction.



### ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following three functions.

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### < SERVICE INFOMATION >

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	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected.  The following malfunctions will light up 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 MIL lighting up 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 Flashing Without DTC

When any SRT codes are not set, MIL may flash without DTC. For the details, refer to <u>EC-542</u>. "Emission-related Diagnostic Information".

### HOW TO SWITCH DIAGNOSTIC TEST MODE

#### NOTE:

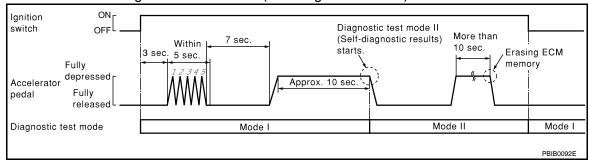
- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF.

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

- Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 2. Repeat the following procedure quickly five times within 5 seconds.
- a. Fully depress the accelerator pedal.
- b. Fully release the accelerator pedal.
- 3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
- 4. Fully release the accelerator pedal.

< SERVICE INFOMATION > [MR TYPE 1]

ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



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

- Set ECM in Diagnostic Test Mode II (Self-diagnostic results).
   Refer to "How to Set Diagnostic Test Mode II (Self-diagnostic Results)".
- 2. Fully depress the accelerator pedal and keep it for more than 10 seconds.

  The emission-related diagnostic information has been erased from the backup memory in the ECM.
- 3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

## DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-20 or EC-1010.

## DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

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

These DTC numbers are 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-

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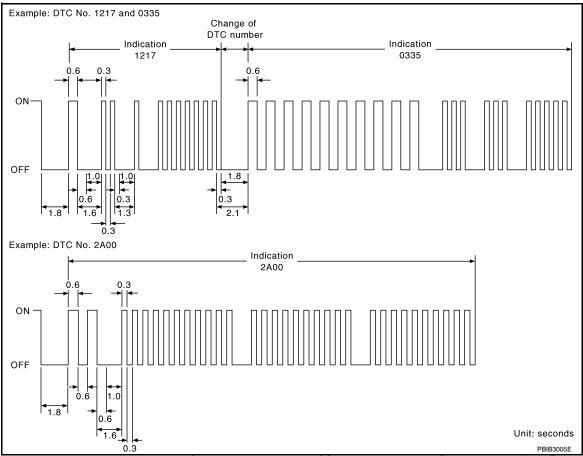
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tified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The "A" is indicated by the number of eleven flash. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle. The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle. A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

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

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See EC-506)

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

The DTC can be erased from the back-up memory in the ECM by depressing accelerator pedal.

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

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

## **OBD System Operation Chart**

INFOID:0000000004537042

## 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. For details, refer to EC-541, "Two Trip Detection Logic".
- The MIL will go off after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern).

## ON BOARD DIAGNOSTIC (OBD) SYSTEM

## < SERVICE INFOMATION >

[MR TYPE 1]

C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CON-SULT-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 (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

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

For details about patterns A and B under "Other", see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUAL-ITY DETERIORATION>", "FUEL INJECTION SYSTEM"".

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

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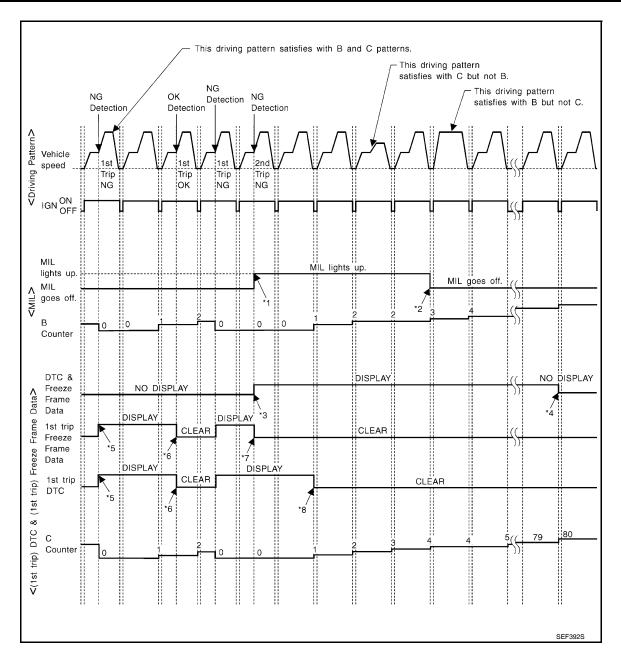
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<sup>\*1:</sup> Clear timing is at the moment OK is detected.

<sup>\*2:</sup> Clear timing is when the same malfunction is detected in the 2nd trip.



- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*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.)
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*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.
- \*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the 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.

# EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

## ON BOARD DIAGNOSTIC (OBD) SYSTEM

[MR TYPE 1] < SERVICE INFOMATION >

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 go off when the B counter reaches 3. (\*2 in "OBD SYSTEM OPERATION CHART")

### <Driving Pattern C>

Driving pattern C means the vehicle operation as follows:

The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data)  $\pm 375$  rpm

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

Engine coolant temperature (T) condition:

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

#### Example:

If the stored freeze frame data is as follows:

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

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

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

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

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

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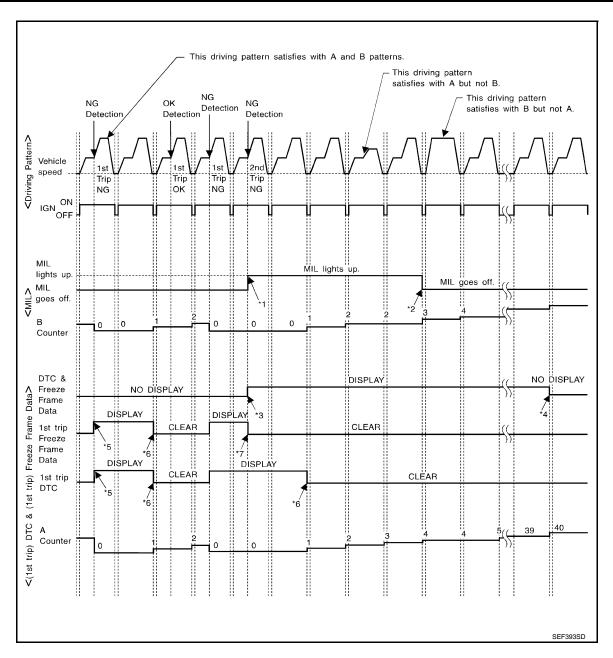
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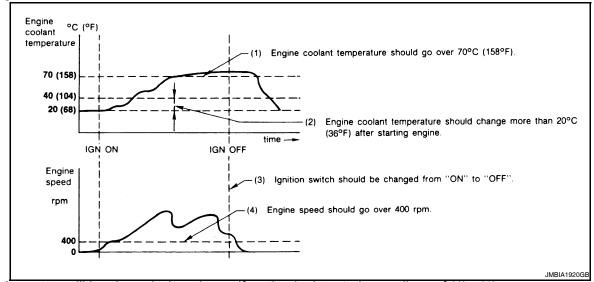


- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*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.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the 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.

EXPLANATION FOR DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



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

## <Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

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

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

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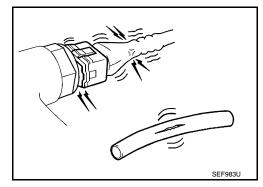
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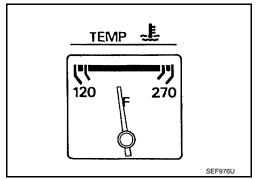
## BASIC SERVICE PROCEDURE

Basic Inspection

## 1.INSPECTION START

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

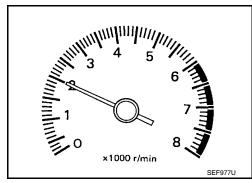




- 5. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 6. Make sure that no DTC is displayed with CONSULT-III or GST.

#### OK or NG

OK >> GO TO 3. NG >> GO TO 2.



## 2. REPAIR OR REPLACE

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

>> GO TO 3.

## 3. CHECK TARGET IDLE SPEED

## With CONSULT-III

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

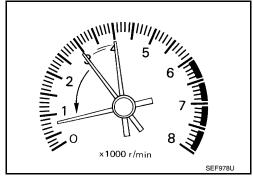
## **BASIC SERVICE PROCEDURE**

## < SERVICE INFOMATION > [MR TYPE 1]

2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.

3. Read idle speed in "DATA MONITOR" mode with CONSULT-III. Refer to EC-570, "Idle Speed and Ignition Timing Check".

M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)



## Without CONSULT-III

- 1. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
- 3. Check idle speed. Refer to EC-570, "Idle Speed and Ignition Timing Check".

M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)

## OK or NG

OK >> GO TO 10. NG >> GO TO 4.

## 4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform EC-572, "Accelerator Pedal Released Position Learning".

>> GO TO 5.

## 5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-572, "Throttle Valve Closed Position Learning".

>> GO TO 6.

## 6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-572, "Idle Air Volume Learning".

### Is Idle Air Volume Learning carried out successfully?

### Yes or No

Yes >> GO TO 7.

No >> 1. Follow the instruction of Idle Air Volume Learning.

GO TO 4.

## 7.CHECK TARGET IDLE SPEED AGAIN

### With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Read idle speed in "DATA MONITOR" mode with CONSULT-III. Refer to <u>EC-570</u>, "Idle Speed and Ignition <u>Timing Check"</u>.

M/T: 700  $\pm$  50 rpm (in Neutral position) A/T: 700  $\pm$  50 rpm (in P or N position) CVT: 700  $\pm$  50 rpm (in P or N position)

## Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Check idle speed. Refer to <u>EC-570</u>, "Idle Speed and Ignition Timing Check".

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M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  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 crankshaft position sensor (POS) and circuit.
 Refer to EC-775.

Check camshaft position sensor (PHASE) and circuit.
 Refer to EC-781.

#### OK or NG

OK >> GO TO 9.

NG >> 1. Repair or replace.

2. GO TO 4.

## 9. CHECK ECM FUNCTION

- 1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
- 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "ECM Re-communicating Function".

>> GO TO 4.

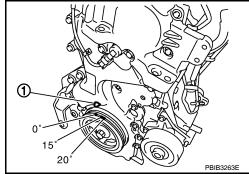
# 10. CHECK IGNITION TIMING

- 1. Run engine at idle.
- Check ignition timing with a timing light.
   Refer to <u>EC-570</u>, "Idle Speed and Ignition Timing Check".
- Timing indicator (1)

M/T:  $13 \pm 5^\circ$  BTDC (in Neutral position) A/T:  $13 \pm 5^\circ$  BTDC (in P or N position) CVT:  $13 \pm 5^\circ$  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.
- Perform <u>EC-572</u>, "Accelerator <u>Pedal Released Position Learning</u>".

>> GO TO 12.

# 12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-572, "Throttle Valve Closed Position Learning".

>> GO TO 13.

## 13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-572, "Idle Air Volume Learning".

Is Idle Air Volume Learning carried out successfully?

Yes or No

## **BASIC SERVICE PROCEDURE**

[MR TYPE 1] < SERVICE INFOMATION > Yes >> GO TO 14.

No >> 1. Follow the instruction of Idle Air Volume Learning. GO TO 4.

# 14. CHECK TARGET IDLE SPEED AGAIN

### With CONSULT-III

Start engine and warm it up to normal operating temperature.

2. Read idle speed in "DATA MONITOR" mode with CONSULT-III. Refer to EC-570, "Idle Speed and Ignition Timing Check".

M/T: 700  $\pm$  50 rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)

### Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.

Check idle speed. Refer to EC-570, "Idle Speed and Ignition Timing Check".

M/T: 700  $\pm$  50 rpm (in Neutral position) A/T: 700  $\pm$  50 rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)

### OK or NG

OK >> GO TO 15. NG >> GO TO 17.

# 15. CHECK IGNITION TIMING AGAIN

Run engine at idle.

2. Check ignition timing with a timing light. Refer to EC-570, "Idle Speed and Ignition Timing Check".

Timing indicator (1)

M/T:  $13 \pm 5^{\circ}$  BTDC (in Neutral position) A/T:  $13 \pm 5^{\circ}$  BTDC (in P or N position) CVT:  $13 \pm 5^{\circ}$  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-160.

## 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 crankshaft position sensor (POS) and circuit. Refer to EC-775.

 Check camshaft position sensor (PHASE) and circuit. Refer to EC-781.

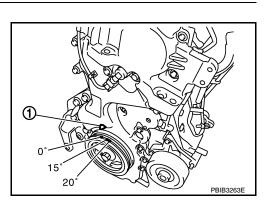
### OK or NG

OK >> GO TO 18.

NG >> 1. Repair or replace.

GO TO 4.

18.check ecm function



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## < SERVICE INFOMATION >

- Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
- 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "ECM Re-communicating Function".

>> GO TO 4.

## 19. INSPECTION END

Did you replace ECM, referring this Basic Inspection procedure?

## Yes or No

Yes >> 1. Perform <u>EC-572</u>, "VIN Registration".

2. INSPECTION END

No >> INSPECTION END

## Idle Speed and Ignition Timing Check

INFOID:0000000004537044

## **IDLE SPEED**

## With CONSULT-III

Check idle speed in "DATA MONITOR" mode with CONSULT-III.

## With GST

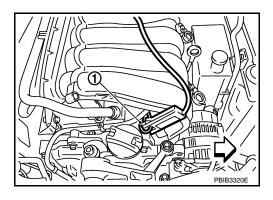
Check idle speed in Service \$01 with GST.

### **IGNITION TIMING**

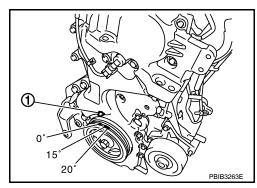
Any of following two methods may be used.

### Method A

- 1. Attach timing light to loop wire (1) as shown.
  - : Vehicle front



- 2. Check ignition timing.
  - Timing indicator (1)

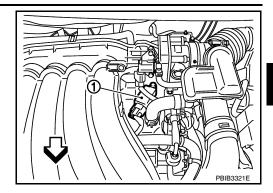


#### Method B

1. Remove No. 4 ignition coil (1).

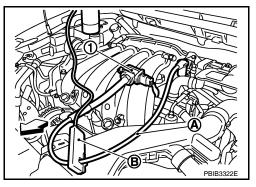
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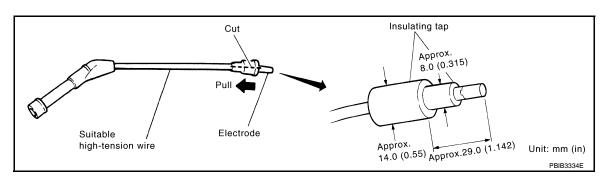
• : Vehicle front



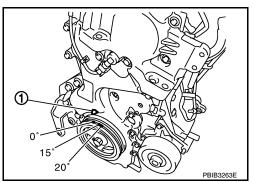
2. Connect No. 4 ignition coil (1) and No. 4 spark plug with suitable high-tension wire (A) as shown, and attach timing light clamp (B) to this wire.

• : Vehicle front





- Check ignition timing.
  - Timing indicator (1)



## Procedure After Replacing ECM

When replacing ECM, the following procedure must be performed.

- 1. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>".
- 2. Perform EC-572, "VIN Registration".
- 3. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 4. Perform EC-572, "Throttle Valve Closed Position Learning".

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EC-571

#### < SERVICE INFOMATION >

5. Perform EC-572, "Idle Air Volume Learning".

## VIN Registration

INFOID:0000000004537046

#### DESCRIPTION

VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced. **NOTE:** 

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

## **OPERATION PROCEDURE**

#### With CONSULT-III

- 1. Check the VIN of the vehicle and note it. Refer to GI-43.
- 2. Turn ignition switch ON and engine stopped.
- 3. Select "VIN REGISTRATION" in "WORK SUPPORT" mode.
- 4. Follow the instruction of CONSULT-III display.

## Accelerator Pedal Released Position Learning

INFOID:0000000004537047

## **DESCRIPTION**

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

### **OPERATION PROCEDURE**

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

## Throttle Valve Closed Position Learning

INFOID:0000000004537048

### DESCRIPTION

Throttle Valve Closed Position Learning is an operation 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.

### **OPERATION PROCEDURE**

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

## Idle Air Volume Learning

INFOID:0000000004537049

## **DESCRIPTION**

Idle Air Volume Learning is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

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

## **PREPARATION**

Before performing Idle Air Volume Learning, make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 95°C (158 203°F)
- · Park/neutral position (PNP) switch: ON
- · Electric load switch: OFF

## **BASIC SERVICE PROCEDURE**

#### [MR TYPE 1] < SERVICE INFOMATION >

[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
- Models with CONSULT-III (A/T and CVT models)
- Drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" or "CVT" system indicates less than 0.9V.
- Models without CONSULT-III (A/T and CVT models) and M/T models
- · Drive vehicle for 10 minutes.

### OPERATION PROCEDURE

### With CONSULT-III

- Perform EC-572, "Accelerator Pedal Released Position Learning".
- Perform <u>EC-572</u>, "Throttle Valve Closed Position Learning".
- Start engine and warm it up to normal operating temperature.
- Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
- Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 6. Touch "START" and wait 20 seconds.
- Make sure 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 the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

Refer to EC-566, "Basic Inspection".

ITEM	SPECIFICATION
Idle speed	M/T: $700 \pm 50$ rpm (in Neutral position) A/T: $700 \pm 50$ rpm (in P or N position) CVT: $700 \pm 50$ rpm (in P or N position)
Ignition timing	M/T: $13 \pm 5^{\circ}$ BTDC (in Neutral position) A/T: $13 \pm 5^{\circ}$ BTDC (in P or N position) CVT: $13 \pm 5^{\circ}$ 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-572, "Accelerator Pedal Released Position Learning".
- Perform <u>EC-572</u>, "Throttle Valve Closed Position Learning".
- 3. Start engine and warm it up to normal operating temperature.
- 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.
- 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.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
- Fully release the accelerator pedal within 3 seconds after the MIL turned ON.
- Start engine and let it idle.

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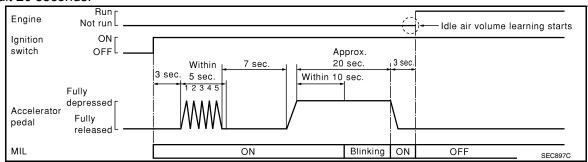
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11. Wait 20 seconds



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications. Refer to EC-566, "Basic Inspection".

ITEM	SPECIFICATION
Idle speed	M/T: $700 \pm 50$ rpm (in Neutral position) A/T: $700 \pm 50$ rpm (in P or N position) CVT: $700 \pm 50$ rpm (in P or N position)
Ignition timing	M/T: $13 \pm 5^{\circ}$ BTDC (in Neutral position) A/T: $13 \pm 5^{\circ}$ BTDC (in P or N position) CVT: $13 \pm 5^{\circ}$ BTDC (in P or N position)

13. If idle speed and ignition timing are not within the specification, 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 follows:

- 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 <u>EC-618</u>.
- 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 all over again:
- Engine stalls.
- Erroneous idle.

## **Fuel Pressure Check**

INFOID:0000000004537050

#### **FUEL PRESSURE RELEASE**

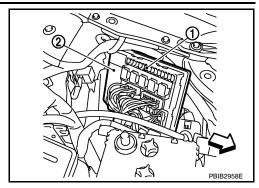
- With CONSULT-III
- 1. Turn ignition switch ON.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-III.
- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- Without CONSULT-III

## **BASIC SERVICE PROCEDURE**

## < SERVICE INFOMATION > [MR TYPE 1]

1. Remove fuel pump fuse (1) located in IPDM E/R (2).

- : Vehicle front
- 2. Start engine.
- 3. After engine stalls, crank it two or three times to release all fuel pressure.
- 4. Turn ignition switch OFF.
- 5. Reinstall fuel pump fuse after servicing fuel system.



## **FUEL PRESSURE CHECK**

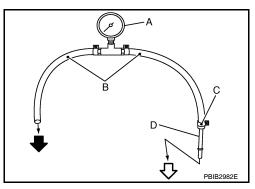
#### **CAUTION:**

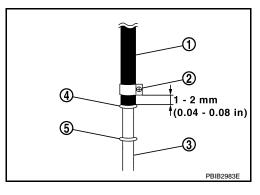
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger. NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because C11 models do not have fuel return system.
- The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.
- Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains sealability with O-rings inside.
- Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.
- 1. Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
- 2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
  - : To quick connector
  - To fuel tube (engine side)
  - C: Clamp
  - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
  - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
  - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
  - Use Pressure Gauge to check fuel pressure.
- 3. Remove fuel hose. Refer to EM-156.
  - Do not twist or kink fuel hose because it is plastic hose.
- 4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
  - No.2 spool (5)
  - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
  - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
  - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
  - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
  - When reconnecting fuel line, always use new clamps.
  - Use a torque driver to tighten clamps.
  - Install hose clamp to the position within 1 2 mm (0.04 0.08 in).

## Tightening torque: 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

Make sure that clamp screw does not contact adjacent parts.





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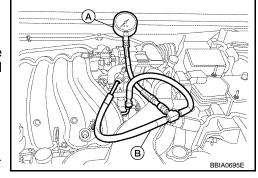
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## **BASIC SERVICE PROCEDURE**

### < SERVICE INFOMATION >

[MR TYPE 1]

- Connect fuel tube adapter to quick connector.
  - · A: Fuel pressure gauge
  - B: Fuel hose for fuel pressure check
- After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
- 7. Turn ignition switch ON and check for fuel leakage.
- Start engine and check for fuel leakage.
- 9. Read the indication of fuel pressure gauge.
  - Do not perform fuel pressure check with system operating.
     Fuel pressure gauge may indicate false readings.
  - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.



## At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 51 psi)

- 10. If result is unsatisfactory, go to next step.
- 11. Check the following.
  - Fuel hoses and fuel tubes for clogging
  - · Fuel filter for clogging
  - Fuel pump
  - · Fuel pressure regulator for clogging

If OK, replace fuel pressure regulator.

If NG, repair or replace.

- 12. Check the following.
  - · Fuel hoses and fuel tubes for clogging
  - Fuel filter for clogging
  - Fuel pump
  - · Fuel pressure regulator for clogging

If OK, replace fuel pressure regulator.

If NG, repair or replace.

13. Before disconnecting Fuel Pressure Gauge and Fuel Pressure Adapter J-44321-6, release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".

# TROUBLE DIAGNOSIS

# **Trouble Diagnosis Introduction**

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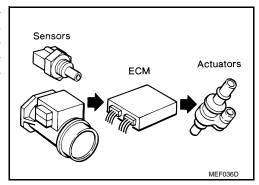
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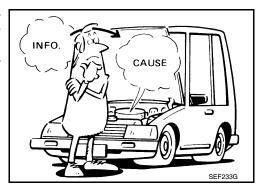
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#### INTRODUCTION

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 leaks, fouled spark plugs, or other malfunctions with the engine.



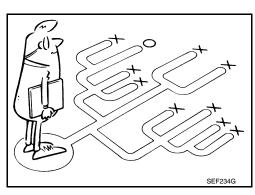
It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



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 on "WORK FLOW".

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.

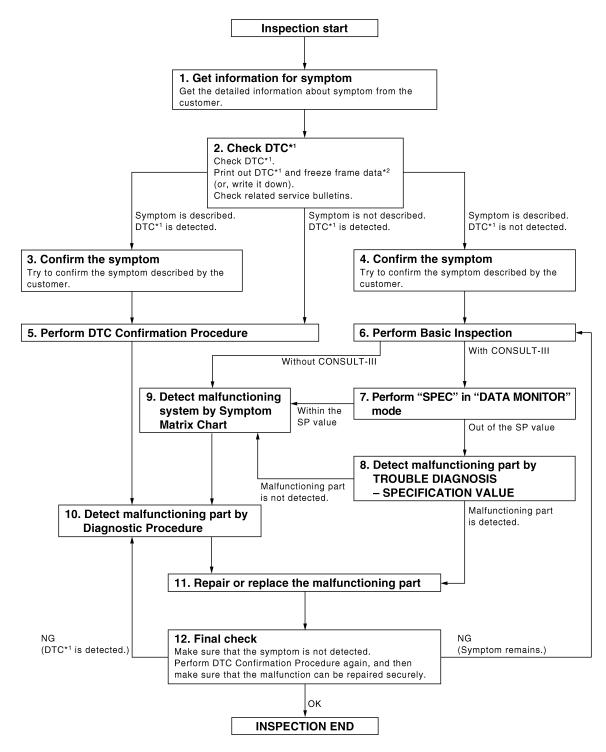


**WORK FLOW** 

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Overall Sequence



\*1: Include 1st trip DTC.

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

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#### **Detailed Flow**

# 1.GET INFORMATION FOR SYMPTOM

Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "DIAGNOSTIC WORKSHEET".

**IMR TYPE 11** < SERVICE INFOMATION >

# $\overline{2}$ .CHECK DTC $^{*1}$

Check DTC\*1. 1.

Perform the following procedure if DTC\*<sup>1</sup> is displayed.

Record DTC\*1 and freeze frame data\*2. (Print them out with CONSULT-III or GST.)

Erase DTC\*1. (Refer to EC-542, "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-583, "Symptom Matrix Chart".)

Check related service bulletins for information.

### Is any symptom described and any DTC 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 WORK SHEET is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

# f 4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

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.

# ${f 5}$ PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC Confirmation Procedure for the displayed DTC\*1, and then make sure that DTC\*1 is detected again.

If two or more DTCs\*<sup>1</sup> are detected, refer to EC-581, "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<sup>1</sup> by DTC Confirmation Procedure.

Is DTC\*1 detected?

Yes >> GO TO 10.

>> Check according to EC-626.

#### $\mathbf{6}$ Perform basic inspection

Perform EC-566, "Basic Inspection".

With CONSULT-III>>GO TO 7. Without CONSULT-III>>GO TO 9.

# / .PERFORM SPEC IN DATA MONITOR (SPEC) MODE

### With CONSULT-III

Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL", and "A/F ALPHA-B1" are within the SP value using CONSULT-III "SPEC" in "DATA MONITOR" mode. Refer to EC-618, "Inspection Procedure".

### Are they within the SP value?

Yes >> GO TO 9. EC

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No >> GO TO 8.

# $8.\mathsf{DETECT}$ MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to EC-618, "Diagnosis Procedure".

### Is malfunctioning part detected?

Yes >> GO TO 11. No >> GO TO 9.

# 9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM MATRIX CHART

Detect malfunctioning system according to <u>EC-583</u>. "Symptom Matrix Chart" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

>> GO TO 10.

# 10. DETECT MALFUNCTIONING PART BY 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-25, "How to Perform Efficient Diagnosis for an Electrical Incident".

#### Is malfunctioning part detected?

Yes >> GO TO 11.

No

>> Monitor input data from related sensors or check voltage of related ECM terminals using CON-SULT-III. Refer to <a href="EC-597">EC-597</a>, "ECM Terminal and Reference Value", <a href="EC-614">EC-614</a>, "CONSULT-III Reference Value in Data Monitor Mode".

# 11. REPAIR OR REPLACE THE MALFUNCTIONING PART

- 1. Repair or replace the malfunctioning part.
- Reconnect parts or connectors disconnected during Diagnostic Procedure again after repair and replacement.
- 3. Check DTC. If DTC is displayed, erase it, refer to EC-542, "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 make sure that the malfunction have been repaired securely.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

### 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, make sure to erase unnecessary DTC\*1 in ECM and TCM (Transmission Control Module). (Refer to <a href="EC-542">EC-542</a>. "Emission-related Diagnostic Information" and <a href="AT-39">AT-39</a>, "OBD-II Diagnostic Trouble Code (DTC)", <a href="CVT-209">CVT-209</a>, "OBD-II Diagnostic Trouble Code (DTC)".)
  - 2. If the completion of SRT is needed, drive vehicle under the specific driving pattern. Refer to <u>EC-542</u>, "Emission-related Diagnostic Information".
  - 3. INSPECTION END
- \*1: Include 1st trip DTC.
- \*2: Include 1st trip freeze frame data.

### DIAGNOSTIC WORKSHEET

Description

< SERVICE INFOMATION >

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

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

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the 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

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#### Worksheet Sample

		<u></u>								
Customer nan	ne MR/MS	Model & Year	VIN							
Engine #		Trans.	Mileage							
Incident Date		Manuf. Date	In Service Date							
Fuel and fuel	filler cap	<ul><li>☐ Vehicle ran out of fuel causing misfire</li><li>☐ Fuel filler cap was left off or incorrectly screwed on.</li></ul>								
	☐ Startability	☐ Partial combustion affected by th☐ Partial combustion NOT affected	<ul><li>☐ Partial combustion affected by throttle position</li><li>☐ Partial combustion NOT affected by throttle position</li></ul>							
Symptoms	☐ Idling	<ul><li>☐ No fast idle</li><li>☐ Unstable</li><li>☐ High idle</li><li>☐ Low idle</li><li>☐ Others [</li><li>☐ ]</li></ul>								
□ Driveability       □ Stumble □ Surge □ Knock □ Lack of power         □ Intake backfire □ Exhaust backfire □ Others [ □ Others [ □ At the time of start □ While idling □ While accelerating □ While decelerating □ Just after stopping □ While loading										
								Incident occur	rence	☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐
Frequency		☐ All the time ☐ Under certain cond	ditions							
Weather cond	litions	☐ Not affected								
	Weather	☐ Fine ☐ Raining ☐ Snowing	☐ Others [ ]							
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐	] Cold ☐ Humid °F							
		☐ Cold ☐ During warm-up ☐ /	After warm-up							
Engine condit	ions	Engine speed0 2,000								
Road conditio	ns	☐ In town ☐ In suburbs ☐ Hig	hway 🗌 Off road (up/down)							
Driving condit	ions	□ Not affected         □ At starting       □ While idling       □ At racing         □ While accelerating       □ While cruising         □ While decelerating       □ While turning (RH/LH)         Vehicle speed       □ U U U U U U U U U U U U U U U U U U U								
		0 10 20	30 40 50 60 MPH							
Malfunction in	dicator lamp	☐ Turned on ☐ Not turned on								
			MTBL0017							

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# **DTC Inspection Priority Chart**

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	<ul> <li>U1000 U1001 CAN communication line</li> <li>U1010 CAN communication</li> <li>P0101 P0102 P0103 Mass air flow sensor</li> <li>P0112 P0113 P0127 Intake air temperature sensor</li> <li>P0117 P0118 P0125 Engine coolant temperature sensor</li> <li>P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor</li> <li>P0128 Thermostat function</li> <li>P0181 P0182 P0183 Fuel tank temperature sensor</li> <li>P0327 P0328 Knock sensor</li> <li>P0335 Crankshaft position sensor (POS)</li> <li>P0340 Camshaft position sensor (PHASE)</li> <li>P0460 P0461 P0462 P0463 Fuel level sensor</li> <li>P0500 Vehicle speed sensor</li> <li>P0605 ECM</li> <li>P0643 Sensor power supply</li> <li>P0705 P0850 Park/neutral position (PNP) switch</li> <li>P1610 - P1615 NATS</li> <li>P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor</li> </ul>
2	<ul> <li>P0031 P0032 Air fuel ratio (A/F) sensor 1 heater</li> <li>P0037 P0038 Heated oxygen sensor 2 heater</li> <li>P0075 Intake valve timing control solenoid valve</li> <li>P0130 P0131 P0132 P0133 P2A00 Air fuel ratio (A/F) sensor 1</li> <li>P0137 P0138 P0139 Heated oxygen sensor 2</li> <li>P0441 EVAP control system purge flow monitoring</li> <li>P0443 P0444 P0445 EVAP canister purge volume control solenoid valve</li> <li>P0447 P0448 EVAP canister vent control valve</li> <li>P0451 P0452 P0453 EVAP control system pressure sensor</li> <li>P1217 Engine over temperature (OVERHEAT)</li> <li>P1805 Brake switch</li> <li>P2100 P2103 Throttle control motor relay</li> <li>P2101 Electric throttle control function</li> <li>P2118 Throttle control motor</li> </ul>
3	<ul> <li>P0011 Intake valve timing control</li> <li>P0171 P0172 Fuel injection system function</li> <li>P0300 - P0304 Misfire</li> <li>P0420 Three way catalyst function</li> <li>P0442 P0456 EVAP control system (SMALL LEAK, VERY SMALL LEAK)</li> <li>P0455 EVAP control system (GROSS LEAK)</li> <li>P0506 P0507 Idle speed control system</li> <li>P0710 P0715 P0720 P0725 P0731 P0732 P0733 P0734 P0740 P0744 P0745 P0746 P0750 P0755 P0776 P0778 P0840 P0845 P1705 P1740 P1760 P1777 P1778 A/T or CVT related sensors, solenoid valves and switches</li> <li>P1148 Closed loop control</li> <li>P1421 Cold start control</li> <li>P1564 ASCD steering switch</li> <li>P1572 ASCD brake switch</li> <li>P1574 ASCD vehicle speed sensor</li> <li>P1715 Turbine revolution sensor (A/T), Primary speed sensor (CVT)</li> <li>P2119 Electric throttle control actuator</li> </ul>

Fail-Safe Chart

When the DTC listed below is detected, the ECM enters fail-safe mode and the MIL lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

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DTC No.	Detected items	Engine operating condition in fail-sa	afe mode						
P0117 P0118	Engine coolant temperature sensor circuit	tion.	determined by ECM based on the following condi- colant 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 sarting.	80°C (176°F)						
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)						
		When the fail-safe system for engin ing fan operates while engine is rur	e coolant temperature sensor is activated, the coonning.						
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle open 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 norr condition.  So, the acceleration will be poor.							
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.							
P2100 P2103	Throttle control relay	ECM stops the electric throttle contributed opening (approx. 5 degrees) by	rol actuator control, throttle valve is maintained at a by the return spring.						
P2101	Electric throttle control function	ECM stops the electric throttle contributed opening (approx. 5 degrees) by	rol actuator control, throttle valve is maintained at a by the return spring.						
P2118	Throttle control motor	ECM stops the electric throttle contributed opening (approx. 5 degrees) by	rol actuator control, throttle valve is maintained at a by the return spring.						
P2119	Electric throttle control actuator	spring malfunction:)	ator does not function properly due to the return tuator by regulating the throttle opening around the not rise more than 2,000 rpm.						
			in fail-safe mode is not in specified range:) ontrol actuator by regulating the throttle opening to						
		the engine stalls.	ve is stuck open:) down gradually by fuel cut. After the vehicle stops /T, CVT), Neutral (M/T) position, and engine speed						
P2122 P2123 P2127 P2128	Accelerator pedal position sensor	in order for the idle position to be w	le control actuator in regulating the throttle opening ithin +10 degrees. Seed of the throttle valve to be slower than the norma						

<sup>•</sup> When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting up MIL when there is malfunction on engine control system.

So, the acceleration will be poor.

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

Symptom Matrix Chart

INFOID:0000000004537054

		SYMPTOM													
		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)	Reference page
	y symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-991
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-574
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-986
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-527
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-538
	Incorrect idle speed adjustment						1	1	1	1		1			EC-566
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-929, EC-940
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-566
	Ignition circuit	1	1	2	2	2		2	2			2			EC-996
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			EC-627
Mass air	r flow sensor circuit	1			2										EC-655, EC-663
Engine	coolant temperature sensor circuit	•					3			3					EC-674, EC-684
Air fuel ı	ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-692, EC-698, EC-704, EC-710, EC-966
Throttle	Throttle position sensor circuit						2			2					EC-679, EC-760, EC-895, EC-897, EC-954
Accelerator pedal position sensor circuit				3	2	1									EC-874, EC-942, EC-947, EC-959
	Knock sensor circuit			2								3			EC-771
	naft position sensor (POS) circuit	2	2												EC-775
	aft position sensor (PHASE) circuit	3	2			_									EC-781
	speed signal circuit		2	3	_	3			_			3			EC-866
ECM		2	2	3	3	3	3	3	3	3	3	3			EC-872

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						S'	MPT	OM						
	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)	Reference page
Warranty symptom code Intake valve timing control solenoid valve cir-	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	
cuit		3	2		1	3	2	2	3		3			EC-650
Park/neutral position (PNP) switch circuit			3		3		3	3			3			EC-879
Refrigerant pressure sensor circuit		2				3			3		4			EC-1005
Electrical load signal circuit							3							EC-984
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	MTC-22
ABS actuator and electric unit (control unit)			4											BRC-8

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next page)

# SYSTEM — ENGINE MECHANICAL & OTHER

							SY	/MPT	ОМ						
		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)	Reference page
Warranty s	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FL-9
	Fuel piping	5		5	5	5		5	5			5			EM-156
	Vapor lock		5												_
	Valve deposit		5												_
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_

							S'	YMPT	OM						
		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)	Reference page
Warranty s	ymptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Air	Air duct														EM-139
	Air cleaner														EM-139
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			EM-139
	Electric throttle control actuator	5			5		5			5					EM-141
	Air leakage from intake manifold/ Collector/Gasket													-	<u>EM-141</u>
Cranking	Battery	1	1	1		1		1	1					1	<u>SC-5</u>
-	Generator circuit	-					-								<u>SC-21</u>
	Starter circuit	3										1			<u>SC-9</u>
	Signal plate	6										'			<u>EM-199</u>
	Park/neutral position (PNP) switch	4													MT-54, AT- 91 or CVT-244
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-185
	Cylinder head gasket	5	5	5	5	5		5	5		4	5	3		<u> </u>
	Cylinder block														
	Piston												4		
	Piston ring	6	6	6	6	6		6	6			6			EM-199
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-	Timing chain														EM-160
nism	Camshaft	E	_	5	E	_		F	_			F			EM-170
	Intake valve timing control Intake valve	5	5	Э	5	5		5	5			5			EM-170
	Exhaust valve	<u> </u>											3		<u>EM-185</u>
Exhaust	Exhaust valve  Exhaust manifold/Tube/Muffler/														
LAHOUSE	Gasket	5	5	5	5	5		5	5			5			<u>EM-144</u> ,
	Three way catalyst							L	L		L				<u>EX-9</u>
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			EM-147, LU-19
	Oil level (Low)/Filthy oil														<u>LU-16</u>

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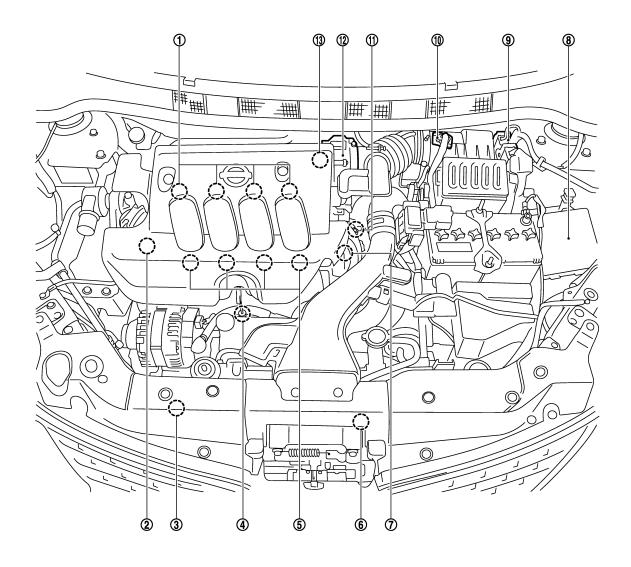
							S١	/MPT	OM						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	
Cooling	Radiator/Hose/Radiator filler cap														CO-38
	Thermostat									5					<u>CO-45</u>
	Water control valve														<u>CO-47</u>
	Water pump	5	5	5	5	5		5	5		4	5			<u>CO-43</u>
	Water gallery														<u>CO-34</u>
	Cooling fan														<u>CO-42</u>
	Coolant level (Low)/Contaminated coolant									5					<u>CO-35</u>
NVIS (NIS NATS)	SSAN Vehicle Immobilizer System-	1	1												BL-248

<sup>1 - 6:</sup> The numbers refer to the order of inspection.

EC-587

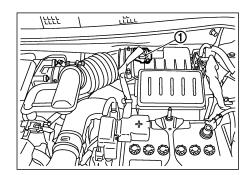
# **Engine Control Component Parts Location**

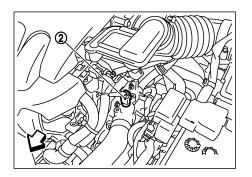
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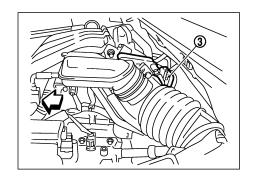


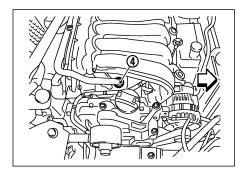
PBIB3261E

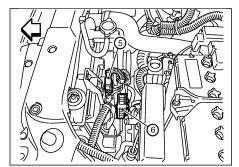
- Ignition coil (with power transistor) and spark plug
- 4. Knock sensor
- 7. Camshaft position sensor (PHASE)
- 10. Mass air flow sensor (with intake air temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- . Intake valve timing control solenoid 3. valve
- 5. Fuel injector
-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

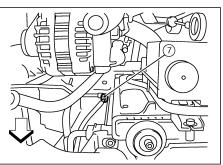












BBIA0724E

### : Vehicle front

- Mass air flow sensor
   (with intake air temperature sensor)
- 4. PCV valve
- 7. Refrigerant pressure sensor
- . Engine coolant temperature sensor
- 5. Cooling fan motor

- Electric throttle control actuator (with built in throttle position sensor, throttle control motor)
- Resistor

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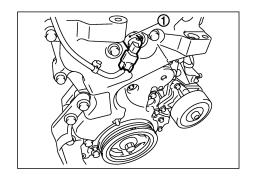
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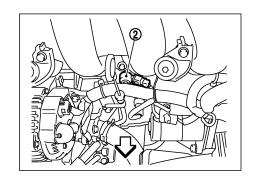
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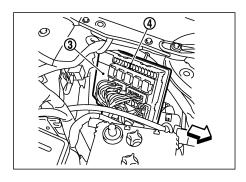
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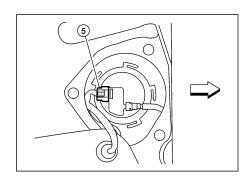
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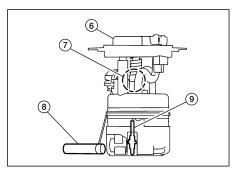
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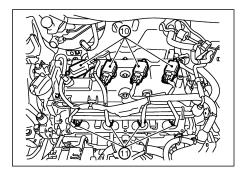








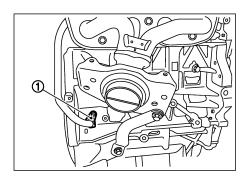


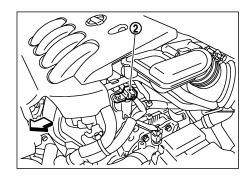


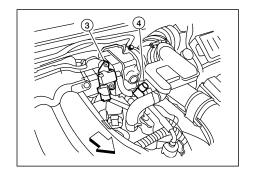
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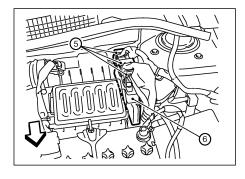
- : Vehicle front
- Intake valve timing control solenoid valve
- 4. Fuel pump fuse (15A)
- 7. Fuel pressure regulator
- 10. Ignition coil (with power transistor) and spark plug
- 2. Knock sensor
- Fuel level sensor unit and fuel pump harness connector (view with inspection hole cover removed)
- 8. Fuel level sensor
- 11. Fuel injector

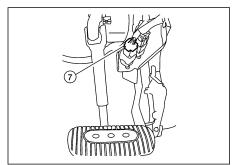
- 3. IPDM E/R
- Fuel level sensor unit and fuel pump 6. Fuel level sensor unit and fuel pump
  - 9. Fuel tank temperature sensor

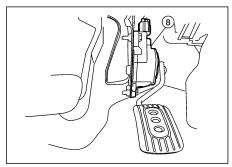












BBIA0727E

Vehicle front

1. Crankshaft position sensor (POS)

- 4. EVAP service port
- 7. Stop lamp switch
- 2. Camshaft position sensor (PHASE) 3.
- 5. ECM harness connector
- 8. Accelerator pedal position sensor
- EVAP canister purge volume control solenoid valve
- 6. ECM

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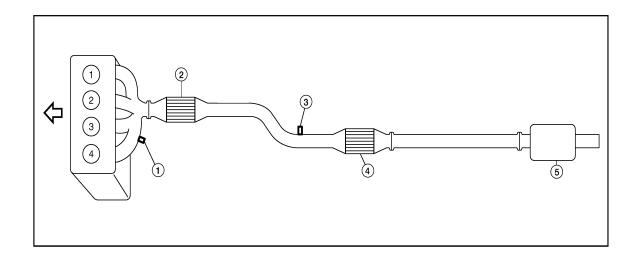
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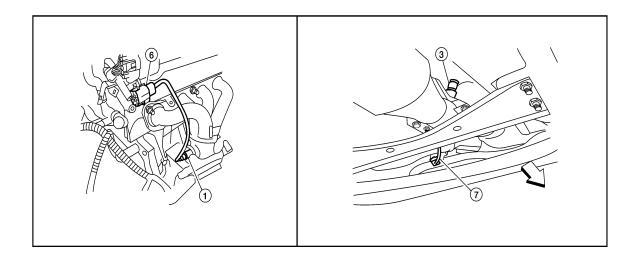
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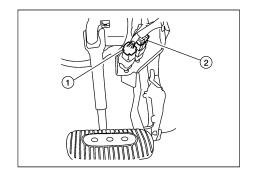


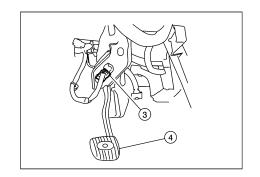


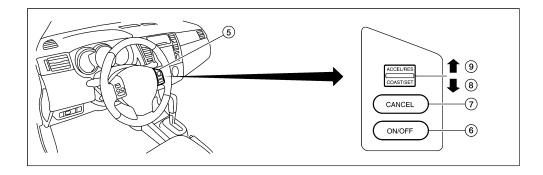
BBIA0726E

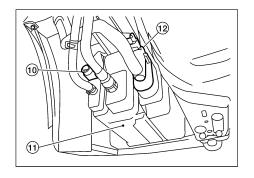
- : Vehicle front
- 1. Air fuel ratio (A/F) sensor 1
- 4. Three way catalyst (Under floor)
- 7. Heated oxygen sensor 2 harness connector
- 2. Three way catalyst (Manifold)
- 5. Muffler

- 3. Heated oxygen sensor 2
- 6. Air fuel ratio (A/F) sensor 1 harness connector









BBIA0728E

Stop lamp switch 1.

Clutch pedal 4.

CANCEL switch

10. EVAP control system pressure sen- 11. EVAP canister

ASCD brake switch 2.

5. ASCD steering switch

8. SET/COAST switch

ASCD clutch switch 3.

MAIN switch 6.

RESUME/ACCELERATOR switch

12. EVAP canister vent control valve

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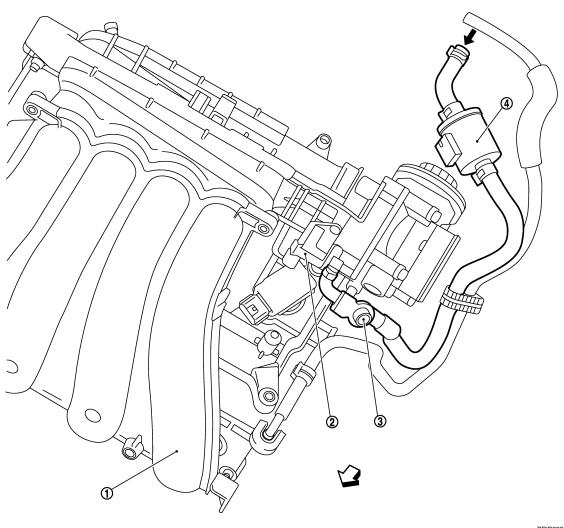
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Vacuum Hose Drawing

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PBIB3330E

: Vehicle front

1. Intake manifold

: From EVAP canister

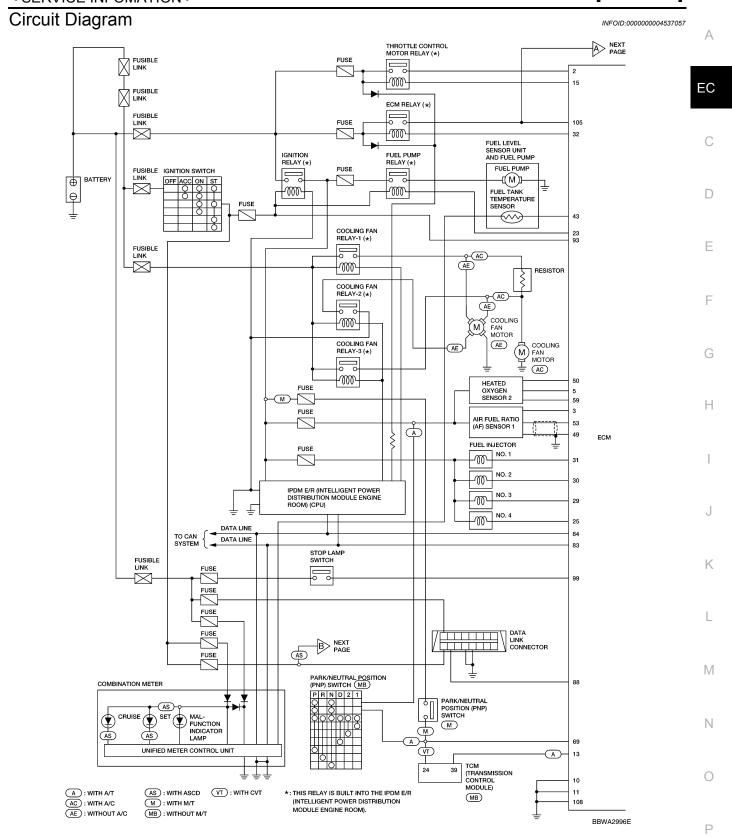
EVAP canister purge volume control 3. EVAP service port solenoid valve

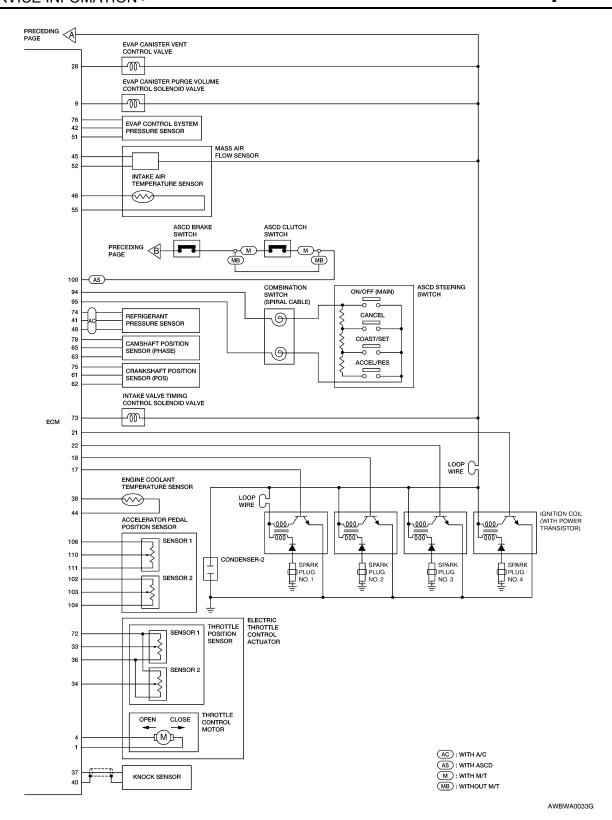
4. EVAP purge resonator

#### NOTE:

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

Refer to EC-518, "Schematic" for Vacuum Control System.





[MR TYPE 1]

INFOID:0000000004537058

# **ECM Harness Connector Terminal Layout**

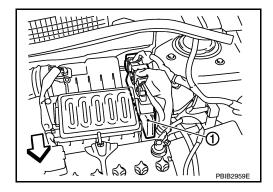
PBIA9221J

# ECM Terminal and Reference Value

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### **PREPARATION**

- 1. ECM (1) is located in the engine room left side near battery.
  - : Vehicle front



### **ECM INSPECTION TABLE**

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

# **CAUTION:**

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

					K
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	L
1	L	Throttle control motor (Open)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully depressed	Approximately 3.2V  → John John John John John John John John	M
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	0
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V	Р

**EC-597** 

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# < SERVICE INFOMATION >

-02:00	102 1111	OWATION >		
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	Р	Throttle control motor (Close)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully released	Approximately 1.8V  >>> 5V/Div 1ms/Div T  PBIA8149J
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  >>> 10.0V/Div 50ms/Div T  PBIA8148J
			[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
9	P	EVAP canister purge volume	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Accelerator pedal: Not depressed even slightly, after engine starting.</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  >> 10.0V/Div 50 ms/Div  PBIB0050E
		control solenoid valve	<ul> <li>[Engine is running]</li> <li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li> </ul>	Approximately 10V
10 11	B B	ECM ground	[Engine is running] • Idle speed	Body ground
13	L	Tachometer signal	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	3 - 5V ⇒ 2.0V/Div 50ms/Div   PBIA8164J
13 l	L	Tachometer signal	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm.</li></ul>	3 - 5V  ⇒ 2.0V/Div 50ms/Div  PBIA8165J

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
15	Υ	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)	
			[Ignition switch: ON]	0 - 1.0V	
17 18	R LG	Ignition signal No. 1 Ignition signal No. 2	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	0 - 0.3V	
21 22	G SB	Ignition signal No. 4 Ignition signal No. 3		Warm-up condition	0.2 - 0.5V  → 2.0 V/DIV 50 ms/DIV T  PBIA9266J
23	GR	Fuel pump relay	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0V	
			<ul><li>[Ignition switch: ON]</li><li>More than 1 second after turning ignition switch ON</li></ul>	BATTERY VOLTAGE (11 - 14V)	
25 29	V	Fuel injector No. 4 Fuel injector No. 3	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  Description of the property of th	
30 31	O L	Fuel injector No. 2 Fuel injector No. 1	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	BATTERY VOLTAGE  (11 - 14V)  PBIA4943J	
28	W	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	
32	Р	ECM relay	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V	
		(Self shut-off)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)	

# < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
			[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully released	More than 0.36V
33	LG	Throttle position sensor 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75V
34	0	Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	Less than 4.75V
04		Throtae position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36V
36	Y	Sensor ground (Throttle position sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
37	W	Knock sensor	[Engine is running] • Idle speed	Approximately 2.5V
38	Р	Engine coolant temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
40	_	Sensor ground (Knock sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
41	GR	Refrigerant pressure sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan switch: ON (Compressor operates.)</li> </ul>	1.0 - 4.0V
42	V	EVAP control system pressure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V
43	Р	Fuel tank temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature
44	В	Sensor ground (Engine coolant temperature sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
45	G	Mass air flow sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0.8 - 1.1V
43	J	Wass all now sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.7V
46	V	Intake air temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
48	BR	Sensor ground (Refrigerant pressure sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
49	w	A/F sensor 1	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	Approximately 1.8V Output voltage varies with air fuel ratio.

# **TROUBLE DIAGNOSIS**

< SERVICE INFOMATION >

[MR TYPE 1]

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W//IRF	ITEM	CONDITION	DATA (DC Voltage)	Α
w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V	<b>EC</b>
0	Sensor ground (EVAP control system pressure sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V	D
LG	Sensor ground (Mass air flow sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V	Е
В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V	
О	Sensor ground (Intake air temperature sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	F
0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V	G
W	Crankshaft position sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	Approximately 4.0V	H
VV	(POS)	[Engine is running] • Engine speed: 2,000 rpm	Approximately 4.0V	K
R	Sensor ground [Crankshaft position sensor (POS)]	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	M
BR	Sensor ground [Camshaft position sensor (PHASE)]	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	Ν
	W O LG B O O R	WIRE COLOR  WHE COLOR  Heated oxygen sensor 2  Sensor ground (EVAP control system pressure sensor)  LG Sensor ground (Mass air flow sensor)  B A/F sensor 1  Sensor ground (Intake air temperature sensor)  O Sensor ground (Heated oxygen sensor 2)  W Crankshaft position sensor (POS)  R Sensor ground (Crankshaft position sensor (POS)]  Sensor ground (Crankshaft position sensor ground (Camshaft position sensor ground game)	WirkE COLOR  W Heated oxygen sensor 2  Heated oxygen sensor 2  Beauty after the following conditions are met. Engine: After warming up temption and 4,000 rpm for 1 minute and at idle for 1 minute under no load.  LG Sensor ground (EVAP control system pressure sensor)  LG Sensor ground (Mass air flow sensor)  B A/F sensor 1  Condition the sensor ground (Intake air temperature sensor)  Condition the sensor ground (Heated oxygen sensor 2)  Condition the sensor ground (Heated oxygen sensor 2)  Condition the sensor ground (Intake air temperature sensor)  Condition the sensor ground (Intake air temperature sensor (Intake air temperature sensor ground gro	COLOR   ITEM   CONDITION   DATA (DC Voltage)

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		OWATION >		
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	G	Camehaft position sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	1.0 - 2.0V
	C	(PHASE)	[Engine is running] • Engine speed: 2,000 rpm.	1.0 - 2.0V
			[Ignition switch: ON] • Shift lever: P or N (A/T, CVT), Neutral (M/T)	BATTERY VOLTAGE (11 - 14V)
69	L	Park/neutral position (PNP) switch	[Ignition switch: ON] • Except above	Approximately 0V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V
			[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14V)
73	P	Intake valve timing control solenoid valve	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>When revving engine up to 2,000 rpm quickly</li> </ul>	7 - 10V
74	w	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pressure sensor power supply	[Ignition switch: ON]	Approximately 5V
78	0	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5V
83	Р	CAN communication line	_	_
84	L	CAN communication line	_	_
88	LG	DATA link connector	_	_
-			[Ignition switch: OFF]	0V
93	0	Ignition switch	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

ERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
			[Ignition switch: ON] • ASCD steering switch: OFF	Approximately 4V
			[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0V
94	R	ASCD steering switch	[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1V
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 2V
95	В	Sensor ground (ASCD steering switch)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
00	Б	Cton lawn quitab	[Ignition switch: OFF]  • Brake pedal: Fully released	Approximately 0V
99	R	Stop lamp switch	[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)
100	G	ASCD brake switch	[Ignition switch: ON]  • Brake pedal: Slightly depressed (A/T, CVT)  • Brake pedal and/or clutch pedal: Slightly depressed (M/T)	Approximately 0V
100	G	ASCD DIAKE SWILCH	[Ignition switch: ON]  • Brake pedal: Fully released (A/T, CVT)  • Brake pedal and clutch pedal: Fully released (M/T)	BATTTERY VOLTAGE (11 - 14V)
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5V
103	GR	Accelerator pedal position	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	OK .	sensor 2	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully depressed</li></ul>	1.95 - 2.4V
104	Y	Sensor ground (Accelerator pedal position sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
106	Р	Sensor power supply (Accelerator pedal position sensor 1)	[Ignition switch: ON]	Approximately 5V
108	В	ECM ground	[Engine is running] Idle speed	Body ground
110	G	Accelerator pedal position	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
		sensor 1	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully depressed</li></ul>	3.9 - 4.7V
111	R	Sensor ground (Accelerator pedal position sensor 1)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

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

[MR TYPE 1]

# CONSULT-III Function (ENGINE)

INFOID:0000000004537060

### **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 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 their vehicle condition requires periodic maintenance.
DTC & SRT Confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECU Identification	ECM part number can be read.

<sup>\*:</sup> 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

			DIAGNOSTIC TEST MODE						
			WORK		AGNOSTIC SULT	DATA		DTC & SRT CONFIRMATION	
	Item		SUP- PORT DTC*1	DTC*1	FREEZE FRAME DATA* <sup>2</sup>	MONI- TOR	ACTIVE TEST	SRT STATUS	DTC WORK SUP- PORT
		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		×		×			
TS		Throttle position sensor		×	×	×			
PAR		Fuel tank temperature sensor		×		×	×		
NENT		EVAP control system pressure sensor		×		×			
ΠPO		Intake air temperature sensor		×	×	×			
ő	INPUT	Knock sensor		×					
7	Ξ	Refrigerant pressure sensor				×			
ENGINE CONTROL COMPONENT PARTS		Closed throttle position switch (Accelerator pedal position sensor signal)				×			
S S		Air conditioner switch				×			
Ш		Park/neutral position (PNP) switch		×		×			
		Stop lamp switch		×		×			
		Battery voltage				×			
		Load signal				×			
		Fuel level sensor		×		×			
		ASCD steering switch		×		×			
		ASCD brake switch		×		×			
		ASCD clutch switch		×		×			
		Power steering operation signal				×			

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				DIAGNOSTIC TEST MODE						
			_	AGNOSTIC SULT	DATA		DTC 8	-		
ltem		WORK SUP- PORT	DTC*1	FREEZE FRAME DATA*2	MONI- TOR	ACTIVE TEST	SRT STATUS	DTC WORK SUP- PORT		
	Fuel injector				×	×				
	Power transistor (Ignition timing)				×	×				
RTS	Throttle control motor relay		×		×					
<u>₹</u>	Throttle control motor		×							
ENGINE CONTROL COMPONENT PARTS OUTPUT	EVAP canister purge volume control solenoid valve		×		×	×		×		
MPC	Air conditioner relay				×					
OL COM	Fuel pump relay	×			×	×				
징	Cooling fan relay		×		×	×				
IL	Air fuel ratio (A/F) sensor 1 heater		×		×		×* <sup>3</sup>			
ECC	Heated oxygen sensor 2 heater		×		×		×* <sup>3</sup>			
S S	EVAP canister vent control valve	×	×		×	×				
Ш N	Intake valve timing control solenoid valve		×		×	×				
	Calculated load value			×	×					

### X: Applicable

# **WORK SUPPORT MODE**

#### Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING.     CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT.	When clearing the coefficient of self-learning control value

<sup>\*1:</sup> This item includes 1st trip DTCs.

<sup>\*2:</sup> 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 <a href="EC-542">EC-542</a>. "Emission-related Diagnostic Information".

<sup>\*3:</sup> Always "COMPLT" is displayed.

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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.  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 vapor leak point of EVAP system
TARGET IDLE RPM ADJ*	IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	IDLE CONDITION	When adjusting target ignition timing
VIN REGISTRATION	IN THIS MODE, VIN IS REGISTERED IN ECM.	When registering VIN in ECM

<sup>\*:</sup> 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-542, "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, it is displayed as PXXXX. (Refer to EC-506)
FUEL SYS-B1	"Fuel injection system status" at the moment a malfunction is detected is displayed.     One mode in the following is displayed.     Mode2: Open loop due to detected system malfunction     Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment)     Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control     Mode5: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRM-B1 [%]	<ul> <li>"Long-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.</li> </ul>
S-FUEL TRM-B1 [%]	<ul> <li>"Short-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.</li> </ul>
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.

# **TROUBLE DIAGNOSIS**

# < SERVICE INFOMATION >

Freeze frame data item*	Description
FUEL SYS-B2	
L-FUEL TRM-B2 [%]	
S-FUEL TRM-B2 [%]	These items are displayed but are not applicable to this model.
INT MANI PRES [kPa]	
COMBUST CONDITION	

<sup>\*:</sup> 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 signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	<ul> <li>Accuracy becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul>
MAS A/F SE-B1 [V]	The signal voltage of the mass air flow sensor is displayed.	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>When engine is running, specification range is indicated in "SPEC".</li> </ul>
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.	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>This data also includes the data for the air/fuel ratio learning control.</li> <li>When engine is running, specification range is indicated in "SPEC".</li> </ul>
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 A/F sensor 1 is displayed.	
HO2S2 (B1) [V]	The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR (B1) [RICH/LEAN]	Display of heated oxygen sensor 2 signal:     RICH: means the amount of oxygen after three way catalyst is relatively small.     LEAN: means the amount of oxygen after three way catalyst is relatively large.	When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]  ACCEL SEN 2 [V]	The accelerator pedal position sensor signal voltage is displayed.	ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 1-B1 [V] TP SEN 2-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.

[MR TYPE 1]

Monitored item [Unit]	Description	Remarks	
FUEL T/TMP SE [°C] or [°F]	The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.		
INT/A TEMP SE [°C] or [°F]	The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.		Ξ
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]	<ul> <li>Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.</li> </ul>	After starting the engine, [OFF] is displayed regardless of the starter signal.	_
CLSD THL POS [ON/OFF]	<ul> <li>Indicates idle position [ON/OFF] computed by the ECM according to the accelerator pedal position sensor signal.</li> </ul>		_
AIR COND SIG [ON/OFF]	Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.		
P/N POSI SW [ON/OFF]	Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.		
PW/ST SIGNAL [ON/OFF]	[ON/OFF] condition of the power steering system (determined by the signal sent from EPS control unit) is indicated.		
LOAD SIGNAL [ON/OFF]	Indicates [ON/OFF] condition from the electrical load signal.     ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position.		
	OFF: Both rear window defogger switch and lighting switch are OFF.		_
IGNITION SW [ON/OFF]	Indicates [ON/OFF] condition from ignition switch.		
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]	<ul> <li>Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.</li> </ul>	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 airflow.		
MASS AIRFLOW [g·m/s]	Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.		
PURG VOL C/V [%]	<ul> <li>Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>		
INT/V TIM (B1) [°CA]	Indicates [°CA] of intake camshaft advanced angle.		
INT/V SOL (B1) [%]	<ul> <li>The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>The advance angle becomes larger as the value increases</li> </ul>		
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.		

# < SERVICE INFOMATION >

Monitored item [Unit] Description		Remarks
VENT CONT/V [ON/OFF]	The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated.     ON: Closed     OFF: Open	
THRTL RELAY [ON/OFF]	Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]	Indicates the condition of the cooling fan (determined by ECM according to the input signals).     HI: High speed operation     LOW: Low speed operation     OFF: Stop	
HO2S2 HTR (B1) [ON/OFF]	Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
I/P PULLY SPD [rpm]	Indicates the engine speed computed from the turbine revolution 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]	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.	
A/F S1 HTR (B1) [%]	<ul> <li>Indicates A/F sensor 1 heater control value computed by ECM according to the input signals.</li> <li>The current flow to the heater becomes larger as the value increases.</li> </ul>	
AC PRESS SEN [V]	The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [MPH]	The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
SET VHCL SPD [km/h] or [MPH]	The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]	Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW [ON/OFF]	Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW [ON/OFF]	Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW [ON/OFF]	Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1 [ON/OFF]	Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2 [ON/OFF]	Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT [NON/CUT]	Indicates the vehicle cruise condition.     NON: Vehicle speed is maintained at the ASCD set speed.     CUT: Vehicle speed increased to excessively high 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 compared with the ASCD set speed, and ASCD operation is cut off.	
AT OD MONITOR [ON/OFF]	<ul> <li>Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.</li> </ul>	For M/T models always "OFF" is displayed

# **TROUBLE DIAGNOSIS**

# < SERVICE INFOMATION >

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Monitored item [Unit]	Description	Remarks	
AT OD CANCEL [ON/OFF]	Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM.	For M/T models always "OFF" is displayed	1
CRUISE LAMP [ON/OFF]	Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.		E
SET LAMP [ON/OFF]	Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.		
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.		

### NOTE:

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

# **ACTIVE TEST MODE**

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)	
FUEL INJEC- TION	Engine: Return to the original trouble condition     Change the amount of fuel injection using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	<ul><li>Harness and connectors</li><li>Fuel injector</li><li>Air fuel ratio (A/F) sensor 1</li></ul>	
IGNITION TIM- ING	Engine: Return to the original trouble condition     Timing light: Set     Retard the ignition timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learning.	
POWER BAL- ANCE	<ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>Cut off each fuel injector signal one at a time using CONSULT-III.</li> </ul>	Engine runs rough or dies.	Harness and connectors     Compression     Fuel injector     Power transistor     Spark plug     Ignition coil	
COOLING FAN*	Ignition switch: ON     Turn the cooling fan "LOW", "HI" and "OFF" with CONSULT-III.	Cooling fan moves and stops.	Harness and connectors     Cooling fan relay     Cooling fan motor	
ENG COOLANT TEMP	Engine: Return to the original trouble condition     Change the engine coolant temperature using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	Harness and connectors     Engine coolant temperature sensor     Fuel injector	
FUEL PUMP RE- LAY	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.	<ul><li> Harness and connectors</li><li> Fuel pump relay</li></ul>	
PURG VOL CONT/V	<ul> <li>Engine: After warming up, run engine at 1,500 rpm.</li> <li>Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.</li> </ul>	Engine speed changes according to the opening percent.	Harness and connectors     EVAP canister purge volume control solenoid valve	
FUEL/T TEMP SEN	Change the fuel tank temperature	using CONSULT-III.		

### < SERVICE INFOMATION >

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
VENT CON- TROL/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     EVAP canister vent control valve
V/T ASSIGN AN- GLE	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

<sup>\*:</sup> 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-542, "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
EVAPORATIVE SYS- TEM	PURG FLOW P0441	P0441	EC-792
	EVP SML LEAK P0442/P1442*	P0442	EC-797
	EVP SIVIL LEAR PU442/P 1442	P0455	EC-847
	EVP V/S LEAK P0456/P1456*	P0456	EC-853
	PURG VOL CN/V P1444	P0443	EC-804
A/F SEN1	A/F SEN1 (B1) P1276	P0130	EC-692
A/F SENT	A/F SEN1 (B1) P1278/P1279	P0133	EC-710
HO2S2	HO2S2 (B1) P0139	P0139	EC-733
	HO2S2 (B1) P1146	P0138	EC-724
	HO2S2 (B1) P1147	P0137	EC-717

<sup>\*:</sup> DTC P1442 and P1456 does not apply to C11 models but appears in DTC Work Support Mode screens.

# Generic Scan Tool (GST) Function

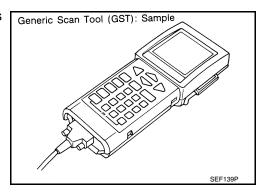
INFOID:0000000004537061

### **DESCRIPTION**

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained below.

ISO 15765-4 is used as the protocol.

The name GST or Generic Scan Tool is used in this service manual.



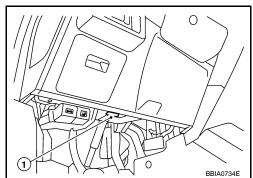
**FUNCTION** 

Diag	gnostic test mode	Function	Δ
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 <a href="EC-604">EC-604</a> , "CONSULT-III Function (EN-GINE)".	EC
Service \$03	DTCs	This diagnostic service gains access to emission-related power train trouble codes which were stored by ECM.	С
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)	E
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.	F
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.	C-
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	F
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.	

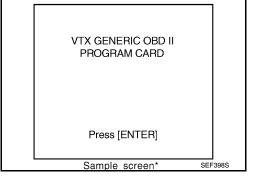
### INSPECTION PROCEDURE

1. Turn ignition switch OFF.

2. Connect GST to data link connector (1), which is located under LH dash panel.



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



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Perform each diagnostic service according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.

**OBD II FUNCTIONS** 

F0: DATA LIST F1: FREEZE DATA

F2: DTCs

F3: SNAPSHOT

F4: CLEAR DIAG INFO

F5: O2 TEST RESULTS

#### **F6: READINESS TESTS**

F7: ON BOARD TESTS F8: EXPAND DIAG PROT F9: UNIT CONVERSION

Sample screen\* SEF

### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537062

#### 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	CON	NDITION	SPECIFICATION
ENG SPEED	· ·		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See <u>EC-618</u> .		
B/FUEL SCHDL	See <u>EC-618</u> .		
A/F ALPHA-B1	See <u>EC-618</u> .		
COOLAN TEMP/S	Engine: After warming up		More than 70°C (158°F)
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V
HO2S2 (B1)	are met	rpm quickly after the following conditions	0 - 0.3V ←→ Approx. 0.6 - 1.0V
- Engine: After warming up - Keeping the engine speed betwee at idle for 1 minute under no load		en 3,500 and 4,000 rpm for 1 minute and	LEAN ←→ RICH
VHCL SPEED SE	Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication.
BATTERY VOLT	Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN I	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCLL SLIV 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V
EVAP SYS PRES	Ignition switch: ON		Approx. 1.8 - 4.8V
TP SEN 1-B1	Ignition switch: ON     (Engine stopped)	Accelerator pedal: Fully released	More than 0.36V
TP SEN 2-B1*	Shift lever: D (A/T, CVT),     1st (M/T)	Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow O$	Ignition switch: ON → START → ON	
CLED THE BOO	- Ignition quitable CAI	Accelerator pedal: Fully released	ON
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Slightly depressed	OFF
	- Engine: Afterwarming up idle the	Air conditioner switch: OFF	OFF
AIR COND SIG	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates.)	ON

MONITOR ITEM	CON	NDITION	SPECIFICATION
P/N POSI SW	Ignition switch: ON	Shift lever: P or N (A/T, CVT), Neutral (M/T)	ON
		Shift lever: Except above	OFF
DW/CT CICNAL	Engine: After warming up, idle the	Steering wheel: Not being turned	OFF
PW/ST SIGNAL	engine	Steering wheel: Being turned	ON
LOAD GIONAL	January Make ON	Rear window defogger switch: ON and/or Lighting switch: 2nd	ON
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$		$ON \rightarrow OFF \rightarrow ON$
LIEATED FAN OW	Leaffice of Hale ON	Heater fan: Operating	ON
HEATER FAN SW	Ignition switch: ON	Heater fan: Not operating	OFF
DDAKE OW	Leaffing a state ON	Brake pedal: Fully released	OFF
BRAKE SW	Ignition switch: ON	Brake pedal: Slightly depressed	ON
	Engine: After warming up	Idle	2.0 - 3.0 msec
INJ PULSE-B1	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,000 rpm	1.9 - 2.9 msec
	Engine: After warming up	Idle	8° - 18° BTDC
IGN TIMING	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,000 rpm	25° - 45° BTDC
	Engine: After warming up	Idle	10% - 35%
CAL/LD VALUE	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,500 rpm	10% - 35%
	Engine: After warming up	Idle	1.0 - 4.0 g·m/s
MASS AIRFLOW	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,500 rpm	2.0 - 10.0 g·m/s
PURG VOL C/V	<ul> <li>Engine: After warming up</li> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT),</li> </ul>	Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%
	Neutral (M/T)  No load	2,000 rpm	0 - 50%
	Engine: After warming up	Idle	–5° - 5°CA
INT/V TIM (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0° - 40°CA
	Engine: After warming up	Idle	0% - 2%
INT/V SOL (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0% - 90%
	Engine: Afterwarming up, idle the	Air conditioner switch: OFF	OFF
AIR COND RLY	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	For 1 second after turning ignition     Engine running or cranking	switch ON	ON
	Except above conditions		OFF

## < SERVICE INFOMATION >

MONITOR ITEM	COI	NDITION	SPECIFICATION
VENT CONT/V	Ignition switch: ON		OFF
THRTL RELAY	Ignition switch: ON		ON
		Engine coolant temperature: 97°C (207°F) or less	OFF
COOLING FAN	<ul><li>Engine: After warming up, idle the engine</li><li>Air conditioner switch: OFF</li></ul>	Engine coolant temperature: Between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature: 100°C (212°F) or more	HIGH
HO2S2 HTR (B1)	Below 3,600 rpm after the followir     Engine: After warming up     Keeping the engine speed betwee     at idle for 1 minute under no load	ng conditions are met. en 3,500 and 4,000 rpm for 1 minute and	ON
	• Engine speed: Above 3,600 rpm		OFF
I/P PULLY SPD	Vehicle speed: More than 20 km/h	n (12 MPH)	Almost the same speed as the tachometer indication
VEHICLE SPEED	Turn drive wheels and compare C indication.	ONSULT-III value with the speedometer	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 mile)
A/F S1 HTR (B1)	Engine: After warming up, idle the engine (More than 140 seconds after starting engine.)		4 - 100%
AC PRESS SEN	Engine: Idle     Air conditioner switch: ON (Compressor operates)		1.0 - 4.0V
VHCL SPEED SE	Turn drive wheels and compare speedometer indication with the CONSULT- III value.		Almost the same speed as the speedometer indication
SET VHCL SPD			The preset vehicle speed is displayed.
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
IVIAIN SVV	Ignition switch: ON	MAIN switch: Released	OFF
CANCEL SW	Ignition switch: ON	CANCEL switch: Pressed	ON
CANCEL SW	• Ignition switch. ON	CANCEL switch: Released	OFF
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
RESUME/ACC SW	ignition switch. ON	RESUME/ACCELERATE switch: Released	OFF
SET SW	Ignition switch: ON	SET/COAST switch: Pressed	ON
OL I GVV	Ignition switch. On	SET/COAST switch: Released	OFF
RDAKE SIM1	• Ignition switch: ON	Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	ON
• Ignition switch: ON		Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	OFF
BRAKE SW2	Ignition switch: ON	Brake pedal: Fully released	OFF
DIVAIVE SWZ	- Igrillion Switch. ON	Brake pedal: Slightly depressed	ON
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time $\rightarrow$ at the 2nd time	$ON \rightarrow OFF$

## **TROUBLE DIAGNOSIS**

## < SERVICE INFOMATION >

[MR TYPE 1]

MONITOR ITEM	CONDITION		SPECIFICATION
		ACSD: Operating	ON
SET LAMP	<ul> <li>Vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Not operating	OFF

<sup>\*:</sup> 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.

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## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description INFOID:0000000004537063

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

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the 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 correc-
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

## Testing Condition

< SERVICE INFOMATION >

INFOID:0000000004537064

**IMR TYPE 11** 

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (1.003 1.064 kg/cm<sup>2</sup>, 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
- A/T and CVT models: After the engine is warmed up to normal operating temperature, drive vehicle until "FLUID TEMP SE" (A/T or CVT) fluid temperature sensor signal) indicates more than 60°C (140°F).
- M/T models: After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- · Engine speed: Idle

## Inspection Procedure

INFOID:0000000004537065

#### NOTE:

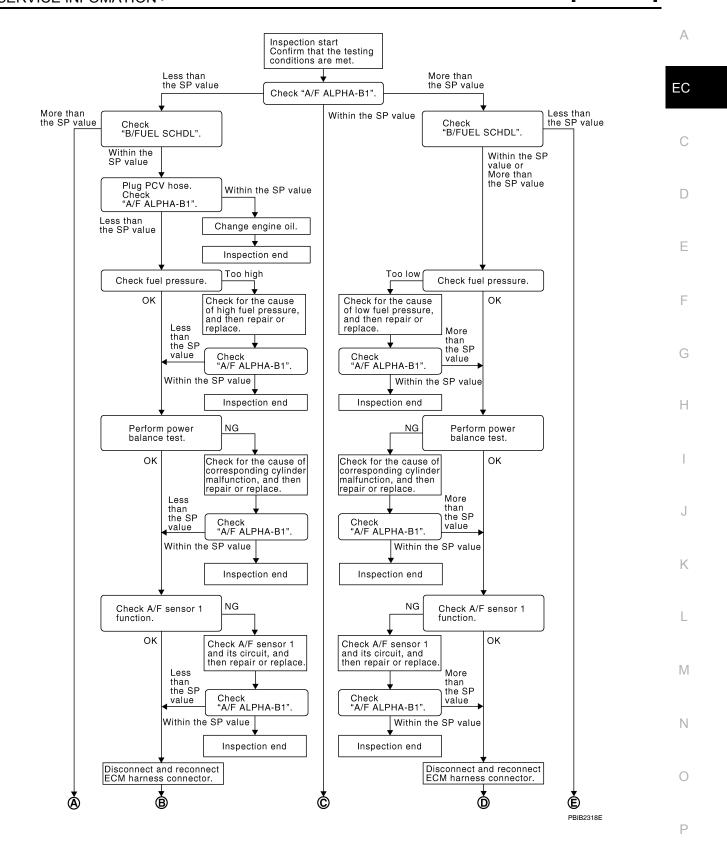
Perform "SPEC" of "DATA MONITOR" mode in maximum scale display.

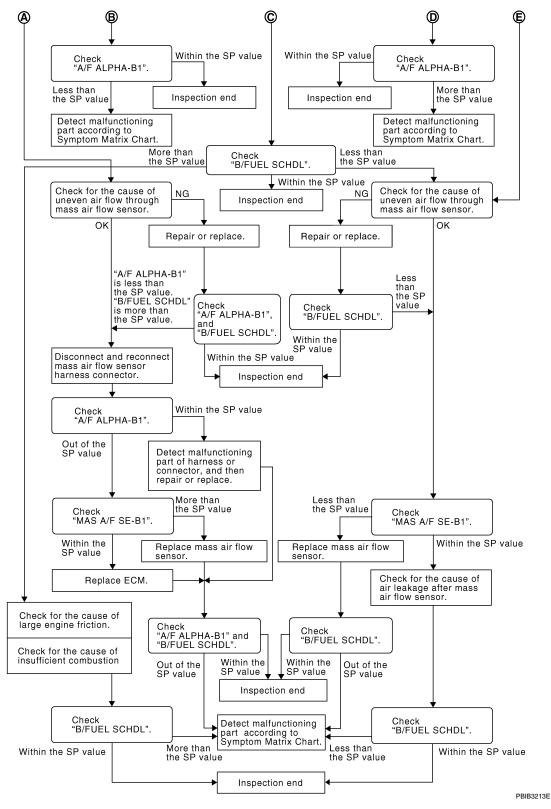
- Perform EC-566, "Basic Inspection".
- Confirm that the testing conditions indicated above are met.
- Select "B/FUEL SCHDL", "A/F ALPHA-B1" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT-III.
- Make sure that monitor items are within the SP value. 4.
- If NG, go to EC-618, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004537066

**OVERALL SEQUENCE** 





### **DETAILED PROCEDURE**

# 1.CHECK "A/F ALPHA-B1"

- Start engine.
- Confirm that the testing conditions are met. Refer to <u>EC-618. "Testing Condition"</u>.
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

NOTE:

### TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[MR TYPE 1] < SERVICE INFOMATION > Check "A/F ALPHA-B1" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little. Α OK or NG OK >> GO TO 17. NG (Less than the SP value)>>GO TO 2. EC 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 make sure that the indication is within the SP value. OK or NG D OK >> GO TO 4. NG (More than the SP value)>>GO TO 19. 3.CHECK "B/FUEL SCHDL" Е Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. OK or NG F 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" Stop the engine. Н 2. Disconnect PCV hose, and then plug it. Start engine. 4. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. OK or NG OK >> GO TO 5. NG >> GO TO 6. CHANGE ENGINE OIL Stop the engine. K Change engine oil. Refer to LU-17, "Changing 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 L short during winter). The symptom will not be detected after changing engine oil or changing driving condition. M >> INSPECTION END O.CHECK FUEL PRESSURE N Check fuel pressure. (Refer to EC-574, "Fuel Pressure Check".) OK or NG OK >> GO TO 9. NG (Fuel pressure is too high)>>Replace fuel pressure regulator, refer to EC-574, "Fuel Pressure Check". GO TO 8. NG (Fuel pressure is too low)>>GO TO 7. Р .DETECT MALFUNCTIONING PART Check the following. Clogged and bent fuel hose and fuel tube

- Clogged fuel filter
- Fuel pump and its circuit (Refer to EC-991.)
- If NG, repair or replace the malfunctioning part. (Refer to EC-574, "Fuel Pressure Check".) If OK, replace fuel pressure regulator.

**EC-621** 

>> GO TO 8.

# 8.CHECK "A/F ALPHA-B1"

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

#### OK or NG

OK >> INSPECTION END

NG >> GO TO 9.

## 9.PERFORM POWER BALANCE TEST

- Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- Make sure that the each cylinder produces a momentary engine speed drop.

### OK or NG

OK >> GO TO 12. NG >> GO TO 10.

# 10.DETECT MALFUNCTIONING PART

- Check the following.
- Ignition coil and its circuit (Refer to EC-996.)
- Fuel injector and its circuit (Refer to EC-986.)
- Intake air leakage
- Low compression pressure (Refer to EM-185, "On-Vehicle Service".)
- If NG, repair or replace the malfunctioning part.

If OK, replace fuel injector. (It may be caused by leakage from fuel injector or clogging.)

>> GO TO 11.

# 11.CHECK "A/F ALPHA-B1"

- 1. Start engine.
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the 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, refer to EC-692, "DTC Confirmation Procedure".
- For DTC P0131, refer to EC-698, "DTC Confirmation Procedure".
- For DTC P0132, refer to <u>EC-704</u>, "DTC Confirmation Procedure".
- For DTC P0133, refer to <u>EC-710, "DTC Confirmation Procedure"</u>.
   For DTC P2A00, refer to <u>EC-966, "DTC Confirmation Procedure"</u>.

### 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"

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

#### OK or NG

# **TROUBLE DIAGNOSIS - SPECIFICATION VALUE**

< SERVICE INFOMATION > [MR TYPE 1]	
OK >> INSPECTION END NG >> GO TO 15.	А
15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR	
<ol> <li>Stop the engine.</li> <li>Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.</li> </ol>	EC
>> GO TO 16.	0
16.CHECK "A/F ALPHA-B1"	С
<ol> <li>Start engine.</li> <li>Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.</li> </ol>	D
OK or NG	
OK >> INSPECTION END  NG >> Detect malfunctioning part according to <u>EC-583, "Symptom Matrix Chart".</u> 17	Е
17. CHECK "B/FUEL SCHDL"	F
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.	
OK or NG	G
OK >> INSPECTION END NG (More than the SP value)>>GO TO 18.	
NG (Less than the SP value)>>GO TO 25.	Н
18. DETECT MALFUNCTIONING PART	11
<ol> <li>Check for the cause of large engine friction. Refer to the following.</li> <li>Engine oil level is too high</li> </ol>	
- Engine oil viscosity	I
<ul> <li>Belt tension of alternator, A/C compressor, etc. is excessive</li> <li>Noise from engine</li> </ul>	
- Noise from transmission, etc.	J
<ul><li>Check for the cause of insufficient combustion. Refer to the following.</li><li>Valve clearance malfunction</li></ul>	
- Intake valve timing control function malfunction	K
- Camshaft sprocket installation malfunction, etc.	
>> Repair or replace malfunctioning part, and then GO TO 30.	L
19. CHECK INTAKE SYSTEM	
Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.	M
<ul> <li>Crushed air ducts</li> <li>Malfunctioning seal of air cleaner element</li> </ul>	IVI
Uneven dirt of air cleaner element	
Improper specification of intake air system	Ν
OK or NG OK >> GO TO 21.	
NG >> Repair or replace malfunctioning part, and then GO TO 20.	0
20. CHECK "A/F ALPHA-B1" AND "B/FUEL SCHDL"	
Select "A/F ALPHA-B1" and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the each indication is within the SP value.	Р
OK or NG	
OK >> INSPECTION END  NG ("B/FUEL SCHDL" is more, "A/F ALPHA-B1" is less than the SP value)>>GO TO 21.	
21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR	

1. Stop the engine.

[MR TYPE 1] < SERVICE INFOMATION >

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"

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

#### OK or NG

OK >> 1. Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-655.

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 make sure 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

- Replace ECM.
- Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>".

  3. Perform <u>EC-572</u>, "<u>VIN Registration</u>".
- 4. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 5. Perform EC-572, "Throttle Valve Closed Position Learning".
- 6. Perform EC-572, "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 of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of 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 make sure that the indication is within the SP value.

#### OK or NG

>> INSPECTION END OK

NG (Less than the SP value)>>GO TO 27.

2/.CHECK "MAS A/F SE-B1"

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

#### OK or NG

>> 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 leak after the mass air flow sensor. Refer to the following.

### TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< SERVICE INFOMATION >

- · Disconnection, looseness, and cracks in air duct
- · Looseness of oil filler cap
- · Disconnection of oil level gauge
- · Open stuck, breakage, hose disconnection, or cracks of PCV valve
- Disconnection or cracks of EVAP purge hose, open stuck of EVAP canister purge volume control solenoid valve
- Malfunctioning seal of rocker cover gasket
- Disconnection, looseness, or cracks of hoses, such as vacuum hose, connecting to intake air system parts
- · Malfunctioning seal of intake air system, etc.

>> GO TO 30.

# $29.\mathsf{CHECK}$ "A/F ALPHA-B1" AND "B/FUEL SCHDL"

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

### OK or NG

OK >> INSPECTION END

NG >> Detect malfunctioning part according to <u>EC-583</u>, "Symptom Matrix Chart".

# 30. CHECK "B/FUEL SCHDL"

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

#### OK or NG

OK >> INSPECTION END

NG >> Detect malfunctioning part according to <a href="EC-583">EC-583</a>. "Symptom Matrix Chart".

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## TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description INFOID.000000004537067

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 o		
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:0000000004537068

# 1.INSPECTION START

Erase (1st trip) DTCs.

Refer to EC-542, "Emission-related Diagnostic Information".

>> GO TO 2.

# 2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.

Refer to EC-632, "Ground Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

# 3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-25, "How to Perform Efficient Diagnosis for an Electrical Incident", "INCIDENT SIMULATION TESTS".

#### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

# 4. CHECK CONNECTOR TERMINALS

Refer to GI-22, "How to Check Terminal", "HOW TO PROBE CONNECTORS", "How to Check Enlarged Contact Spring of Terminal".

#### OK or NG

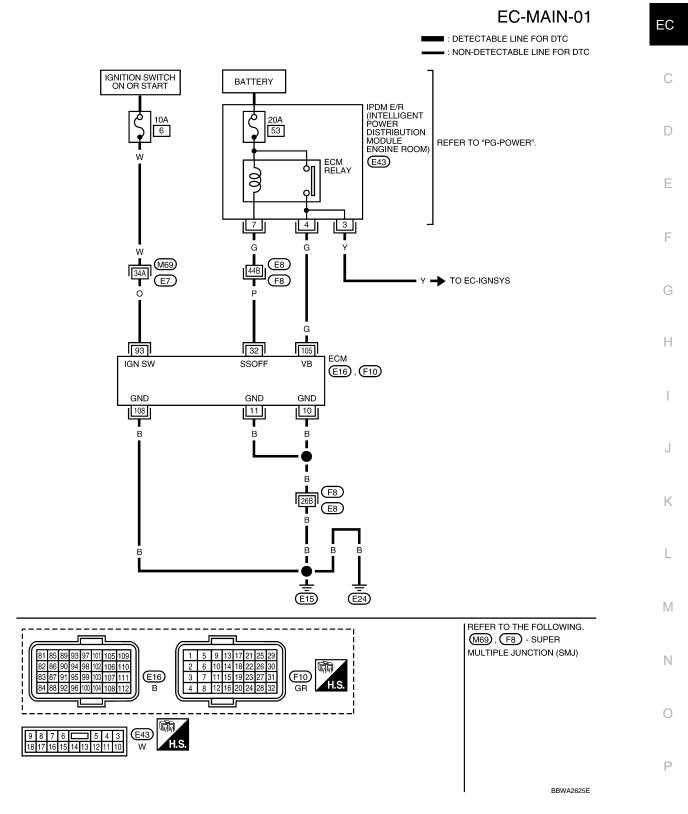
OK >> INSPECTION END

NG >> Repair or replace connector.

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# POWER SUPPLY AND GROUND CIRCUIT

Wiring Diagram INFOID:0000000004537069



Specification data are reference values and are measured between each terminal and ground.

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.

### < SERVICE INFOMATION >

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
10 11	B B	ECM ground	[Engine is running] • Idle speed	Body ground
32	2 P ECM relay		[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
		(Self shut-off)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch: OFF]	OV
93	О	Ignition switch	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
108	В	ECM ground	[Engine is running] • Idle speed	Body ground

# Diagnosis Procedure

INFOID:0000000004537070

# 1.INSPECTION START

Start engine.

### Is engine running?

#### Yes or No

Yes >> GO TO 8. No >> GO TO 2.

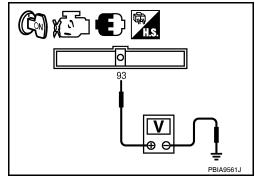
# 2. CHECK ECM POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF and then ON.
- 2. Check voltage between ECM terminal 93 and ground with CON-SULT-III or tester.

### **Voltage: Battery voltage**

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



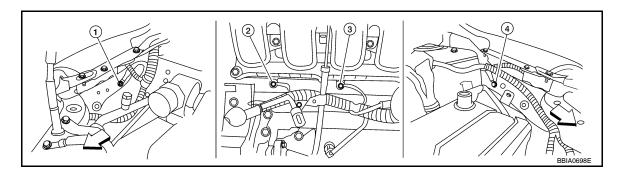
# 3. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- 10A 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 screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



Vehicle front

- Body ground E24 1.
- Engine ground F9
- Engine ground F16

4. Body ground E15

OK or NG

OK >> GO TO 5.

NG >> Repair or replace ground connections.

# ${f 5}$ .CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

- Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminals 10, 11, 108 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.

### O.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors F8, E8
- · Harness for open or short between ECM and ground

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

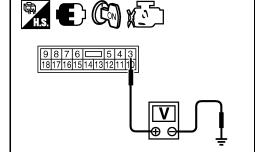
# 7.CHECK ECM POWER SUPPLY CIRCUIT-II

- Reconnect ECM harness connector.
- Turn ignition switch ON.
- 3. Check voltage between IPDM E/R terminal 3 and ground with CONSULT-III or tester.

# Voltage: Battery voltage

### OK or NG

OK >> Go to <u>EC-996</u>. NG >> GO TO 8.



# 8.CHECK ECM POWER SUPPLY CIRCUIT-III

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

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# < SERVICE INFOMATION >

Check voltage between ECM terminal 105 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 14.

NG (Battery voltage does not exist.)>>GO TO 9.

NG (Battery voltage exists for more than a few seconds.)>>GO TO

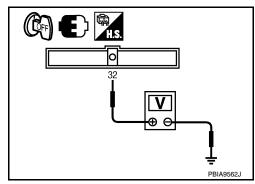
9. CHECK ECM POWER SUPPLY CIRCUIT-IV

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Check voltage between ECM terminal 32 and ground with CON-SULT-III or tester.

### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 10. NG >> GO TO 11.



# 10. CHECK ECM POWER SUPPLY CIRCUIT-V

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E43.
- Check harness continuity between ECM terminal 105 and IPDM E/R 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 17.

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

# 11. CHECK ECM POWER SUPPLY CIRCUIT-VI

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E43.
- Check harness continuity between ECM terminal 32 and IPDM E/R terminal 7. Refer to Wiring Diagram.

### Continuity should exist.

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

#### OK or NG

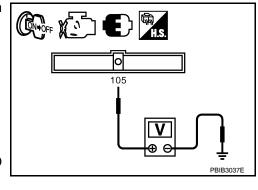
OK >> GO TO 13. NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E8, F8
- 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.



[MR TYPE 1]

POWER SUPPLY AND GROUND CIRCUIT [MR TYPE 1] < SERVICE INFOMATION > 13. CHECK 20A FUSE Disconnect 20A fuse from IPDM E/R. 2. Check 20A fuse. OK or NG EC OK >> GO TO 17. NG >> Replace 20A fuse. 14. CHECK GROUND CONNECTIONS 1. Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection". D F

Vehicle front

Body ground E24 1.

Engine ground F9

Engine ground F16

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4. Body ground E15

### OK or NG

OK >> GO TO 15.

NG >> Repair or replace ground connections.

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

- Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminals 10, 11, 108 and ground. Refer to Wiring Diagram.

### Continuity should exist.

3. Also check harness for short to power.

### OK or NG

OK >> GO TO 17.

NG >> GO TO 16.

# 16. DETECT MALFUNCTIONING PART

### Check the following.

- · Harness connectors F8, E8
- · Harness for open or short between ECM and ground

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

# 17. CHECK INTERMITTENT INCIDENT

### Refer to EC-626.

### OK or NG

NG

OK >> Replace IPDM E/R. Refer to PG-26, "IPDM E/R Power/Ground Circuit Inspection".

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

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**EC-631** 

## **Ground Inspection**

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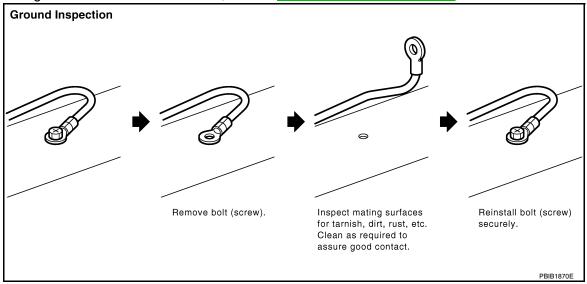
Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

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.

For detailed ground distribution information, refer to PG-29, "Ground Distribution".



## DTC U1000, U1001 CAN COMMUNICATION LINE

[MR TYPE 1] < SERVICE INFOMATION >

# DTC U1000, U1001 CAN COMMUNICATION LINE

Description INFOID:0000000004537072

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:0000000004537073	

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000* <sup>1</sup> 1000* <sup>1</sup>	CAN communication	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) for 2 seconds or more.	Harness or connectors     (CAN communication line is open or
U1001* <sup>2</sup> 1001* <sup>2</sup>	line	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission-related diagnosis) for 2 seconds or more.	shorted.)

<sup>\*1:</sup> This self-diagnosis has the one trip detection logic (A/T, CVT). The MIL will not light up for this self-diagnosis (M/T).

### **DTC Confirmation Procedure**

- Turn ignition switch ON and wait at least 3 seconds.
- 2. Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-634, "Diagnosis Procedure".

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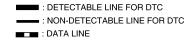
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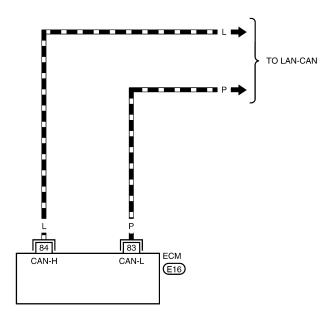
<sup>\*2:</sup> The MIL will not light up for this self-diagnosis.

Wiring Diagram

INFOID:0000000004537075

### EC-CAN-01







BBWA2626E

Diagnosis Procedure

INFOID:000000004537076

Go to LAN-17, "Trouble Diagnosis Flow Chart".

### DTC U1010 CAN COMMUNICATION

< SERVICE INFOMATION > [MR TYPE 1]

## DTC U1010 CAN COMMUNICATION

Description INFOID:000000004537077

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

This self-diagnosis has the one trip detection logic (A/T, CVT). The MIL will not light up for this self-diagnosis (M/T).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1010 1010	CAN communication bus	When detecting error during the initial diagnosis for CAN controller of each control unit.	• ECM

### **DTC Confirmation Procedure**

1. Turn ignition switch ON.

- 2. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-635</u>, "<u>Diagnosis Procedure</u>".

## Diagnosis Procedure

# 1. INSPECTION START

- 1. Erase DTC.
- Perform DTC Confirmation Procedure.
   See <u>EC-635</u>, "DTC Confirmation Procedure".
- 3. Is the 1st trip DTC U1010 displayed again?

### Yes or No

Yes >> GO TO 2.

No >> INSPECTION END

# 2.REPLACE ECM

- 1. Replace ECM.
- Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249, "ECM Re-communicating Function".
- 3. Perform EC-572, "VIN Registration".
- 4. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 5. Perform EC-572, "Throttle Valve Closed Position Learning".
- Perform <u>EC-572</u>, "Idle Air Volume Learning".

#### >> INSPECTION END

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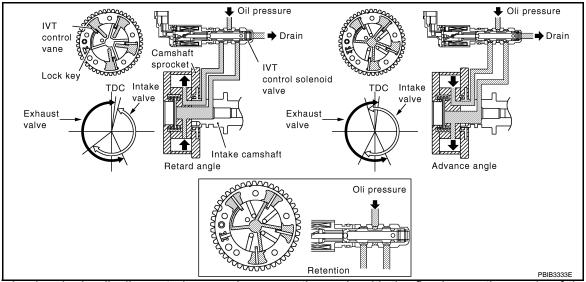
## DTC P0011 IVT CONTROL

Description INFOID:000000004537081

### SYSTEM DESCRIPTION

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

<sup>\*:</sup> This signal is sent to the ECM through 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 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.

### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537082

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
	Engine: After warming up	Idle	−5° - 5°CA
INT/V TIM (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0° - 40°CA
	Engine: After warming up	Idle	0% - 2%
Air conditioner switch: OFF     Shift lever: P or N (A/T, CVT),     Neutral (M/T)     No load		When revving engine up to 2,000 rpm quickly	Approx. 0% - 90%

## On Board Diagnosis Logic

INFOID:0000000004537083

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	DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
_	P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Intake valve timing control solenoid valve Accumulation of debris to the signal pick-up portion of the camshaft Timing chain installation Foreign matter caught in the oil groove for intake valve timing control

#### **FAIL-SAFE MODE**

ECM enters in fail-safe mode when the malfunction is detected.

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:0000000004537084

#### **CAUTION:**

Always drive at a safe speed.

#### NOTE:

- If DTC P0011 is displayed with DTC P0075, first perform trouble diagnosis for DTC P0075.
- · If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

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

#### WITH CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to the normal operating temperature.
- 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)
B/FUEL SCHDL	More than 3.87 msec
Shift lever	P or N position (A/T, CVT) Neutral position (M/T)

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

If 1st trip DTC is detected, go to EC-638, "Diagnosis Procedure".

If 1st trip DTC is not detected, go to next step.

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

ENG SPEED	2,000 - 3,175 rpm (A constant rotation is maintained.)	
COOLAN TEMP/S	70 - 105°C (158 - 221°F)	
Shift lever	1st or 2nd position	
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)	

Check 1st trip DTC.

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If 1st trip DTC is detected, go to EC-638, "Diagnosis Procedure".

#### WITH GST

Follow the procedure "WITH CONSULT-III" above.

## Diagnosis Procedure

INFOID:0000000004537085

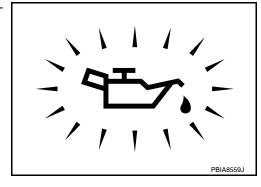
# 1. CHECK OIL PRESSURE WARNING LAMP

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

### OK or NG

OK >> GO TO 2.

NG >> Go to <u>LU-16</u>, "Inspection".



# 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-639, "Component Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Replace intake valve timing control solenoid valve.

# 3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-780, "Component Inspection".

#### OK or NG

OK >> GO TO 4.

NG >> Replace crankshaft position sensor (POS).

# 4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-785, "Component Inspection".

### OK or NG

OK >> GO TO 5.

NG >> Replace camshaft position sensor (PHASE).

## **5.**CHECK CAMSHAFT (INTAKE)

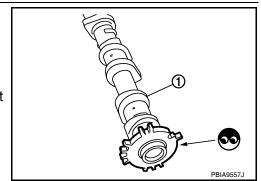
### Check the following.

- · Accumulation of debris to the signal plate of camshaft (1) rear end
- Chipping signal plate of camshaft rear end

#### OK or NG

OK >> GO TO 6.

NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



# 6. CHECK TIMING CHAIN INSTALLATION

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

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

#### Yes or No

Yes >> Check timing chain installation. Refer to EM-160.

No >> GO TO 7.

# 7.CHECK LUBRICATION CIRCUIT

Refer to EM-170, "Removal and Installation".

#### OK or NG

OK >> GO TO 8.

NG >> Clean lubrication line.

## 8. CHECK INTERMITTENT INCIDENT

### Refer to EC-626.

For Wiring Diagram, refer to <u>EC-776</u>, "Wiring <u>Diagram"</u> for CKP sensor (POS) and <u>EC-782</u>, "Wiring <u>Diagram"</u> for CKP sensor (PHASE).

### >> INSPECTION END

# Component Inspection

#### 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 as follows.

Terminal	Resistance	
1 and 2	6.7 - 7.7Ω [at 20°C (68°F)]	
1 or 2 and ground	${}^{\infty}\Omega$ (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.
- Provide 12V DC between intake valve timing control solenoid valve terminals and then interrupt it. Make sure that the plunger moves as shown in the figure.

### **CAUTION:**

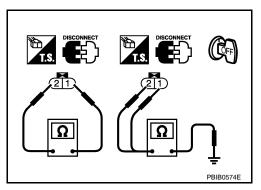
Do not apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

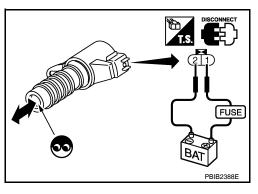
If NG, replace intake valve timing control solenoid valve. **NOTE:** 

Always replace O-ring when intake valve timing control solenoid valve is removed.

### Removal and Installation

INTAKE VALVE TIMING CONTROL SOLENOID VALVE Refer to EM-160.





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# DTC P0031, P0032 A/F SENSOR 1 HEATER

Description INFOID:000000004537088

### SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)			Air fuel ratio (A/F) sensor 1 heater
Mass air flow sensor	Amount of intake air	Tieater Control	61

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:0000000004537089

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
A/F S1 HTR (B1)	Engine: After warming up, idle the engine (More than 140 seconds after starting engine.)	4 - 100%

# On Board Diagnosis Logic

INFOID:0000000004537090

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. [An excessively low voltage signal is sent to ECM through the air fuel ratio (A/F) sensor 1 heater.]	<ul> <li>Harness or connectors         [Air fuel ratio (A/F) sensor 1 heater circuit is open or shorted.]     </li> <li>Air fuel ratio (A/F) sensor 1 heater</li> </ul>
P0032 0032	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. [An excessively high voltage signal is sent to ECM through the air fuel ratio (A/F) sensor 1 heater.]	<ul> <li>Harness or connectors [Air fuel ratio (A/F) sensor 1 heater circuit is shorted.]</li> <li>Air fuel ratio (A/F) sensor 1 heater</li> </ul>

### **DTC Confirmation Procedure**

INFOID:0000000004537091

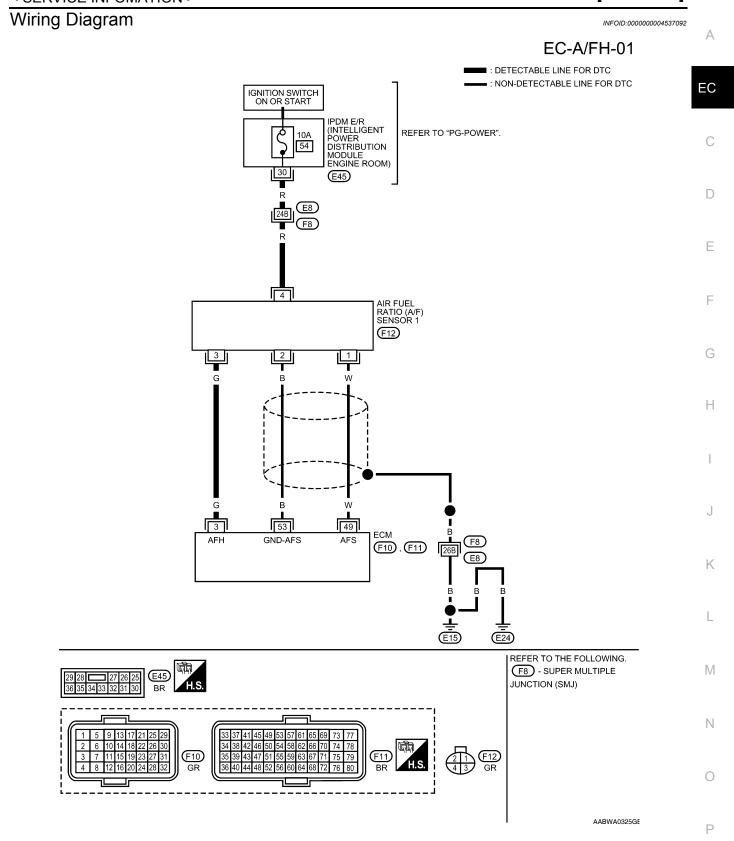
#### NOTE:

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:**

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

- 1. Start engine and run it for at least 10 seconds at idle speed.
- 2. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-642, "Diagnosis Procedure"</u>.



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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V  >> 10.0V/Div 50me/Div T  PBIA8148J
49	W	A/F sensor 1	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

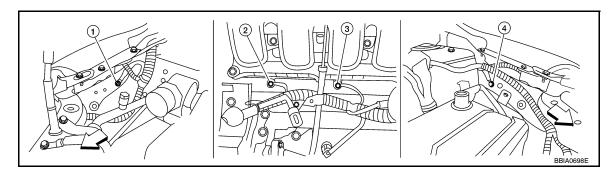
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537093

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

### 4. Body ground E15

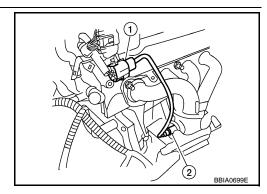
## OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# $2. {\sf CHECK\ AIR\ FUEL\ RATIO\ (A/F)\ SENSOR\ 1\ POWER\ SUPPLY\ CIRCUIT}$

- 1. Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- 2. Turn ignition switch ON.
- Air fuel ratio (A/F) sensor 1 (2)



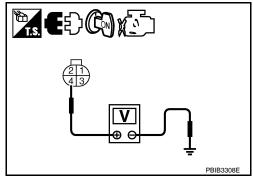
3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.

< SERVICE INFOMATION >



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 3 and A/F sensor 1 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 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-643, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace air fuel ratio (A/F) sensor 1.

### **O.**CHECK INTERMITTENT INCIDENT

Perform EC-626.

#### >> INSPECTION END

### Component Inspection

AIR FUEL RATIO (A/F) SENSOR 1 HEATER

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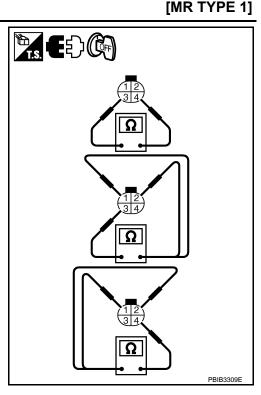
1. Check resistance between A/F sensor 1 terminals as follows.

Terminal No.	Resistance	
3 and 4	1.8 - 2.44 Ω [at 25°C (77°F)]	
3 and 1, 2	$\Omega$	
4 and 1, 2	(Continuity should not exist)	

2. If NG, replace air fuel ratio (A/F) sensor 1.

< SERVICE INFOMATION >

- 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



Removal and Installation

AIR FUEL RATIO SENSOR HEATER Refer to EM-144.

INFOID:0000000004537095

< SERVICE INFOMATION >

# DTC P0037, P0038 HO2S2 HEATER

Description INFOID:0000000004537096

### SYSTEM DESCRIPTION

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

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

#### **OPERATION**

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

### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	<ul> <li>Engine speed: Below 3,600 rpm after the following conditions are met</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	ON
	Engine speed: Above 3,600 rpm	OFF

# On Board Diagnosis Logic

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DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	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.)	<ul> <li>Harness or connectors         (Heated oxygen sensor 2 heater circuit is open or shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>
P0038 0038	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.)	<ul> <li>Harness or connectors (Heated oxygen sensor 2 heater circuit is shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>

### **DTC Confirmation Procedure**

#### 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:**

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

Start engine and warm it up to the normal operating temperature.

[MR TYPE 1]

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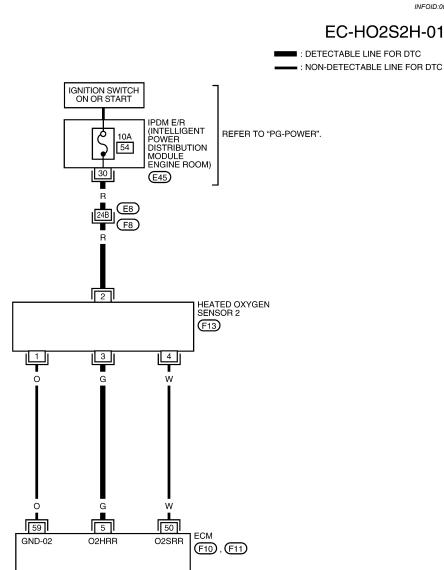
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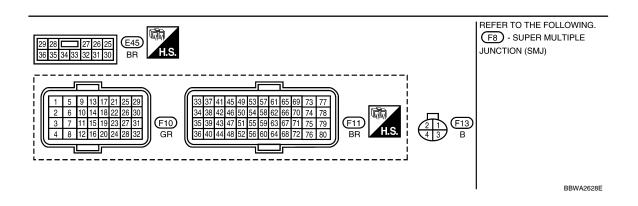
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- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check 1st trip DTC.
- 6. If 1st trip DTC is detected, go to EC-647, "Diagnosis Procedure".

## Wiring Diagram

INFOID:0000000004537100





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.

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5 G	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  >>> 10.0V/Div 50ms/Div T  PBIA8148J
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	BATTERY VOLTAGE (11 - 14V)
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	О	Sensor ground (Heated oxygen sensor 2)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V

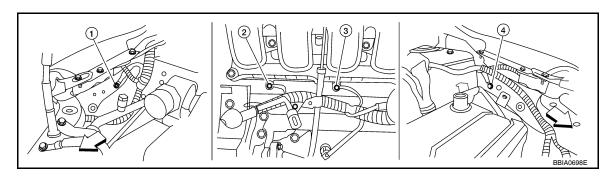
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24 1.
  - Engine ground F9 Body ground E15
- Engine ground F16

### OK or NG

OK >> GO TO 2.

**EC-647** 

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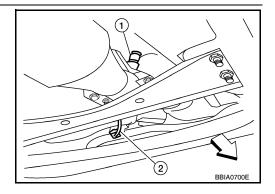
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#### < SERVICE INFOMATION >

NG >> Repair or replace ground connections.

# 2. CHECK HO2S2 POWER SUPPLY CIRCUIT

- 1. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 2. Turn ignition switch ON.

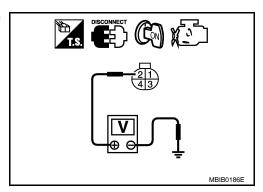


3. Check voltage between HO2S2 terminal 2 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- · Harness for open or short between heated oxygen sensor 2 and fuse
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 5 and HO2S2 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 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-649, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

## 6.CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

# Component Inspection

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### **HEATED OXYGEN SENSOR 2 HEATER**

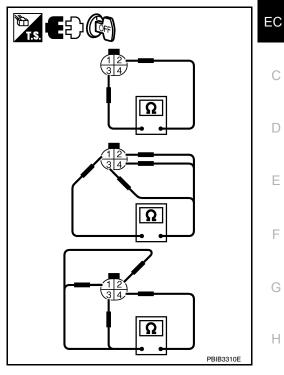
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	3.4 - 4.4 Ω [at 25°C (77°F)]
1 and 2, 3, 4	$\Omega$
4 and 1, 2, 3	(Continuity should not exist)

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 oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



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## Removal and Installation

**HEATED OXYGEN SENSOR 2** Refer to EM-144.

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**EC-649** 

INFOID:0000000004537104

# DTC P0075 IVT CONTROL SOLENOID VALVE

# **Component Description**

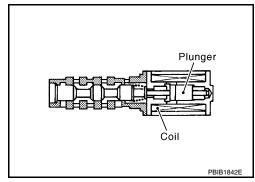
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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:0000000004537105

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
	Engine: After warming up	Idle	0% - 2%
INT/V SOL (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0% - 90%

# On Board Diagnosis Logic

INFOID:0000000004537106

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075 0075	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	Harness or connectors     (Intake valve timing control solenoid valve circuit is open or shorted.)     Intake valve timing control solenoid valve

# **DTC Confirmation Procedure**

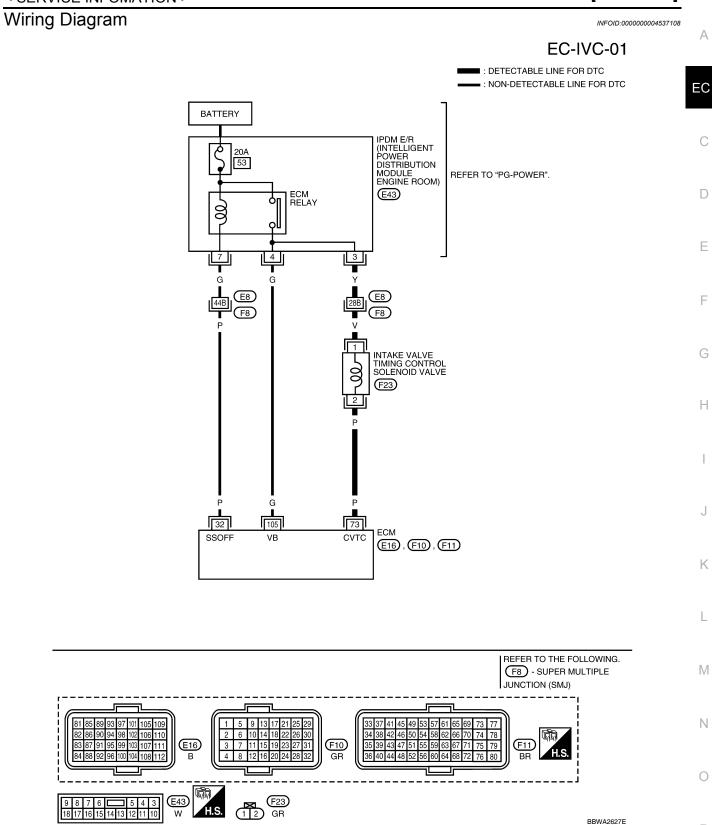
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#### NOTE:

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

- 1. Start engine and let it idle for 5 seconds.
- 2. Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-652, "Diagnosis Procedure".

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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32 P		ECM relay	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
	(Self shut-off)		<ul><li>[Ignition switch: OFF]</li><li>More than a few seconds after turning ignition switch OFF</li></ul>	BATTERY VOLTAGE (11 - 14V)
			<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	BATTERY VOLTAGE (11 - 14V)
73	P	Intake valve timing control solenoid valve	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	7 - 10V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

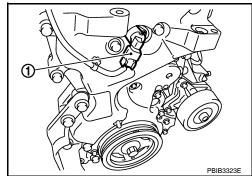
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

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

- 1. Turn ignition switch OFF.
- 2. Disconnect intake valve timing control solenoid valve (1) harness connector.
- 3. Turn ignition switch ON.

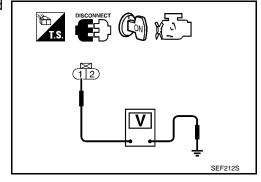


4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-III or tester.

### **Voltage: Battery voltage**

### OK or NG

OK >> GO TO 3. NG >> GO TO 2.



# 2. DETECT MALFUNCTION PART

Check the following.

# **DTC P0075 IVT CONTROL SOLENOID VALVE**

# < SERVICE INFOMATION >

[MR TYPE 1]

- Harness connectors E8, F8
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

>> Repair or replace harness or connectors.

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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 73 and intake valve timing 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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-653, "Component Inspection".

#### OK or NG

OK >> GO TO 5.

NG >> Replace intake valve timing control solenoid valve.

# 5. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

# Component Inspection

#### INTAKE VALVE TIMING CONTROL SOLENOID VALVE

- Disconnect intake valve timing control solenoid valve harness connector.
- 2. Check resistance between intake valve timing control solenoid valve as follows.

Terminal	Resistance
1 and 2	6.7 - 7.7Ω [at 20°C (68°F)]
1 or 2 and ground	$\infty\Omega$ (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. Make sure that the plunger moves as shown in the figure.

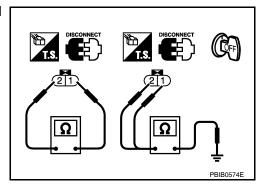
#### **CAUTION:**

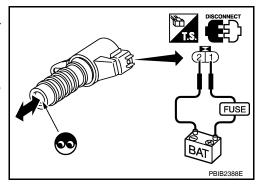
Do not apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve.

#### NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.





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# **DTC P0075 IVT CONTROL SOLENOID VALVE**

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[MR TYPE 1]

Removal and Installation

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INTAKE VALVE TIMING CONTROL SOLENOID VALVE Refer to <u>EM-160</u>.

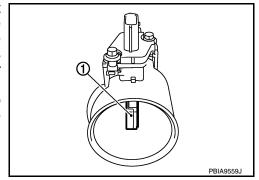
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# DTC P0101 MAF SENSOR

# Component Description

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION	
MAS A/F SE-B1	• See <u>EC-618</u> .			(
	Engine: After warming up	Idle	10% - 35%	
CAL/LD VALUE	<ul> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,500 rpm	10% - 35%	ŀ
	Engine: After warming up	Idle	1.0 - 4.0 g·m/s	
MASS AIRFLOW	<ul> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,500 rpm	4.0 - 10.0 g⋅m/s	

# On Board Diagnosis Logic

INFOID:0000000004537114

INFOID:0000000004537115

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
P0101	Mass air flow sensor cir-	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	Harness or connectors     (Mass air flow sensor circuit is open or shorted.)     Mass air flow sensor     EVAP control system pressure sensor     Intake air temperature sensor
0101	cuit range/performance	В)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	Harness or connectors     (Mass air flow 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**

### 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.

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#### < SERVICE INFOMATION >

### 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.
- 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-659, "Diagnosis Procedure".

## PROCEDURE FOR MALFUNCTION B

#### **CAUTION:**

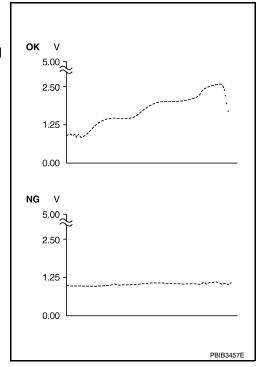
Always drive vehicle at a safe speed.

- With CONSULT-III
- 1. Turn ignition switch ON.
- 2. Start engine and warm it up to normal operating temperature.

If engine cannot be started, go to EC-659, "Diagnosis Procedure".

- 3. Select "DATA MONITOR" mode with CONSULT-III.
- 4. Check the voltage of "MAS A/F SE-B1" with "DATA MONITOR".
- 5. Increases engine speed to about 4,000 rpm.
- Monitor the linear voltage rise in response to engine speed increases.

If NG, go to <u>EC-659</u>, "<u>Diagnosis Procedure</u>". If OK, go to following step.



7. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL SEN 1	More than 3V
THRTL SEN 2	More than 3V
Shift lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

- 8. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-659. "Diagnosis Procedure"</u>.

### Overall Function Check

INFOID:0000000004537116

## PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st DTC might not be confirmed.

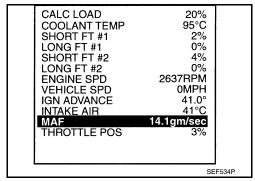
With GST

## **DTC P0101 MAF SENSOR**

< SERVICE INFOMATION > [MR TYPE 1]

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 about 4,000 rpm in engine speed.
- If NG, go to <u>EC-659, "Diagnosis Procedure"</u>.



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Wiring Diagram

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# EC-MAFS-01 ■ : DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC BATTERY IPDM E/R (INTELLIGENT 20A POWER DISTRIBUTION MODULE 53 REFER TO "PG-POWER". ENGINE ROOM) ECM RELAY **E**43 4 Œ (F8) (E8) (F8) ■ 30B ■ BR BR 2 MASS AIR FLOW SENSOR (F31) 4 3 LG 32 52 105 45 SSOFF QA+ GND-QA E16, F10, F11 REFER TO THE FOLLOWING. (F8) - SUPER MULTIPLE JUNCTION (SMJ)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

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95 99 103 107 111

**E**16

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.

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## < SERVICE INFOMATION >

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	32 P ECM relay (Self shut-off)		[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
			[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
45	45 G Mass air flow sensor		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0.8 - 1.1V
43			<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.7V
52	LG	Sensor ground (Mass air flow sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

Diagnosis Procedure

1.INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.

B >> GO TO 2.

# 2. CHECK INTAKE AIR LEAK

Check the following for connections.

- · Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

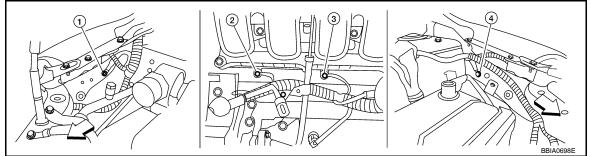
## OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

# 3. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



INFOID:0000000004537118

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Body ground E15

Vehicle front

1. Body ground E24

2. Engine ground F9

Engine ground F16

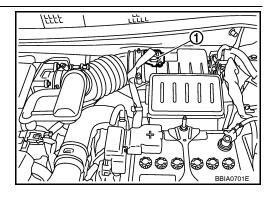
#### OK or NG

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.

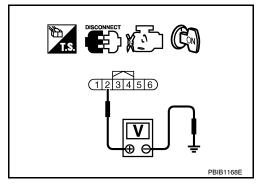


Check voltage between MAF sensor terminal 2 and ground with CONSULT-III or tester.

## Voltage: Battery voltage

### OK or NG

OK >> GO TO 6. NG >> GO TO 5.



# DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness connectors E8, F8
- Harness for open or short between mass air flow sensor and IPDM E/R
- Harness for open or short between mass air flow sensor and ECM
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between MAF sensor terminal 3 and ECM terminal 52. 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

 Check harness continuity between MAF sensor terminal 4 and ECM terminal 45. 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 or short to power in harness or connectors. 8.CHECK INTAKE AIR TEMPERATURE SENSOR Refer to EC-688, "Component Inspection". OK or NG OK >> GO TO 9. NG >> Replace intake air temperature sensor.

Refer to EC-831, "Component Inspection".

#### OK or NG

OK >> GO TO 10.

NG >> Replace EVAP control system pressure sensor.

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

# 10.CHECK MASS AIR FLOW SENSOR

Refer to EC-661, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> Replace mass air flow sensor.

# 11. CHECK INTERMITTENT INCIDENT

Perform EC-626.

### >> INSPECTION END

# Component Inspection

#### MASS AIR FLOW SENSOR

#### With CONSULT-III

- 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.
- 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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 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 following.
  - · Crushed air ducts
  - · Malfunctioning seal of air cleaner element
  - Uneven dirt of air cleaner element
  - Improper specification of intake air system parts

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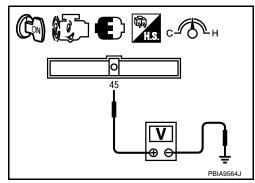
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- If NG, repair or replace malfunctioning part and perform step 2 to 4 again. If OK, go to next step.
- 6. Turn ignition switch OFF.
- Disconnect mass air flow sensor harness connector and reconnect it again.
- 8. Perform step 2 to 4 again.
- 9. If 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 45 (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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*



- \*: Check for linear voltage rise in response to engine being increased to about 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 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 step 2 and 3 again. If OK, go to next step.
- 5. Turn ignition switch OFF.
- Disconnect mass air flow sensor harness connector and reconnect it again.
- 7. Perform step 2 and 3 again.
- If NG, clean or replace mass air flow sensor.

### Removal and Installation

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MASS AIR FLOW SENSOR

INFOID:0000000004537121

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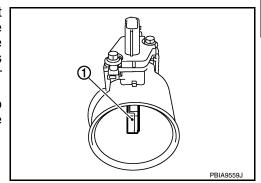
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# DTC P0102, P0103 MAF SENSOR

# Component Description

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537122

Specification data are reference values.

MONITOR ITEM	CC	SPECIFICATION	
MAS A/F SE-B1	See <u>EC-618</u> .		
	Engine: After warming up	Idle	10% - 35%
CAL/LD VALUE	Shift lever: P or N (A/T, CVT),     Neutral (M/T)     Air conditioner switch: OFF     No load	2,500 rpm	10% - 35%
	Engine: After warming up	Idle	1.0 - 4.0 g·m/s
MASS AIRFLOW	Shift lever: P or N (A/T, CVT),     Neutral (M/T)     Air conditioner switch: OFF     No load	2,500 rpm	4.0 - 10.0 g·m/s

# On Board Diagnosis Logic

INFOID:0000000004537123

## 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     (Mass air flow sensor circuit is open or shorted.)     Intake air leaks     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     (Mass air flow 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 lights up.

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**

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#### 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.

# DTC P0102, P0103 MAF SENSOR

### < SERVICE INFOMATION >

[MR TYPE 1]

## PROCEDURE FOR DTC P0102

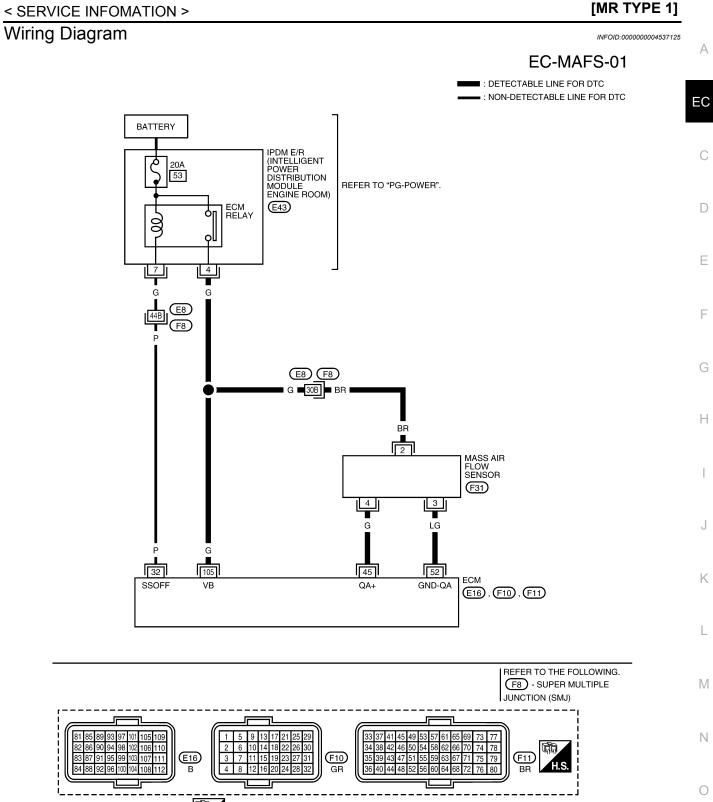
- 1. Start engine and wait at least 5 seconds.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-666, "Diagnosis Procedure".

## 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 <u>EC-666, "Diagnosis Procedure"</u>. 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-666, "Diagnosis Procedure".

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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

INFOID:0000000004537126

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32 P		ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
	(Sell Silut-Oil)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)	
45 G	Mass air flow sensor	[Engine is running] • Warm-up condition • Idle speed	0.8 - 1.1V	
43 0		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.7V	
52	LG	Sensor ground (Mass air flow sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

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

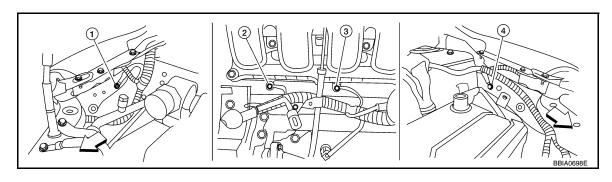
# OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

# 3. Check ground connections

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



Vehicle front -

1. Body ground E24

Body ground E15

Engine ground F9

Engine ground F16

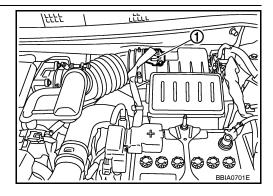
OK or NG

OK >> GO TO 4.

NG >> Repair or replace ground connections.

f 4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow (MAF) sensor (1) harness connector.
- Turn ignition switch ON.

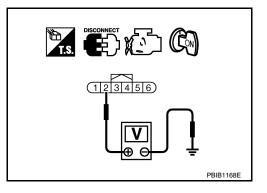


Check voltage between MAF sensor terminal 2 and ground with CONSULT-III or tester.

Voltage: Battery voltage

## OK or NG

OK >> GO TO 6. NG >> GO TO 5.



# 5. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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.

# $oldsymbol{6}.$ CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between MAF sensor terminal 3 and ECM terminal 52. 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.

## 1. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between MAF sensor terminal 4 and ECM terminal 45. Refer to Wiring Diagram.

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### 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-668, "Component Inspection".

#### OK or NG

OK >> GO TO 9.

NG >> Replace mass air flow sensor.

# 9. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004537127

## MASS AIR FLOW SENSOR

### With CONSULT-III

- 1. Reconnect all harness connectors disconnected.
- 2. Start engine and warm it up to normal operating temperature.
- 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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 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 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 step 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 step 2 to 4 again.
- 9. If NG, clean or replace mass air flow sensor.

### Without CONSULT-III

- 1. Reconnect all harness connectors disconnected.
- Start engine and warm it up to normal operating temperature.

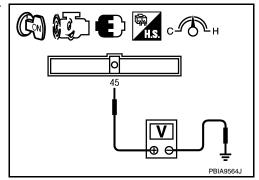
# DTC P0102, P0103 MAF SENSOR

# < SERVICE INFOMATION >

[MR TYPE 1]

Check voltage between ECM terminal 45 (Mass air flow sensor signal) and ground.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx 0.4
Idle (Engine is warmed-up to normal operating temperature.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*



- \*: Check for linear voltage rise in response to engine being increased to about 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 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 step 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 step 2 and 3 again.
- 8. If NG, clean or replace mass air flow sensor.

### Removal and Installation

MASS AIR FLOW SENSOR

Refer to EM-139.

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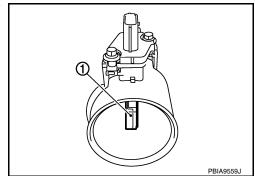
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# DTC P0112, P0113 IAT SENSOR

# **Component Description**

The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



#### <Reference data>

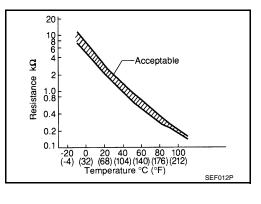
Intake air temperature °C (°F)	Voltage* V	Resistance $k\Omega$
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 46 (Intake air temperature sensor) and ground.

#### **CAUTION:**

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

# On Board Diagnosis Logic



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air tempera- ture sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Intake air temperature sensor circuit is open
P0113 0113	Intake air tempera- ture sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	or shorted.)  Intake air temperature sensor

# **DTC Confirmation Procedure**

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INFOID:0000000004537130

#### 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.

- 1. Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-671, "Diagnosis Procedure".

# Wiring Diagram

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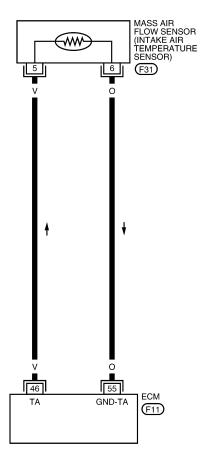
## EC-IATS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

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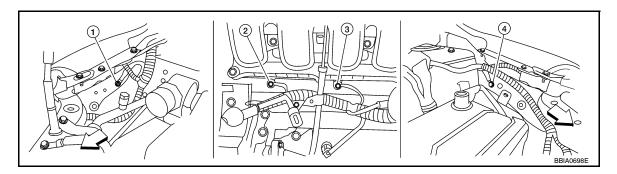
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# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

## OK or NG

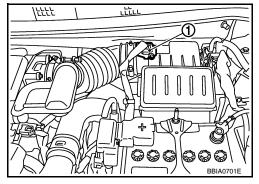
4.

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 (with intake air temperature sensor) (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.

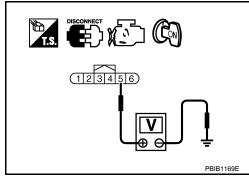
## **Voltage: Approximately 5V**

### 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

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between mass air flow sensor terminal 6 and ECM terminal 55. 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

# **DTC P0112, P0113 IAT SENSOR**

< SERVICE INFOMATION >

Refer to EC-673, "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-626.

### >> INSPECTION END

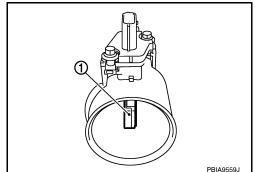
# Component Inspection

# 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

If NG, replace mass air flow sensor (with intake air temperature sensor).



Acceptable 0.4 0.2 0.1 -20 0 20 40 60 80 100 (-4) (32) (68) (104) (140) (176) (212) Temperature °C (°F) SEF012F

# Removal and Installation

MASS AIR FLOW SENSOR

Refer to EM-139.

INFOID:0000000004537135

**EC-673** 

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[MR TYPE 1]

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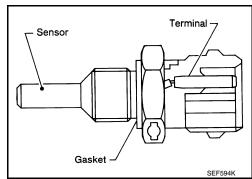
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INFOID:0000000004537136

# DTC P0117, P0118 ECT SENSOR

# **Component Description**

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

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.

# 

#### CAUTION:

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

# On Board Diagnosis Logic

INFOID:0000000004537137

### These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant tem- perature sensor cir- cuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Engine coolant temperature sensor circuit is)
P0118 0118	Engine coolant tem- perature sensor cir- cuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.)  • Engine coolant temperature sensor

## **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

# **DTC P0117, P0118 ECT SENSOR**

# < SERVICE INFOMATION >

[MR TYPE 1]

Detected items	Engine operating condition in fail-safe mode		
	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)	
Engine coolant temper-	Just as ignition switch is turned ON or START	40°C (104°F)	
ature sensor circuit	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 engine is running.	e sensor is activated, the cooling fan operates while	

# **DTC Confirmation Procedure**

INFOID:0000000004537138

#### 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.

## WITH CONSULT-III

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-676, "Diagnosis Procedure".

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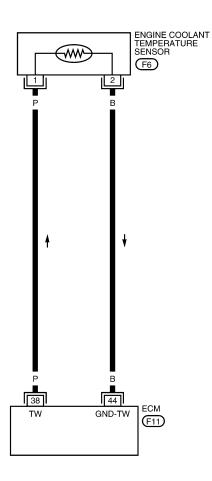
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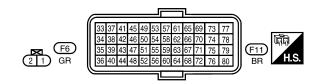
Wiring Diagram

INFOID:0000000004537139

## EC-ECTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2634E

# Diagnosis Procedure

### INFOID:0000000004537140

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".

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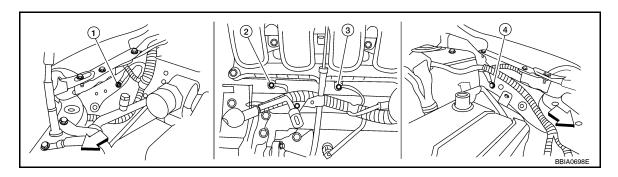
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Vehicle front

Body ground E24 1.

Body ground E15

Engine ground F9

Engine ground F16

OK or NG

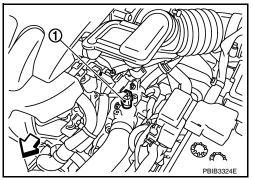
4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

- Disconnect engine coolant temperature (ECT) sensor (1) harness connector.
- : Vehicle front
- 2. Turn ignition switch ON.



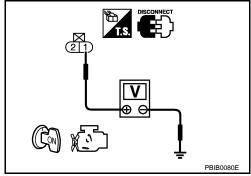
3. Check voltage between ECT sensor terminal 1 and ground with CONSULT-III or tester.

### Voltage: Approximately 5V

### OK or NG

OK >> GO TO 3.

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



# ${f 3.}$ CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 44 and ECT sensor 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 ENGINE COOLANT TEMPERATURE SENSOR

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### < SERVICE INFOMATION >

Refer to EC-678, "Component Inspection".

### OK or NG

OK >> GO TO 5.

NG >> Replace engine coolant temperature sensor.

# 5. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

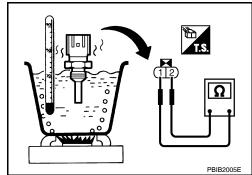
#### >> INSPECTION END

# Component Inspection

#### INFOID:0000000004537141

## **ENGINE COOLANT TEMPERATURE SENSOR**

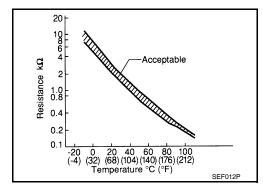
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



#### <Reference data>

Temperature °C (°F)	Resistance $k\Omega$	
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:0000000004537142

ENGINE COOLANT TEMPERATURE SENSOR Refer to EM-185.

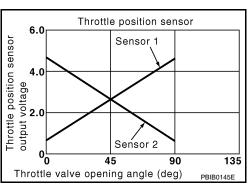
# DTC P0122, P0123 TP SENSOR

# Component Description

< SERVICE INFOMATION >

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

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



## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537144

INFOID:0000000004537143

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TP SEN 1-B1 TP SEN 2-B1*	<ul> <li>Ignition switch: ON (Engine stopped)</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> </ul>	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

<sup>\*:</sup> Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

# On Board Diagnosis Logic

INFOID:0000000004537145

These self-diagnoses have the one trip detection logic.

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-874.

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.)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	Electric throttle control actuator (TP sensor 2)

#### FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

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

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:0000000004537146

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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- Start engine and let it idle for 1 second.
- 2. Check DTC.
- If DTC is detected, go to EC-681, "Diagnosis Procedure".

**EC-679** 

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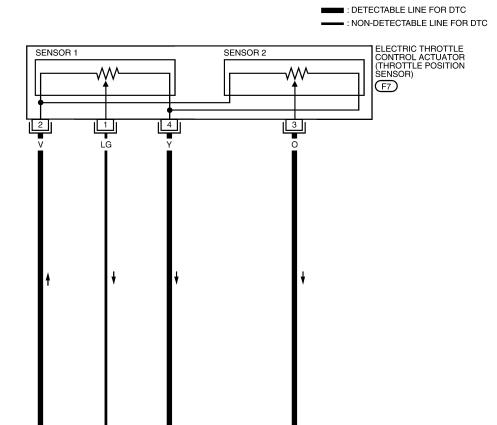
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Wiring Diagram

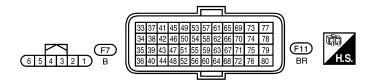
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# EC-TPS2-01



ECM

(F11)



LG 33

36

GND-TPS

72

AVCC-TPS

BBWA2656E

Specification data are reference values and are measured between each terminal and ground.

# **CAUTION:**

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

## < SERVICE INFOMATION >

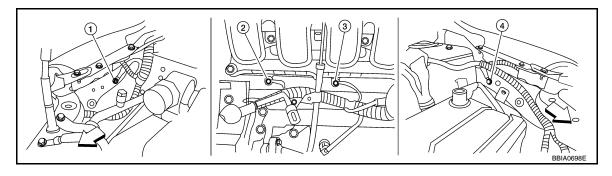
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33 LG	1.0		[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully released	More than 0.36V
	Throttle position sensor 1	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully depressed	Less than 4.75V	
34 O	Threstella position concer 2	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully released	Less than 4.75V	
	0	Throttle position sensor 2	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	More than 0.36V
36	Υ	Sensor ground (Throttle position sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
72	٧	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V

# **Diagnosis Procedure**

INFOID:0000000004537148

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24 1.
- Engine ground F9
- Engine ground E16

4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

**EC-681** 

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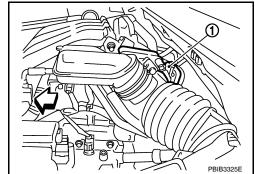
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- Disconnect electric throttle control actuator (1) harness connec-
- : Vehicle front
- Turn ignition switch ON.

< SERVICE INFOMATION >



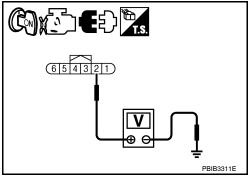
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT-III or tester.

### **Voltage: Approximately 5V**

#### 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 throttle position sensor 2 ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 36. 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 THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 34 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 5.

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

# $\mathbf{5}.$ CHECK THROTTLE POSITION SENSOR

Refer to EC-683, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

# 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Idle Air Volume Learning</u>".

# **DTC P0122, P0123 TP SENSOR**

< SERVICE INFOMATION >

[MR TYPE 1]

INFOID:0000000004537149

### >> INSPECTION END

# 7.CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### >> INSPECTION END

# Component Inspection

# THROTTLE POSITION SENSOR

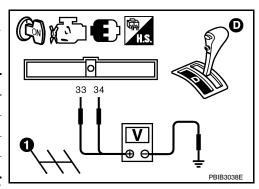
- 1. Reconnect all harness connectors disconnected.
- 2. Perform EC-572, "Throttle Valve Closed Position Learning".
- 3. Turn ignition switch ON.
- 4. Set shift lever to D position (A/T, CVT) or 1st position (M/T).
- 5. Check voltage between ECM terminals 33 (TP sensor 1 signal), 34 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
33	Fully released	More than 0.36V
(Throttle position sensor 1)	Fully depressed	Less than 4.75V
34	Fully released	Less than 4.75V
(Throttle position sensor 2)	Fully depressed	More than 0.36V

- If NG, replace electric throttle control actuator and go to the next step.
- 7. Perform EC-572, "Throttle Valve Closed Position Learning".
- 8. Perform EC-572, "Idle Air Volume Learning".

## Removal and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to EM-141.



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# DTC P0125 ECT SENSOR

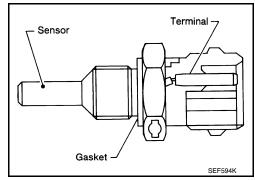
Description INFOID:000000004537151

#### NOTE:

If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to EC-674.

### COMPONENT DESCRIPTION

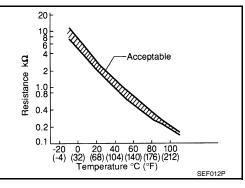
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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

<sup>90 (194) 0.9 0.236 - 0.260
\*:</sup> This data is reference values and is measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.



### **CAUTION:**

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

# On Board Diagnosis Logic

INFOID:0000000004537152

## This self-diagnosis ha one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine cool- ant temperature for closed loop fuel control	<ul> <li>Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.</li> <li>Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul>	Harness or connectors     (High resistance in the circuit)     Engine coolant temperature sensor     Thermostat

## **DTC Confirmation Procedure**

INFOID:0000000004537153

#### **CAUTION:**

Be careful not to overheat engine.

#### 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.

### WITH CONSULT-III

- 1. Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "COOLAN TEMP/S" 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 following step.

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.

- Check DTC.
- If DTC is detected, go to <u>EC-685</u>, "<u>Diagnosis Procedure</u>".

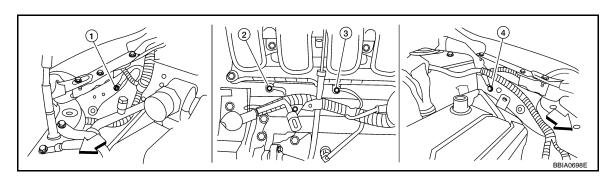
#### WITH GST

Follow the procedure "WITH CONSULT-III" above.

## Diagnosis Procedure

# 1.check ground connections

- Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24 1.

Body ground E15

- Engine ground F9
- Engine ground F16

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-686, "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

NG >> Repair or replace thermostat. Refer to CO-45.

## 4.CHECK INTERMITTENT INCIDENT

Refer to EC-626.

Refer to EC-676, "Wiring Diagram".

## >> INSPECTION END

**EC-685** 

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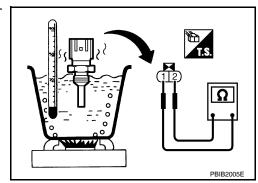
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## **Component Inspection**

INFOID:0000000004537155

## ENGINE COOLANT TEMPERATURE SENSOR

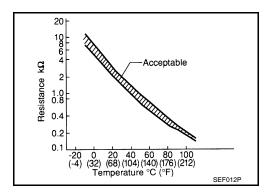
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



### <Reference data>

Engine coolant 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.



INFOID:0000000004537156

## Removal and Installation

ENGINE COOLANT TEMPERATURE SENSOR Refer to <u>EM-186</u>.

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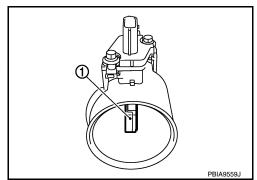
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## DTC P0127 IAT SENSOR

## Component Description

The intake air temperature sensor is built into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



#### <Reference data>

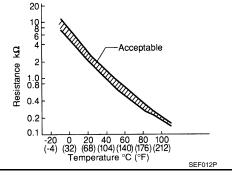
Intake air temperature °C (°F)	Voltage* V	Resistance K.Ω
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 46 (Intake air temperature sensor) and ground.

#### **CAUTION:**

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

## On Board Diagnosis Logic



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     (Intake temperature sensor circuit is open or shorted)     Intake air temperature sensor

### **DTC Confirmation Procedure**

### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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:**

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

- Wait until engine coolant temperature is less than 90°C (194°F) 1.
- Turn ignition switch ON. a.
- Select "DATA MONITOR" mode with CONSULT-III.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch OFF and cool down engine.
  - Perform the following steps before engine coolant temperature is above 90°C (194°F).

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INFOID:0000000004537159

[MR TYPE 1]

## < SERVICE INFOMATION >

- 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 <a href="EC-688">EC-688</a>, "Diagnosis Procedure".

### WITH GST

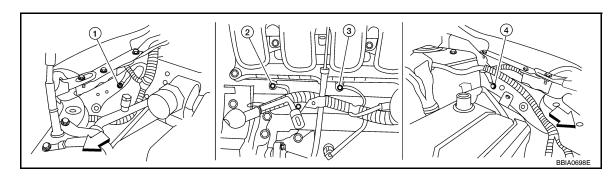
Follow the procedure "With CONSULT-III" above.

## Diagnosis Procedure

INFOID:0000000004537160

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

## 4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-688, "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-626.

Refer to EC-671, "Wiring Diagram".

#### >> INSPECTION END

## Component Inspection

INFOID:0000000004537161

### INTAKE AIR TEMPERATURE SENSOR

## **DTC P0127 IAT SENSOR**

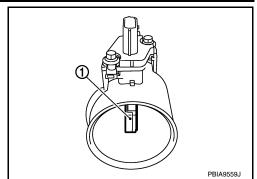
## < SERVICE INFOMATION >

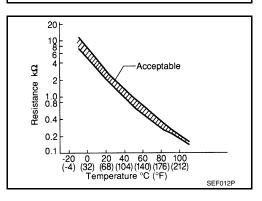
[MR TYPE 1]

1. Check resistance between intake air temperature 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

MASS AIR FLOW SENSOR Refer to EM-139.

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[MR TYPE 1]

## DTC P0128 THERMOSTAT FUNCTION

## On Board Diagnosis Logic

INFOID:0000000004537163

#### NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303 or P0304, first perform the trouble diagnosis for DTC P0300, P0301, P0302, P0303, P0304. Refer to <a href="EC-765">EC-765</a>, "DTC Confirmation Procedure".

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 stuck open.

DTC No.	TC 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:0000000004537164

#### WITH CONSULT-III

#### 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:**

- 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 52°C (126°F).
- Before performing the following procedure, do not fill with the fuel.
- 1. Turn A/C switch OFF.
- 2. Turn blower fan switch OFF.
- Turn ignition switch ON.
- 4. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III.
- Check the indication of "COOLAN TEMP/S".
  - If it is below 52°C (126°F), go to following step.

If it is above 52°C (126°F), cool down the engine to less than 52°C (126°F). Then go to next steps.

6. Start engine and wait at idle for at least 30 minutes.

If "COOLAN TEMP/S" increases to more than 71°C (160°F) within 30 minutes, turn ignition switch OFF because the test result will be OK.

- 7. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-690, "Diagnosis Procedure"</u>.

#### WITH GST

Follow the procedure "WITH CONSULT-III" above.

## Diagnosis Procedure

INFOID:0000000004537165

# 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-691, "Component Inspection".

### OK or NG

OK >> GO TO 2.

NG >> Replace engine coolant temperature sensor.

## 2.CHECK THERMOSTAT

Refer to CO-45, "Removal and Installation".

### OK or NG

OK >> INSPECTION END

NG >> Replace thermostat.

## **Component Inspection**

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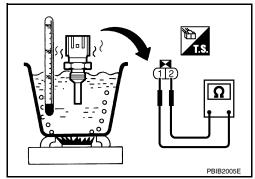
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### ENGINE COOLANT TEMPERATURE SENSOR

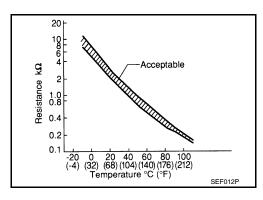
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



### <Reference data>

Engine coolant temperature °C (°F)	Resistance $k\Omega$
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.



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## Removal and Installation

ENGINE COOLANT TEMPERATURE SENSOR Refer to <u>EM-186</u>.

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## DTC P0130 A/F SENSOR 1

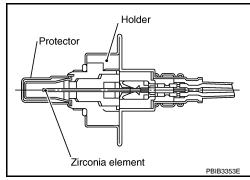
## Component Description

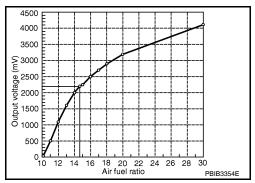
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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

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





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537169

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

INFOID:0000000004537170

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (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 0130 circuit	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in the range other than approx. 2.2V.	Harness or connectors     [Air fuel ratio (A/F) sensor 1 circuit is open or shorted.]	
	B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2V.	Air fuel ratio (A/F) sensor 1	

### **DTC Confirmation Procedure**

INFOID:0000000004537171

### Perform PROCEDURE FOR MALFUNCTION A first.

# If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

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

### **TESTING CONDITION:**

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

#### PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.

### DTC P0130 A/F SENSOR 1

#### [MR TYPE 1] < SERVICE INFOMATION >

- Let engine idle for 2 minutes.
- 3. Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-695, "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.
- Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" indication. If the indication is constantly approx. 2.2V and does not fluctuates, go to EC-695, "Diagnosis Procedure". If the indication fluctuates around 2.2V, go to next step.
- 4. Select "A/F SEN1 (B1) P1276" (for DTC P0130) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Touch "START".
- 6. When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen.

ENG SPEED	1,600 - 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Shift lever	D position with OD OFF (A/T) D position (CVT) 5th position (M/T)

#### If "TESTING" is not displayed after 20 seconds, retry from step 2.

Release accelerator pedal fully.

#### NOTE:

Never apply brake during releasing the accelerator pedal.

- 8. Make sure that "TESTING" changes to "COMPLETED".
  - If "TESTING" changed to "OUT OF CONDITION", retry from step 6.
- 9. Make sure that "OK" is displayed after touching "SELF-DIAG RESULT". If "NG" is displayed, go to EC-695, "Diagnosis Procedure".

### Overall Function Check

#### PROCEDURE MALFUNCTION B

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. Set shift lever to D position with OD ON (A/T), D position (CVT) or 5th position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

#### NOTE:

Never apply brake during releasing the accelerator pedal.

- Repeat steps 2 and 3 for five times.
- 5. Stop the vehicle and turn ignition switch OFF.
- 6. Wait at least 10 seconds and restart engine.
- Repeat steps 2 and 3 for five times.
- 8. Stop the vehicle and connect GST to the vehicle.
- Make sure that no 1st trip DTC is displayed. If the 1st trip DTC is displayed, go to EC-695, "Diagnosis Procedure".

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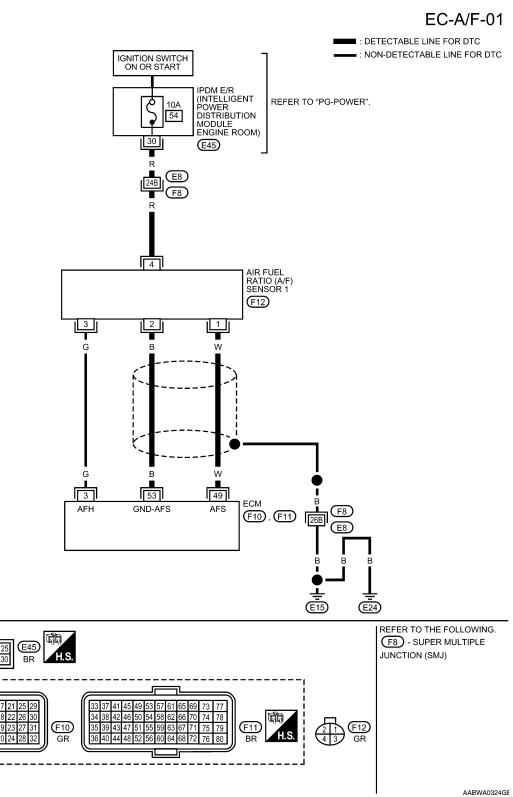
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Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

## < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

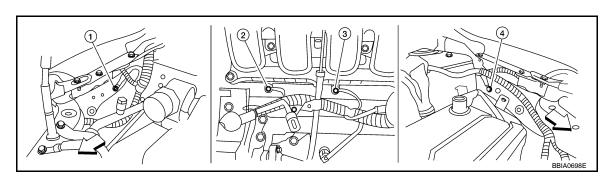
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

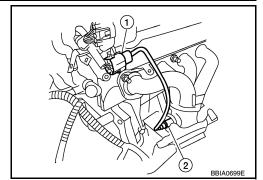
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

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

- 1. Disconnect A/F sensor 1 harness connector (1).
- 2. Turn ignition switch ON.



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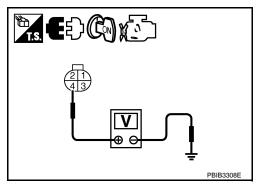
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Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

#### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-626.

#### OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

## $oldsymbol{6}$ .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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

#### >> INSPECTION END

## DTC P0130 A/F SENSOR 1

< SERVICE INFOMATION > [MR TYPE 1]

Removal and Installation

INFOID:0000000004537175

AIR FUEL RATIO SENSOR Refer to EM-144.

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INFOID:0000000004537176

## DTC P0131 A/F SENSOR 1

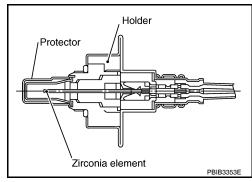
## Component Description

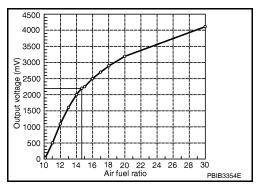
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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

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





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537177

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

INFOID:0000000004537178

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0131 0131	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. 0V.	<ul> <li>Harness or connectors         [Air fuel ratio (A/F) sensor circuit is open or shorted.]</li> <li>Air fuel ratio (A/F) sensor 1</li> </ul>

## **DTC Confirmation Procedure**

INFOID:0000000004537179

#### 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:**

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

### WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III.
- Check "A/F SEN1 (B1)" indication.
   If the indication is constantly approx. 0V, go to <u>EC-701</u>, "<u>Diagnosis Procedure</u>".

## DTC P0131 A/F SENSOR 1

## < SERVICE INFOMATION > [MR TYPE 1]

If the indication is not constantly approx. 0V, go to next step.

- 4. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
- 5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
- 6. Maintain the following conditions for about 20 consecutive seconds.

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

### NOTE:

- Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 4.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is displayed, go to EC-701, "Diagnosis Procedure".

## WITH GST

Follow the procedure "WITH CONSULT-III" above.

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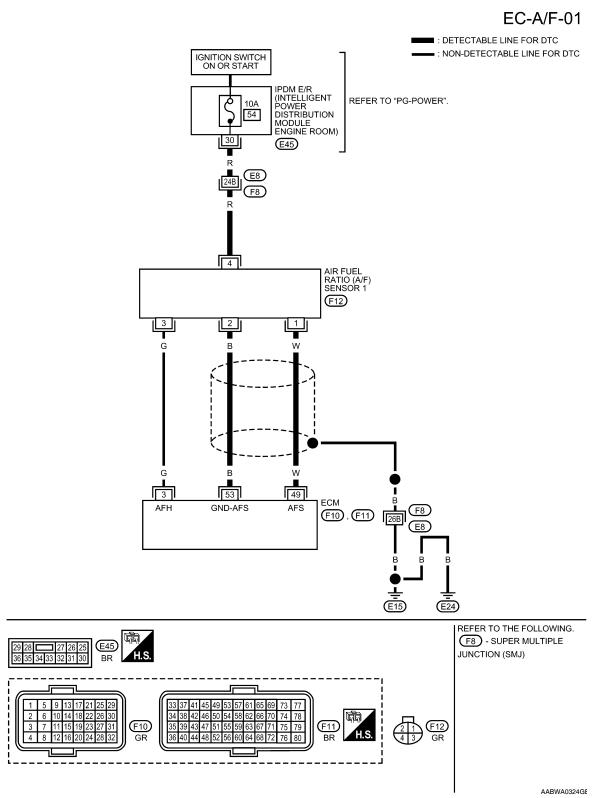
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Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

### < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

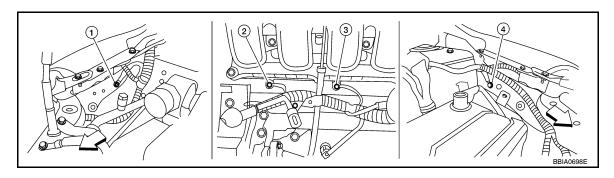
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

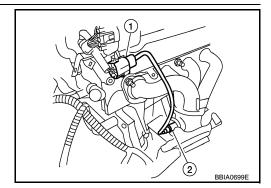
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

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

- 1. Disconnect A/F sensor 1 harness connector (1).
- 2. Turn ignition switch ON.



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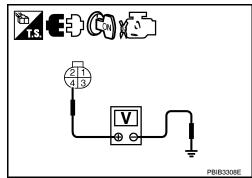
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Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

#### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-626.

#### OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

## 6.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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### >> INSPECTION END

## DTC P0131 A/F SENSOR 1

< SERVICE INFOMATION > [MR TYPE 1]

Removal and Installation

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AIR FUEL RATIO SENSOR Refer to EM-144.

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## DTC P0132 A/F SENSOR 1

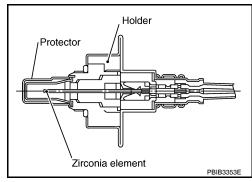
## Component Description

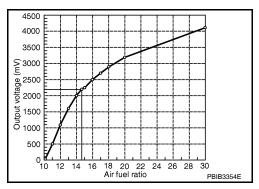
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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

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





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537184

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

INFOID:0000000004537185

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132 0132	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. 5V.	<ul> <li>Harness or connectors     [Air fuel ratio (A/F) sensor circuit is open or shorted.]</li> <li>Air fuel ratio (A/F) sensor 1</li> </ul>

## **DTC Confirmation Procedure**

INFOID:0000000004537186

#### 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:**

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

### WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III.
- Check "A/F SEN1 (B1)" indication.
   If the indication is constantly approx. 5V, go to <u>EC-707</u>, "<u>Diagnosis Procedure</u>".

## DTC P0132 A/F SENSOR 1

## < SERVICE INFOMATION > [MR TYPE 1]

If the indication is not constantly approx. 5V, go to next step.

- 4. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
- 5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
- 6. Maintain the following conditions for about 20 consecutive seconds.

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

#### NOTE:

- Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 4.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is displayed, go to <a href="EC-707"><u>EC-707</a>, "Diagnosis Procedure".</u></a>

## WITH GST

Follow the procedure "WITH CONSULT-III" above.

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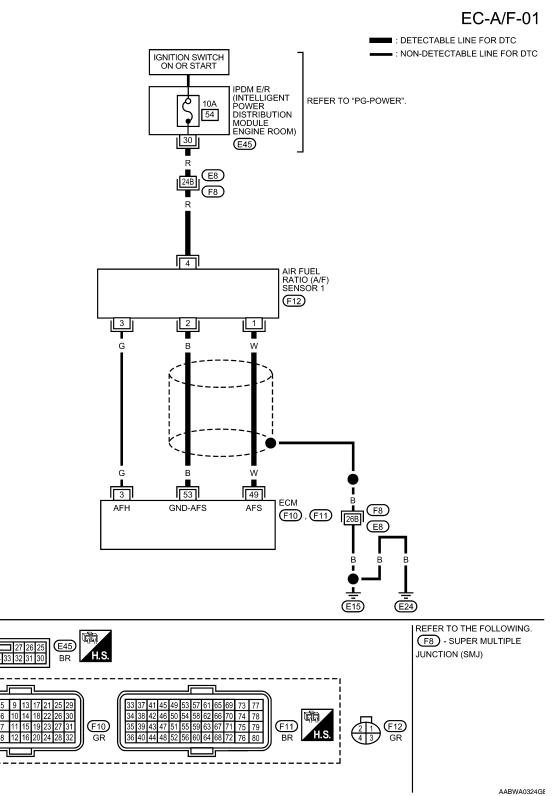
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Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

### < SERVICE INFOMATION >

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.

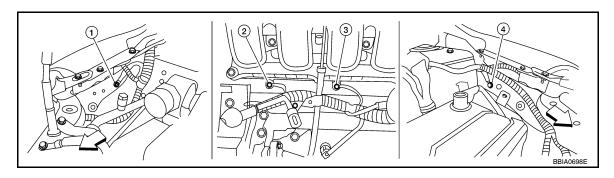
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- 2. Loosen and retighten three ground screws on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

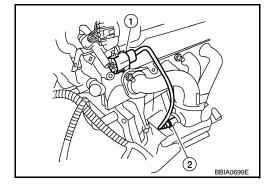
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

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

- 1. Disconnect A/F sensor 1 harness connector (1).
- 2. Turn ignition switch ON.



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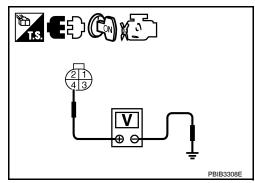
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3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal	
1	49	
2	53	

#### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-626.

#### OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

## $oldsymbol{6}$ .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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

#### >> INSPECTION END

## DTC P0132 A/F SENSOR 1

< SERVICE INFOMATION > [MR TYPE 1]

Removal and Installation

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AIR FUEL RATIO SENSOR Refer to EM-144.

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## DTC P0133 A/F SENSOR 1

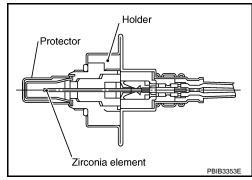
## Component Description

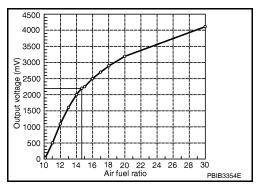
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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

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





## CONSULT-III Reference Value in Data Monitor Mode

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Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

INFOID:0000000004537192

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 air fuel ratio (A/F) sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the air fuel ratio (A/F) sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F sensor 1 signal cycling time index) is inordinately long or not.

DTC No.	Trouble diag- nosis name	DTC detecting condition	Possible Cause
P0133 0133	Air fuel ratio (A/F) sensor 1 circuit slow re- sponse	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 [Air fuel ratio (A/F) sensor circuit is open or shorted.] Air fuel ratio (A/F) sensor 1 Air fuel ratio (A/F) sensor heater 1 Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks PCV Mass air flow sensor

## **DTC Confirmation Procedure**

INFOID:0000000004537193

NOTE:

### DTC P0133 A/F SENSOR 1

[MR TYPE 1] < SERVICE INFOMATION >

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

#### **TESTING CONDITION:**

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

### 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.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
- Let engine idle for 1 minute.
- Select "A/F SEN1(B1) P1278/P1279" of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Touch "START".
  - If "COMPLETED" appears on CONSULT-III screen, go to step 10.
  - If "COMPLETED" does not appear on CONSULT-III screen, go to the following step.
- 7. After perform the following procedure, "TESTING" will be displayed on the CONSULT-III screen.
- Increase the engine speed up to 4,000 to 5,000 rpm and keep it for 10 seconds.
- b. Fully release accelerator pedal and then let engine idle for about 10 seconds.
  - If "TESTING" is not displayed after 10 seconds, refer to EC-618.
- 8. Wait for about 20 seconds at idle at under the condition that "TESTING" is displayed on the CONSULT-III
- Make sure that "TESTING" changes to "COMPLETED".
  - If "TESTING" changed to "OUT OF CONDITION", refer to EC-618.
- 10. Make sure that "OK" is displayed after touching "SELF-DIAG RESULT". If "NG" is displayed, go to EC-713, "Diagnosis Procedure".

### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- Select Service \$01 with GST.
- Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.

Make sure that the total percentage should be within  $\pm 15\%$ .

If OK, go to the following step.

If NG, 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
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
- Let engine idle for 1 minute.
- 7. Increase the engine speed up to 4,000 to 5,000 rpm and keep it for 10 seconds.
- 8. Fully release accelerator pedal and then let engine idle for about 1 minute.
- Select Service \$07 with GST.

If 1st trip DTC is detected, go to EC-713, "Diagnosis Procedure".

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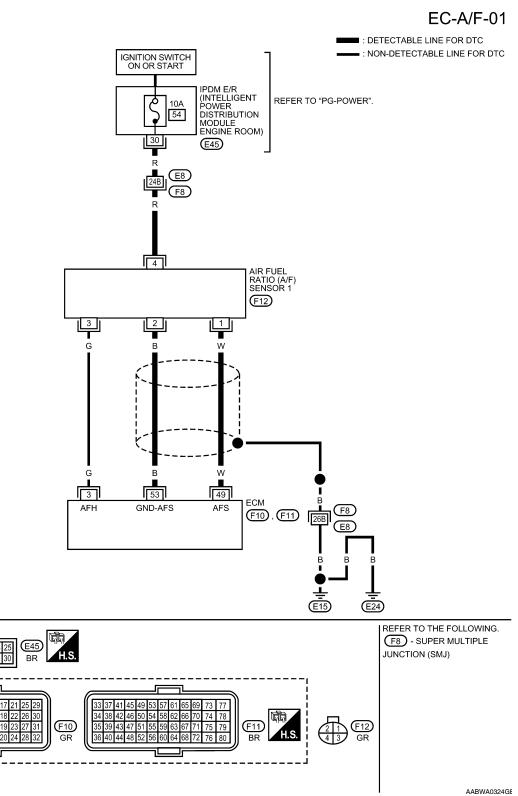
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Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

## < SERVICE INFOMATION >

[MR TYPE 1]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V  → 10.0V/Div 50ms/Div T  PBIA8148J
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

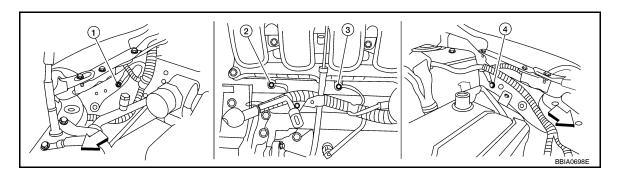
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten engine screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24

Body ground E15

- Engine ground F9
- Engine ground F16

OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

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

Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-144, "Removal and Installation".

>> GO TO 3.

# 3. CHECK EXHAUST GAS LEAK

Start engine and run it at idle.

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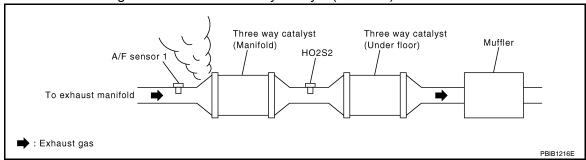
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Listen for an exhaust gas leak before three way catalyst (manifold).



### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

## 4. CHECK FOR INTAKE AIR LEAK

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

#### OK or NG

OK >> GO TO 5.

NG >> Repair or replace.

## 5.CLEAR THE SELF-LEARNING DATA

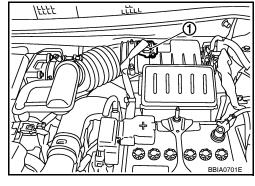
## With CONSULT-III

- 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" or "START".
- Run engine for at least 10 minutes at idle speed.

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

#### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Stop engine and reconnect mass air flow sensor harness connector.
- Make sure DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to <u>EC-542</u>, "<u>Emission-related</u> Diagnostic Information".
- 7. Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.
  Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?



### Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0172. Refer to <u>EC-740</u> or <u>EC-746</u>.

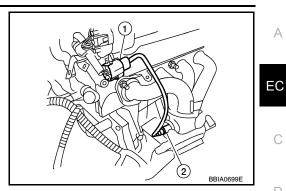
No >> GO TO 6.

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

1. Turn ignition switch OFF.

#### [MR TYPE 1] < SERVICE INFOMATION >

- Disconnect A/F sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor (2)
- 3. Turn ignition switch ON.

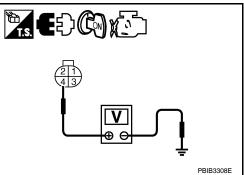


4. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

## Voltage: Battery voltage

#### OK or NG

OK >> GO TO 8. NG >> GO TO 7.



## 7.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- · 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

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- 3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal	
1	49	
2	53	

### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

## 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-643, "Component Inspection".

## OK or NG

OK >> GO TO 10.

NG >> GO TO 13.

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**EC-715** 

## DTC P0133 A/F SENSOR 1

< SERVICE INFOMATION > [MR TYPE 1]

# 10. CHECK MASS AIR FLOW SENSOR

Refer to EC-661, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> Replace mass air flow sensor.

11. CHECK PCV VALVE

Refer to EC-538, "Component Inspection".

### OK or NG

OK >> GO TO 12.

NG >> Repair or replace PCV valve.

12. CHECK INTERMITTENT INCIDENT

## Perform EC-626.

### OK or NG

OK >> GO TO 13.

NG >> Repair or replace.

13.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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

#### >> INSPECTION END

Removal and Installation

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AIR FUEL RATIO SENSOR Refer to EM-144.

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## **DTC P0137 HO2S2**

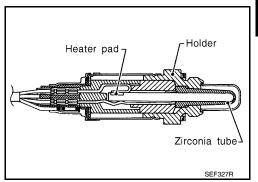
## Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air/fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



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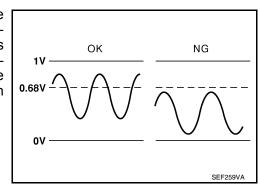
## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	MONITOR ITEM CONDITION	
HO2S2 (B1)	Revving engine from idle to 3,000 rpm quickly after the following	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	<ul> <li>conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	LEAN ←→ RICH

## On Board Diagnosis 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 before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137 0137	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor is not reached to the specified voltage.	Harness or connectors (Heated oxygen sensor 2 circuit open or shorted.) Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air leaks

## **DTC Confirmation Procedure**

#### 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.

### WITH CONSULT-III

#### **TESTING CONDITION:**

For the best results, perform DTC WORK SUPPORT at a temperature of 0 to 30°C (32 to 86°F).

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#### < SERVICE INFOMATION >

- 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.
- Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F).
- 7. Open engine hood.
- 8. Select "HO2S2 (B1) P1147" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 9. Start engine and following the instruction of CONSULT-III.

#### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

- 10. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to <u>EC-720</u>, "<u>Diagnosis Procedure</u>". If "CAN NOT BE DIAGNOSED" is displayed, perform the following.
- a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- b. Return to step 1.

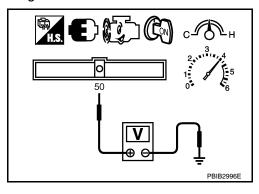
### **Overall Function Check**

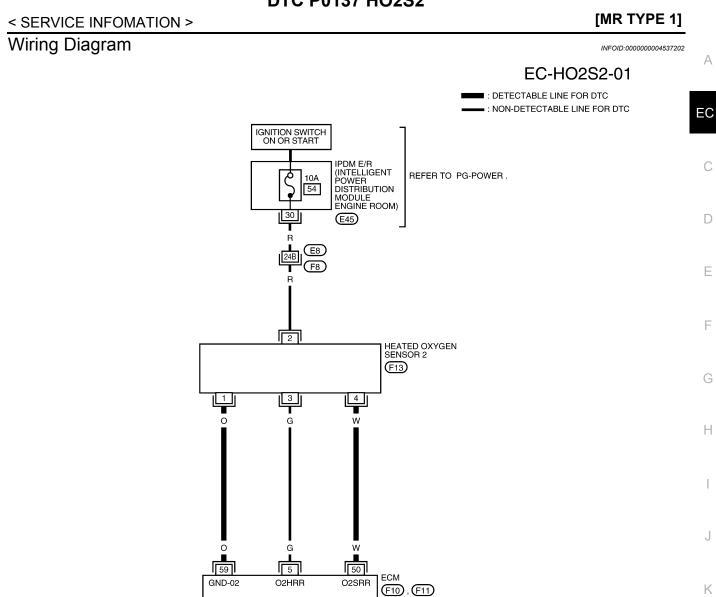
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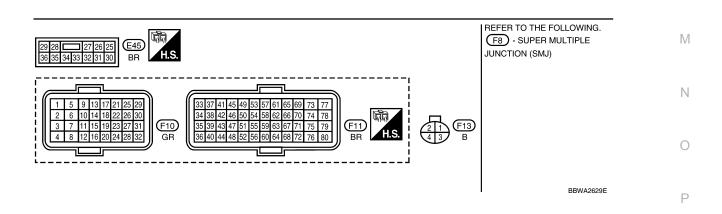
Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

### WITH GST

- 1. Start engine and warm it up to 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.
- Let engine idle 1 minute.
- 5. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V at least once during this procedure.
  - If the voltage can be confirmed in step 6, step 7 is not necessary.
- Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T).
  - The voltage should be above 0.68V at least once during this procedure.
- If NG, go to <u>EC-720, "Diagnosis Procedure"</u>.







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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  → 10.0V/Div 50ms/Div T  PBIAB148J
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	BATTERY VOLTAGE (11 - 14V)
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

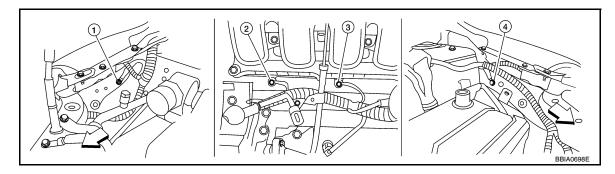
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

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# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CLEAR THE SELF-LEARNING DATA

### With CONSULT-III

- Start engine and warm it up to normal operating temperature.
- 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 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.
- Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to <u>EC-542, "Emission-related Diagnostic Information"</u>.
- 7. Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

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



Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-740.

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 (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 3. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 59 and HO2S2 terminal 1.

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.

# f 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

 Check harness continuity between ECM terminal 50 and HO2S2 terminal 4. Refer to Wiring Diagram.

### Continuity should exist.

Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

# Continuity should not exist.

3. Also check harness for short to power.

#### OK or NG

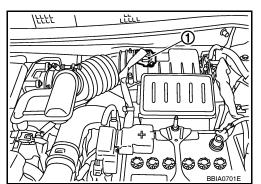
OK >> GO TO 5.

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

# ${f 5.}$ CHECK HEATED OXYGEN SENSOR 2

Refer to EC-722, "Component Inspection".

OK or NG



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OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

# 6. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

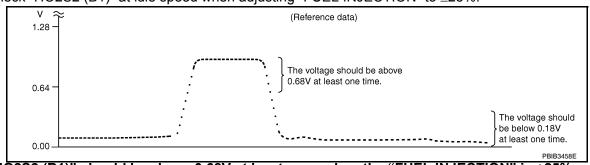
# Component Inspection

INFOID:0000000004537204

#### **HEATED OXYGEN SENSOR 2**

#### With 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. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 6. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)" should be below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

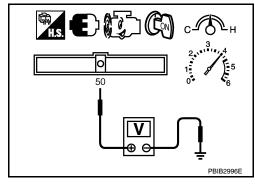
#### Without CONSULT-III

- 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. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V and below 0.18V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.

- 7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T). The voltage should be above 0.68 and below 0.18V at least once during this procedure.
- 8. If NG, replace heated oxygen sensor 2.



# **DTC P0137 HO2S2**

< SERVICE INFOMATION > [MR TYPE 1]

# **CAUTION:**

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

Removal and Installation

INFOID:0000000004537205

HEATED OXYGEN SENSOR 2 Refer to EM-144.

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# **DTC P0138 HO2S2**

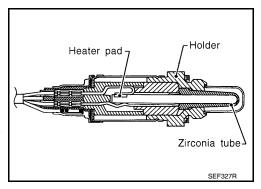
# Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air/fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



INFOID:0000000004537207

# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1)	Revving engine from idle to 3,000 rpm quickly after the following	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	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	LEAN ←→ RICH

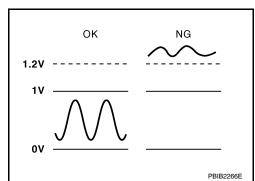
# On Board Diagnosis Logic

INFOID:0000000004537208

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 before the three way catalyst (manifold) causes the longer switching time.

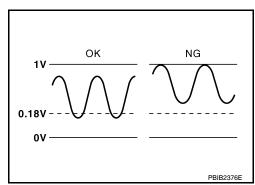
# **MALFUNCTION A**

To judge the malfunctions of rear heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition 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 the various driving condition such as fuel-cut.



			DIC PUI30 HU232		
< SERVIC	E INFOMATION >			[MR TYPE 1]	
DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause	
		A)	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (Heated oxygen sensor 2 circuit is open or shorted.)     Heated oxygen sensor 2	
P0138 0138	Heated oxygen sensor 2 circuit high voltage	В)	The minimum voltage from the sensor is not reached to the specified voltage.	Harness or connectors (Heated oxygen sensor circuit is open or shorted.) Heated oxygen sensor 2 Fuel pressure Fuel injector	
DTC Co	nfirmation Procedu	ıre		INFOID:000000004537209	
Perform P	ROCEDURE FOR MAI	.FUN	CION A first. PROCEDURE FOR MALFUNC		
least 10 se	econds before conducting	g the	next test.	turn ignition switch OFF and wait at	
1. Start e	URE FOR MALFUNC engine and warm it up to gnition switch OFF and	the r	normal operating temperature.		
3. Start e 4. Let en	=			m for at least 1 minute under no load.	
	·	to <u>EC</u>	C-728, "Diagnosis Procedure".		
PROCED	URE FOR MALFUNC	OIT	N B		
TESTING	ONSULT-III CONDITION:		ODK OUDDODT at a town and the		
1. Turn iç 2. Start e	gnition switch ON and s	elect o the	ORK SUPPORT at a temperatur "DATA MONITOR" mode with Conormal 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.
- Let engine idle for 1 minute.
- 6. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).

  If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F).
- 7. Open engine hood.
- Select "HO2S2 (B1) P1146" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 9. Start engine and following the instruction of CONSULT-III.

#### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

10. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".

If "NG" is displayed, refer to EC-728. "Diagnosis Procedure".

- If "CAN NOT BE DIAGNOSED" is displayed, perform the following.

  a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- b. Return to step 1.

# Overall Function Check

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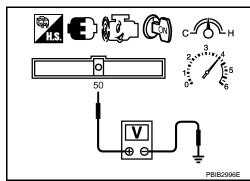
#### PROCEDURE FOR MALFUNCTION B

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

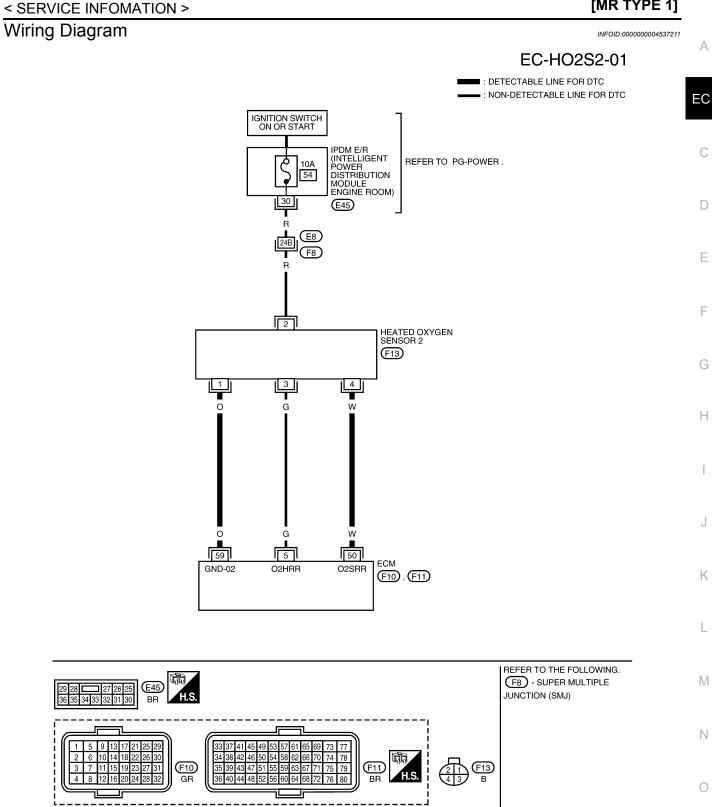
- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle 1 minute.
- 5. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.18V at least once during this procedure.
  - If the voltage can be confirmed in step 6, step 7 is not necessary.
- Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T).
  - The voltage should be below 0.18V at least once during this procedure.





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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	O	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  → 10.0V/Div 50ms/Div T  PBIAB148J
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	BATTERY VOLTAGE (11 - 14V)
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

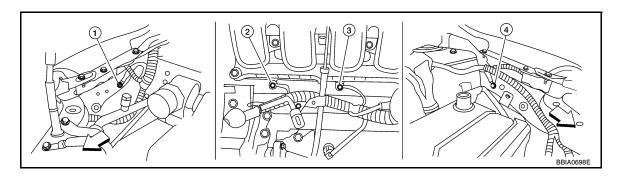
# Diagnosis Procedure

INFOID:0000000004537212

# PROCEDURE FOR MALFUNCTION A

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten engine screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- 1. body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

#### OK or NG

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

# $\overline{2}$ .check ho2s2 ground circuit for open and short

- 1. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 59 and HO2S2 terminal 1. Refer to Wiring Diagram.

# (1) BRIA0700E

# Continuity should exist.

4. 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 50 and HO2S2 terminal 4. Refer to Wiring Diagram.

# Continuity should exist.

2. Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

# 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.

# $oldsymbol{5}$ .CHECK HEATED OXYGEN SENSOR 2

Refer to EC-731, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

# 6.CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

# PROCEDURE FOR MALFUNCTION B

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten engine screw on the body. Refer to EC-632, "Ground Inspection".

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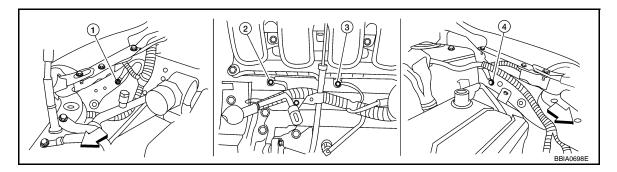
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- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

# OK or NG

4.

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.
- 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 detected?

Is it difficult to start engine?

#### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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. Make sure that DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to <u>EC-542</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".
- 7. Make sure that DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected?

Is it difficult to start engine?

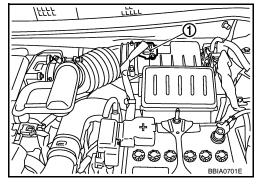
#### Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to <u>EC-746</u>.

No >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.



# **DTC P0138 HO2S2**

### < SERVICE INFOMATION >

[MR TYPE 1]

- 2. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between ECM terminal 59 and HO2S2 terminal 1. Refer to Wiring Diagram.

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# 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

 Check harness continuity between ECM terminal 50 and HO2S2 terminal 4. Refer to Wiring Diagram.

# Continuity should exist.

Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

# 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-731, "Component Inspection".

# OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

#### O.CHECK INTERMITTENT INCIDENT

Refer to EC-626.

# >> INSPECTION END

# Component Inspection

**HEATED OXYGEN SENSOR 2** 

# With 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.
- Let engine idle for 1 minute.
- 5. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.

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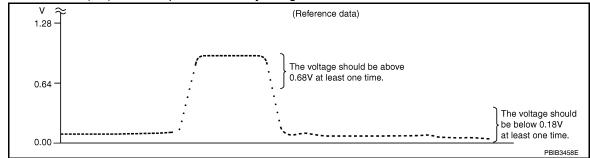
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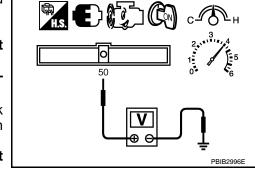
6. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to  $\pm 25\%$ .



- "HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
- "HO2S2 (B1)" should be below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

#### 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. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V and below 0.18V at least once during this procedure.
  - If the voltage can be confirmed at step 6, step 7 is not necessary.
- 7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T). The voltage should be above 0.68 and below 0.18V at least once during this procedure.



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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

# Removal and Installation

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HEATED OXYGEN SENSOR 2 Refer to EM-144.

INFOID:0000000004537215

# **DTC P0139 HO2S2**

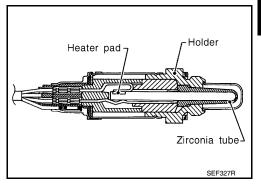
# **Component Description**

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air/fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



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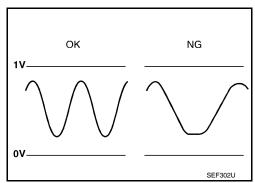
# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1)	Revving engine from idle to 3,000 rpm quickly after the following condi-	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	tions are met.  - Engine: After warming up  - Keep the engine speed between 3,500 rpm and 4,000 rpm for 1 minute and idle for 1 minute under no load	LEAN ←→ RICH

# On Board Diagnosis 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 before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	<ul> <li>Harness or connectors (Heated oxygen sensor circuit is open or shorted.)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

# **DTC Confirmation Procedure**

#### 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.

# WITH CONSULT-III

#### **TESTING CONDITION:**

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

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- 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.
- 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).
- Select "HO2S2 (B1) P0139" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 8. Start engine and following the instruction of CONSULT-III.

#### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

- 9. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to <a href="EC-736">EC-736</a>, "Diagnosis Procedure". If "CAN NOT BE DIAGNOSED" is displayed, perform the following.
- Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- b. Return to step 1.

# **Overall Function Check**

INFOID:0000000004537219

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 the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- Set voltmeter probes between ECM terminal 50 (HO2S2 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.)

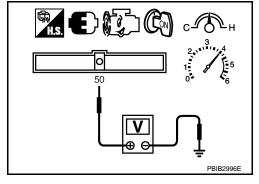
A change of voltage should be more than 0.24V for 1 second during this procedure.

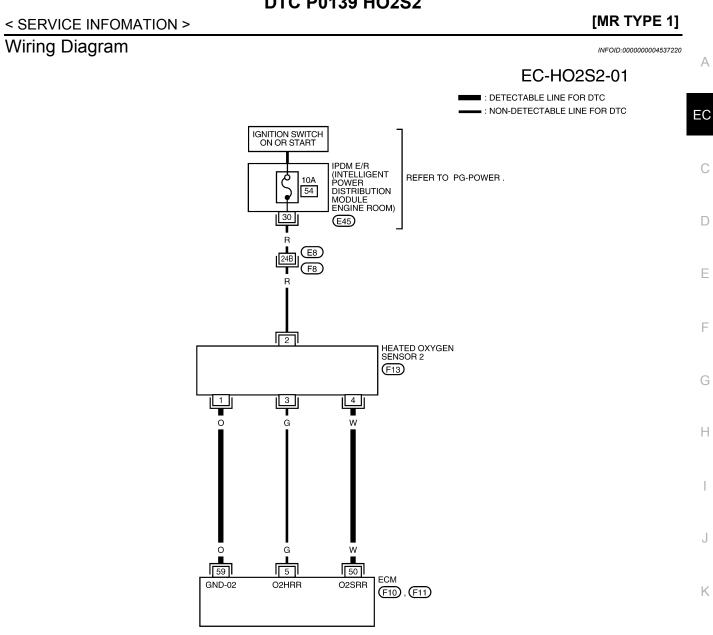
If the voltage can be confirmed in step 6, step 7 is not necessary.

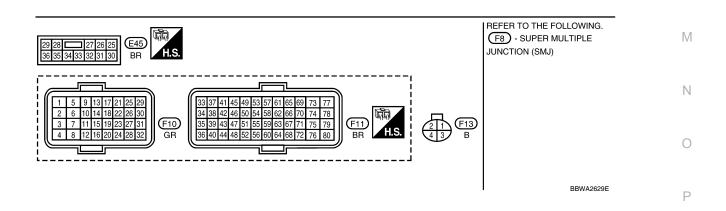
 Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T).

A change of voltage should be more than 0.24V for 1 second during this procedure.

8. If NG, go to EC-736, "Diagnosis Procedure".







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.

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	Approximately 10V
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm</li> </ul>	BATTERY VOLTAGE (11 - 14V)
50	W	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

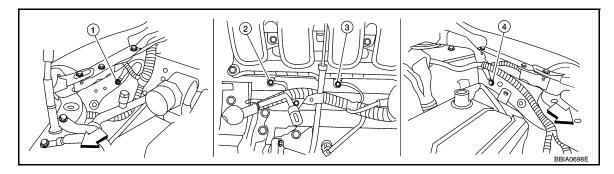
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537221

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

# 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.
- 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 P0172 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.
- Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure that DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to <u>EC-542</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".
- 7. Make sure that DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

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

#### Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-740 or EC-746.

No >> GO TO 3.

# 3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 3. Disconnect ECM harness connector.
- Check harness continuity between HO2S2 terminal 1 and ECM terminal 59. 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.

# f 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 terminal 4 and ECM terminal 50. Refer to Wiring Diagram.

# Continuity should exist.

Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

# Continuity should not exist.

3. Also check harness for short to power.

# OK or NG

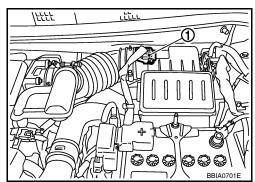
OK >> GO TO 5.

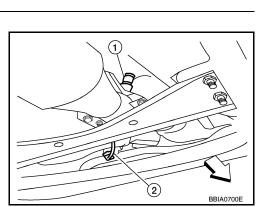
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-738, "Component Inspection".

OK or NG





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OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

# 6. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

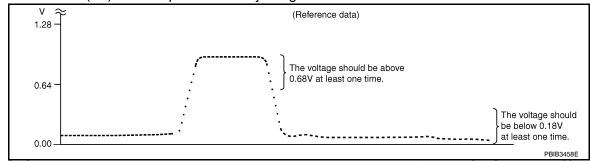
# Component Inspection

INFOID:0000000004537222

#### **HEATED OXYGEN SENSOR 2**

# With 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. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 6. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)" should be below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

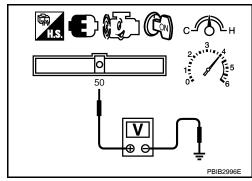
#### Without CONSULT-III

- 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. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V and below 0.18V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.

7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T). The voltage should be above 0.68 and below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

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Removal and Installation

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HEATED OXYGEN SENSOR 2 Refer to EM-144.

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< SERVICE INFOMATION >

# **IMR TYPE 11** DTC P0171 FUEL INJECTION SYSTEM FUNCTION

# On Board Diagnosis Logic

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the 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 lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Air fuel ratio (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	Fuel injection system too lean	<ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)</li> </ul>	<ul> <li>Intake air leaks</li> <li>Air fuel ratio (A/F) sensor 1</li> <li>Fuel injector</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Lack of fuel</li> <li>Mass air flow sensor</li> <li>Incorrect PCV hose connection</li> </ul>

# **DTC Confirmation Procedure**

INFOID:0000000004537225

INFOID:0000000004537224

#### 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.

# WITH CONSULT-III

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.
- 4. Clear the self-learning control coefficient by touching "CLEAR".
- Start engine again and let it idle for at least 10 minutes.
- Check 1st trip DTC.

The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-743, "Diagnosis Procedure".

#### NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.

Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data $\pm$ 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data $\pm$ 10 km/h (6 MPH)

[MR TYPE 1] < SERVICE INFOMATION >

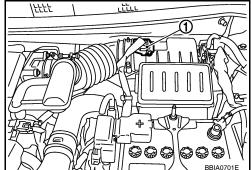
Engine coolant temperature (T)	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
condition	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).

- If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
- 8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-743, "Diagnosis Procedure". If engine does not start, check exhaust and intake air leak visually.

# WITH GST

NOTE:

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Disconnect mass air flow sensor (1) harness connector.
- 4. Restart engine and let idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor (1) harness connector.
- Select Service \$03 with GST. Make sure DTC P0102 is detected.
- Select Service \$04 with GST and erase the DTC P0102. 7.
- Start engine again and let it idle for at least 10 minutes.
- 9. Select Service \$07 with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-743, "Diagnosis Procedure".



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.
- Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.

Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data $\pm400~\text{rpm}$
Vehicle speed	Vehicle speed in the freeze frame data $\pm$ 10 km/h (6 MPH)
Engine coolant temperature (T)	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
condition	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).

- 10. If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 11. Crank engine while depressing accelerator pedal. If engine starts, go to EC-743, "Diagnosis Procedure". If engine does not start, check exhaust and intake air leak visually.

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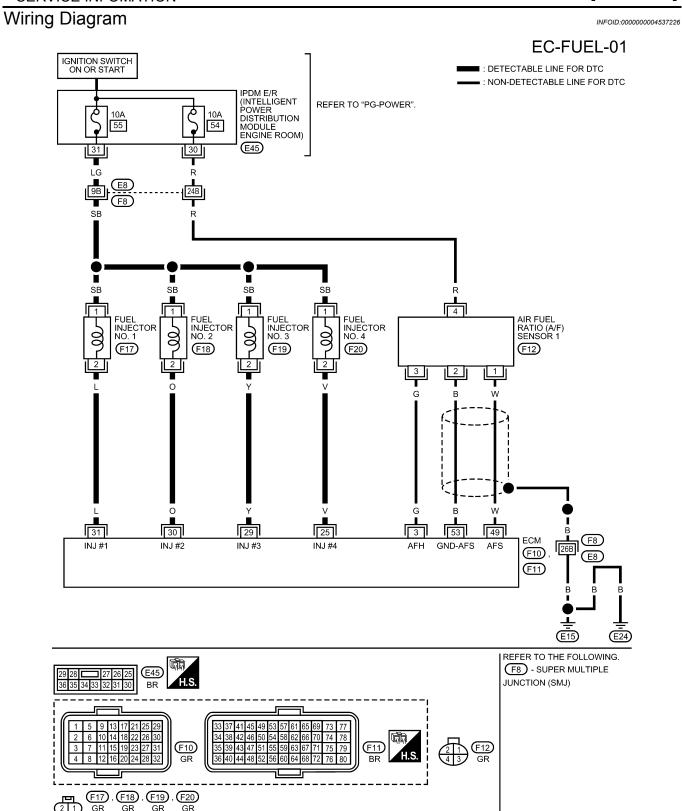
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Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V  >>> 10.0V/Div 50ms/DivT  PBIA8148J	
25 29	V	Fuel injector No. 4 Fuel injector No. 3	idle Fuel injector No. 4	<ul> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  ») 10.0 V/Div 50 ms/Div T  PBIB0529E
30 31	30 O Fuel injector No. 2	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE  (11 - 14V)  Discrete the second of the se		
49	w	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.	
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V	

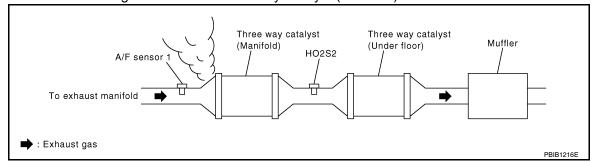
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537227

# 1. CHECK EXHAUST GAS LEAK

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



# OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- Listen for an intake air leak after the mass air flow sensor.
- Check PCV hose connection.

< SERVICE INFOMATION >

#### OK or NG

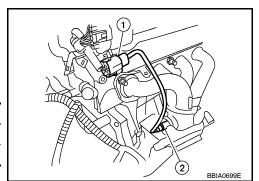
OK >> GO TO 3.

NG >> Repair or replace.

# 3.check air fuel ratio (a/f) sensor 1 circuit for open and short

- Turn ignition switch OFF.
- Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor 1 (2)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53



[MR TYPE 1]

# Continuity should exist.

Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

# 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.

# f 4.CHECK FUEL PRESSURE

- Release fuel pressure to zero. Refer to EC-574, "Fuel Pressure Check".
- Install fuel pressure gauge and check fuel pressure. Refer to EC-574, "Fuel Pressure Check".

# At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 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-991.)
- Fuel pressure regulator (Refer to EC-574, "Fuel Pressure Check".)
- Fuel lines (Refer to EM-156.)
- · Fuel filter for clogging

>> Repair or replace.

# 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.

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

With GST

< SERVICE INFOMATION > Install all removed parts.

- Start engine and warm it up to normal operating temperature.
- 3. Check mass air flow sensor signal in Service \$01 with GST.

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

OK or NG

OK >> GO TO 7.

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-655.

7.CHECK FUNCTION OF FUEL INJECTORS

With CONSULT-III

1. Let engine idle.

2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.

3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-III

1. Let engine idle.

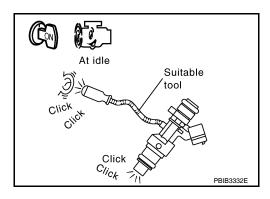
Listen to each fuel injector operating sound.

Clicking noise should be heard.

OK or NG

OK >> GO TO 8.

NG >> Perform trouble diagnosis for EC-986.



# 8. CHECK FUEL INJECTOR

- 1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 2. Turn ignition switch OFF.
- 3. Reconnect all harness connectors disconnected.
- 4. Remove fuel tube assembly. Refer to EM-156.

Keep fuel hose and all fuel injector connected to fuel tube.

The fuel injector harness connectors should remain connected.

- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.
- 7. Crank engine for about 3 seconds. Make sure that fuel sprays out from fuel injectors.

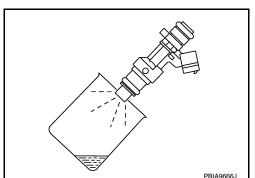
Fuel should be sprayed evenly for each fuel injector.

OK or NG

OK >> GO TO 9.

NG >> Replace fuel injectors from which fuel does not spray

out. Always replace O-ring with new ones.



# 9. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

>> INSPECTION END

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# On Board Diagnosis Logic

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With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the 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 lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Air fuel ratio (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	Fuel injection system too rich	<ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)</li> </ul>	<ul> <li>Air fuel ratio (A/F) sensor 1</li> <li>Fuel injector</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul>

# **DTC Confirmation Procedure**

INFOID:0000000004537229

#### 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.

# 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 and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.
- 4. Clear the self-learning control coefficient by touching "CLEAR".
- 5. Start engine again and let it idle for at least 10 minutes.
- 6. Check 1st trip DTC.

The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to <u>EC-749.</u> "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.
- Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.

Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data $\pm$ 400 rpm
Vehicle speed in the freeze frame data $\pm$ 10 km/h (6 MPH)	
Engine coolant temperature (T)	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
condition	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).

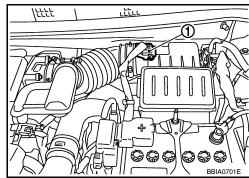
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

< SERVICE INFOMATION > [MR TYPE 1]

Crank engine while depressing accelerator pedal.
 If engine starts, go to <u>EC-749</u>, "<u>Diagnosis Procedure</u>". If engine does not start, remove ignition plugs and check for fouling, etc.

# 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. Restart engine and let idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- Select Service \$03 with GST. Make sure DTC P0102 is detected.
- 7. Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine again and let it idle for at least 10 minutes.
- Select Service \$07 with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to <u>EC-749</u>, "<u>Diagnosis Procedure</u>".



#### 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.
- Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.

Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data $\pm400~\text{rpm}$
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
Engine coolant temperature (T)	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
condition	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).

- 10. If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- Crank engine while depressing accelerator pedal.
   If engine starts, go to <u>EC-749</u>, "<u>Diagnosis Procedure</u>". If engine does not start, remove ignition plugs and check for fouling, etc.

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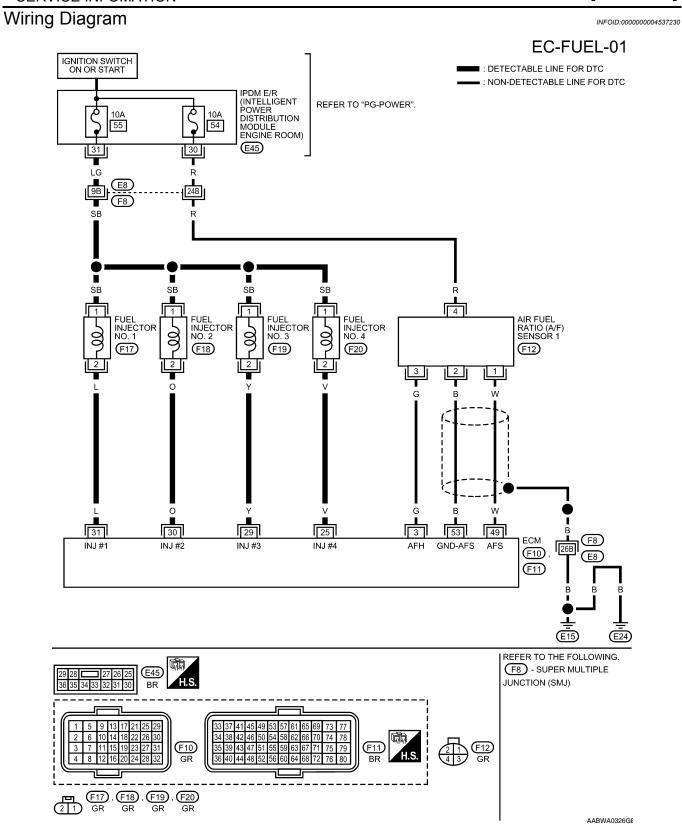
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Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V  >>> 10.0V/Div 50ms/DivT  PBIA8148J
25 29	V	Fuel injector No. 4 Fuel injector No. 3	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  ») 10.0 V/Div 50 ms/Div T  PBIB0529E
30 31	O L	Fuel injector No. 2 Fuel injector No. 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE  (11 - 14V)  Discrete the second of the se
49	w	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

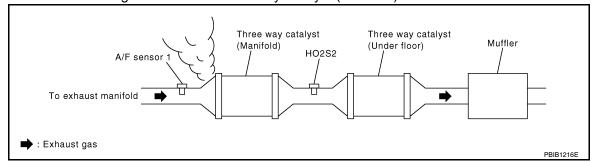
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537231

# 1. CHECK EXHAUST GAS LEAK

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



# OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2.CHECK FOR INTAKE AIR LEAK

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

# OK or NG

OK >> GO TO 3.

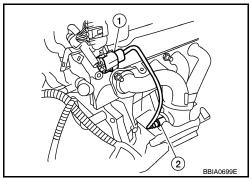
NG >> Repair or replace.

< SERVICE INFOMATION >

# 3.check air fuel ratio (a/f) sensor 1 circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor 1 (2)
- Disconnect ECM harness connector.
- 4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53



[MR TYPE 1]

# Continuity should exist.

5. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

# 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-574, "Fuel Pressure Check".
- Install fuel pressure gauge and check fuel pressure. Refer to EC-574, "Fuel Pressure Check".

# At idling: Approximately 350 kPa (3.57 kg/cm2, 51 psi)

# OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

# ${f 5}$ .DETECT MALFUNCTIONING PART

#### Check the following.

- Fuel pump and circuit (Refer to <u>EC-991</u>.)
- Fuel pressure regulator (Refer to EC-574, "Fuel Pressure Check".)

>> Repair or replace.

# 6.CHECK MASS AIR FLOW SENSOR

# With CONSULT-III

- 1. Install all removed parts.
- Start engine and warm it up to normal operating temperature.
- Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III.

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

# With GST

- 1. Install all removed parts.
- Start engine and warm it up to normal operating temperature.
- Check mass air flow sensor signal in Service \$01 with GST.

< SERVICE INFOMATION > [MR TYPE 1]

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

Α

# OK or NG

NG

OK >> GO TO 7.

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>> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to <u>EC-655</u>.

# 7.CHECK FUNCTION OF FUEL INJECTORS

#### With CONSULT-III

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

#### Without CONSULT-III

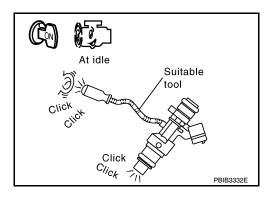
- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

# Clicking noise should be heard.

## OK or NG

OK >> GO TO 8.

NG >> Perform trouble diagnosis for <u>EC-986</u>.



# 8. CHECK FUEL INJECTOR

- 1. Remove fuel injector assembly. Refer to <u>EM-156</u>.
  - Keep fuel hose and all fuel injector connected to fuel tube.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Reconnect all harness connectors disconnected.
- 4. Disconnect all injector harness connectors.
- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.
- Crank engine for about 3 seconds.
   Make sure fuel does not drip from fuel injector.

# OK or NG

OK (Does not drip.)>>GO TO 9.

NG (Drips.)>>Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

# 9. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

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#### >> INSPECTION END

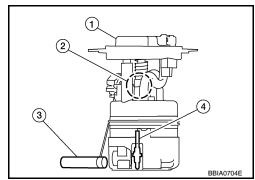
INFOID:0000000004537232

# DTC P0181 FTT SENSOR

# Component Description

The fuel tank temperature sensor (4) 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)
- Fuel level sensor (3)



#### <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

<sup>\*:</sup> This data is reference values and is measured between ECM terminal 43 (Fuel tank temperature sensor) and ground.

#### **CAUTION:**

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

# On Board Diagnosis Logic

	20 - 10 - Acceptable  90 - 10 - Acceptable  1.0 - Acceptable  1.0 - Acceptable  2 - Acceptable  2 - Acceptable  2 - Acceptable  1.0 - Acceptable  2 - Acceptable  1.0 - Accept	SEF012P
--	--	---------

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/per-formance	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     (Fuel tank temperature sensor circuit is open or shorted)     Fuel tank temperature sensor

# **DTC Confirmation Procedure**

#### INFOID:0000000004537234

INFOID:0000000004537233

### 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.

#### WITH CONSULT-III

- 1. Turn ignition switch ON and wait at least 10 seconds.
- Check 1st trip DTC.
  - If 1st trip DTC is detected, go to EC-753, "Diagnosis Procedure".
  - If 1st trip DTC is not detected, go to following step.
- 3. Select "DATA MONITOR" mode with CONSULT-III.
- 4. Check "COOLAN TEMP/S" value.
  - If the "COOLAN TEMP/S" is less than 60°C (140°F), the result will be OK. If the "COOLAN TEMP/S" is above 60°C (140°F), go to the following step.
- Cool engine down until "COOLAN TEMP/S" signal is less than 60°C (140°F).
- 6. Wait at least 10 seconds.
- Check 1st trip DTC.
- 8. If 1st trip DTC is detected, go to EC-753, "Diagnosis Procedure".

# WITH GST

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ECM

(F11)

[MR TYPE 1]

Follow the procedure "WITH CONSULT-III" above.

Wiring Diagram

INFOID:0000000004537235

# EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL TANK TEMPERATURE SENSOR)

(B100)

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FUEL SENS GND COMBINATION METER

M24)

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REFER TO THE FOLLOWING. (M69), (F8) - SUPER MULTIPLE JUNCTION (SMJ)

Diagnosis Procedure

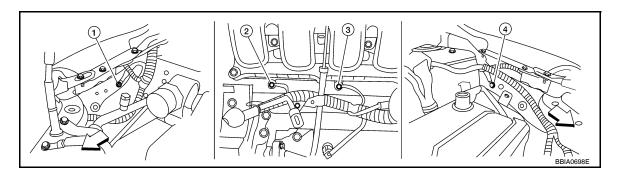
1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.



**EC-753** 

2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

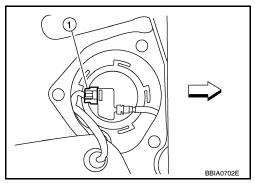
#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector (1).
- : Vehicle front
- 3. Turn ignition switch ON.

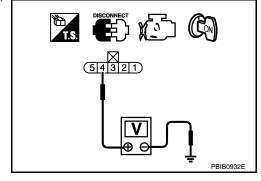


4. Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT-III or tester.

# **Voltage: Approximately 5V**

# OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3.DETECT MALFUNCTIONING PART

# Check the following.

- Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- · 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.
- 4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
- 1. Turn ignition switch OFF.

< SERVICE INFOMATION > [MR TYPE 1]

- 2. Disconnect combination meter harness connector.
- 3. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 5 and combination meter terminal 24. 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 B102, M13
- · Harness for open or short between "fuel level sensor unit and fuel pump" and ground.

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

# 6. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to, EC-755, "Component Inspection".

# OK or NG

OK >> GO TO 7.

NG >> Replace "fuel level sensor unit and fuel pump".

# 7. CHECK INTERMITTENT INCIDENT

Perform EC-626.

#### >> INSPECTION END

# Component Inspection

# FUEL TANK TEMPERATURE SENSOR

 Check resistance between "fuel level sensor unit and fuel pump" terminal 4 and 5 by heating with hot water as shown in the figure.

Temperature °C (°F)	Resistance k $\Omega$
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

2. If NG, replace "fuel level sensor unit and fuel pump".

# Hot water | The content of the cont

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Removal and Installation

FUEL TANK TEMPERATURE SENSOR Refer to FL-5.

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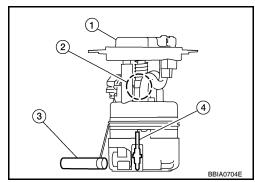
INFOID:0000000004537239

# DTC P0182, P0183 FTT SENSOR

# Component Description

The fuel tank temperature sensor (4) 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)
- Fuel level sensor (3)



#### <Reference data>

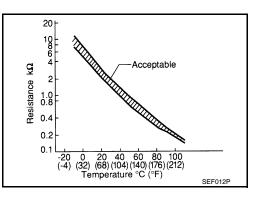
Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

<sup>\*:</sup> This data is reference values and is measured between ECM terminal 43 (Fuel tank temperature sensor) and ground.

# **CAUTION:**

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

# On Board Diagnosis Logic



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     (Fuel tank temperature 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**

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INFOID:0000000004537240

#### 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.

- 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-757, "Diagnosis Procedure".

[MR TYPE 1]

Wiring Diagram

INFOID:0000000004537242

## EC-FTTS-01

: DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC

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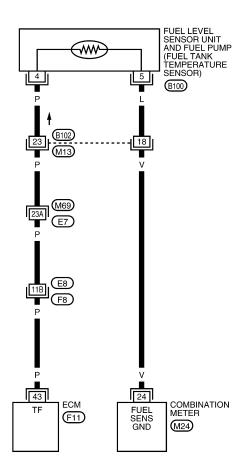
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REFER TO THE FOLLOWING. M Ν

MULTIPLE JUNCTION (SMJ)

M69 , F8 - SUPER

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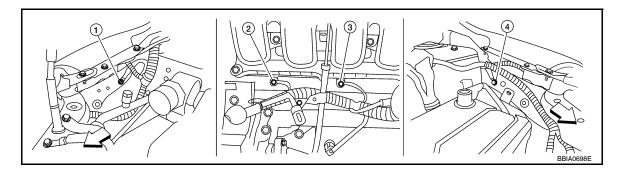
BBWA2636E

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

35 39 43 47 51 55 59 63 67 71 75 79

- Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

## OK or NG

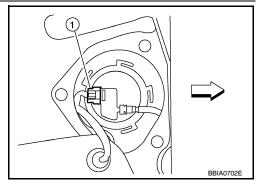
4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Disconnect "fuel level sensor unit and fuel pump" harness connector (1).
- : Vehicle front
- 2. Turn ignition switch ON.

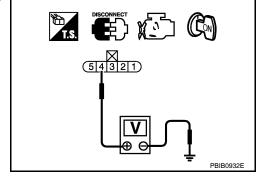


3. Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT-III or tester.

### Voltage: Approximately 5V

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



## 3. DETECT MALFUNCTIONING PART

## Check the following.

- · Harness connectors E8, F8
- · Harness connectors M69, E7
- · Harness connectors B102, M13
- · Harness for open or short to ground 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.

## 4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect combination meter harness connector.
- 3. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 5 and combination meter terminal 24. Refer to Wiring Diagram.

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### 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 B102, M13
- · Harness for open or short between "fuel level sensor unit and fuel pump" and ground

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

## 6.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to, EC-759, "Component Inspection".

### OK or NG

OK >> GO TO 7.

NG >> Replace "fuel level sensor unit and fuel pump".

## .CHECK INTERMITTENT INCIDENT

Perform EC-626.

#### >> INSPECTION END

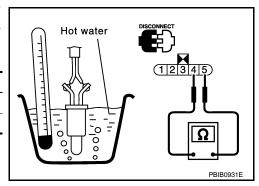
## Component Inspection

#### FUEL TANK TEMPERATURE SENSOR

 Check resistance between "fuel level sensor unit and fuel pump" terminal 4 and 5 by heating with hot water as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

2. If NG, replace "fuel level sensor unit and fuel pump".



## Removal and Installation

FUEL TANK TEMPERATURE SENSOR

Refer to FL-5.

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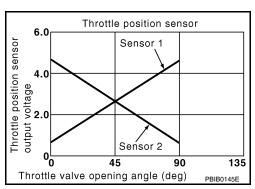
INFOID:0000000004537246

## DTC P0222, P0223 TP SENSOR

## **Component Description**

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537247

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TP SEN 1-B1	Ignition switch: ON     (Engine stopped)	Accelerator pedal: Fully released	More than 0.36V
TP SEN 2-B1*	Shift lever: D (A/T, CVT),     1st (M/T)	Accelerator pedal: Fully depressed	Less than 4.75V

<sup>\*:</sup> Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

INFOID:0000000004537248

These self-diagnoses have the one trip detection logic. NOTE:

If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-874</u>.

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.)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	<ul> <li>(APP sensor 2 circuit is shorted.)</li> <li>Electric throttle control actuator (TP sensor 1)</li> <li>Accelerator pedal position sensor (APP sensor 2)</li> </ul>

#### **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

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:0000000004537249

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

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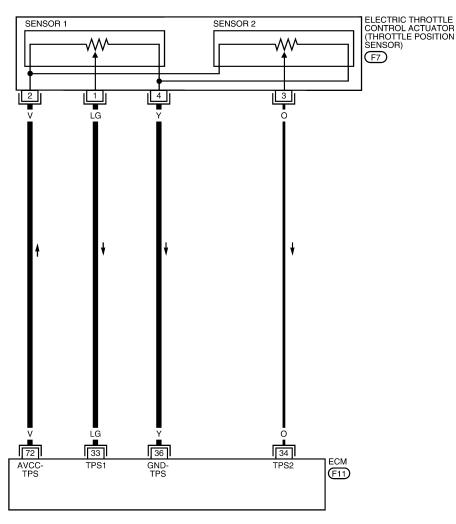
- 1. Start engine and let it idle for 1 second.
- Check DTC.
- 3. If DTC is detected, go to EC-762, "Diagnosis Procedure".

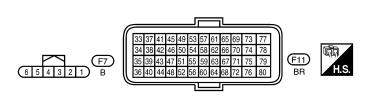
## Wiring Diagram

INFOID:000000004537250

## EC-TPS1-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





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EC-761

Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

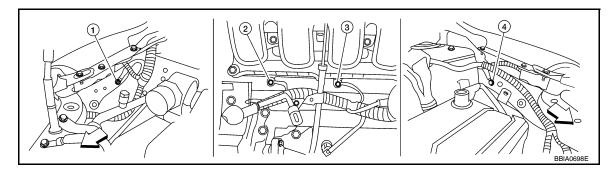
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	33 LG Throttle position sensor 1		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36V
33			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75V
34 O Throttle position sensor 2		Throttle position copper 2	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully released	Less than 4.75V
		Througe position sensor 2	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	More than 0.36V
36	Υ	Sensor ground (Throttle position sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V

## Diagnosis Procedure

INFOID:0000000004537251

## 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

## OK or NG

4.

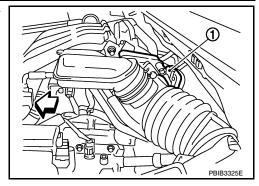
OK >> GO TO 2.

NG >> Repair or replace ground connections.

 $2.\mathsf{CHECK}$  THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

#### [MR TYPE 1] < SERVICE INFOMATION >

- Disconnect electric throttle control actuator (1) harness connec-
- : Vehicle front
- 2. Turn ignition switch ON.



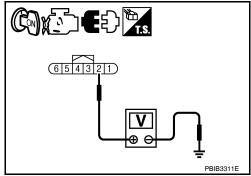
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT-III or tester.

## Voltage: Approximately 5V

#### OK or NG

OK >> GO TO 3.

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



## ${f 3.}$ CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 36 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

### Continuity should exist.

4. Also check harness for short to ground or 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.

## $oldsymbol{4}.$ CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 33 and electric throttle control actuator 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 5.

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

## CHECK THROTTLE POSITION SENSOR

Refer to EC-764, "Component Inspection".

## OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Idle Air Volume Learning</u>".

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**EC-763** 

### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### >> INSPECTION END

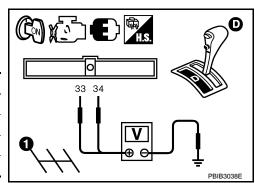
## Component Inspection

#### INFOID:0000000004537252

## THROTTLE POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Perform EC-572, "Throttle Valve Closed Position Learning".
- 3. Turn ignition switch ON.
- 4. Set shift lever to D position (A/T, CVT) or 1st position (M/T).
- Check voltage between ECM terminals 33 (TP sensor 1 signal), 34 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
33	Fully released	More than 0.36V
(Throttle position sensor 1)	Fully depressed	Less than 4.75V
34	Fully released	Less than 4.75V
(Throttle position sensor 2)	Fully depressed	More than 0.36V



- If NG, replace electric throttle control actuator and go to the next step.
- 7. Perform EC-572, "Throttle Valve Closed Position Learning".
- 8. Perform EC-572, "Idle Air Volume Learning".

## Removal and Installation

INFOID:0000000004537253

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to EM-141.

# DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MIS-

< SERVICE INFOMATION >

## DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

## On Board Diagnosis Logic

INFOID:0000000004537254

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.

One Trip Detection Logic (Three Way Catalyst Damage)

On the 1st trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.

When a misfire condition occurs, the ECM monitors the CKP sensor (POS) 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.

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 on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	Improper spark plug     Insufficient compression
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	Incorrect fuel pressure     Fuel injector circuit is open or shorted
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	Fuel injector     Intake air leak     The ignition signal circuit is open or shorted
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	Lack of fuel     Drive plate or flywheel
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	Air fuel ratio (A/F) sensor 1     Incorrect PCV hose connection

## **DTC Confirmation Procedure**

INFOID:0000000004537255

#### **CAUTION:**

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

#### 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.

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Restart engine and let it idle for about 15 minutes.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-766, "Diagnosis Procedure". NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to table below.

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# DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

< SERVICE INFOMATION >

[MR TYPE 1]

### Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following condition should be satisfied at the same time:

Engine speed	Engine speed in the freeze frame data $\pm$ 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data $\pm$ 10 km/h (6 MPH)
Engine coolant temperature	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F)
(T) condition	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F)

The time to driving varies according to the engine speed in the freeze frame data. Refer to the following table.

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:0000000004537256

## 1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- Start engine and run it at idle speed.
- 2. Listen for the sound of the intake air leak.
- 3. Check PCV hose connection.

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

## 2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

### OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

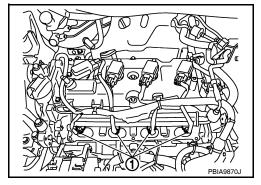
## 3.perform power balance test

### With CONSULT-III

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- 2. Is there any cylinder which does not produce a momentary engine speed drop?

#### Without CONSULT-III

When disconnecting each fuel injector (1) harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



#### Yes or No

Yes >> GO TO 4.

# DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MIS-

[MR TYPE 1] < SERVICE INFOMATION >

No >> GO TO 9.

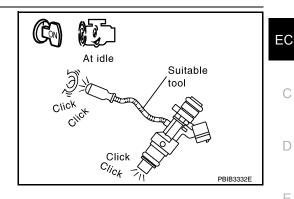
## 4. CHECK FUEL INJECTOR

Does each fuel injector make an operating sound at idle?

Yes or No

Yes >> GO TO 5.

No >> Check fuel injector(s) and circuit(s). Refer to EC-986.



## 5. CHECK FUNCTION OF IGNITION COIL-I

#### **CAUTION:**

Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- 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.

- : Vehicle front
- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 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 about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

## Spark should be generated.

### **CAUTION:**

 Do not approach to the spark plug and the ignition coil within 50cm. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.

It might cause to damage the ignition coil if the gap of more than 17 mm is taken.

When the gap is less than 13 mm, the 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

- Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a known-good spark plug.
- Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

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(Cylinder head, cylinder block, etc.)

Grounded metal portion

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13 - 17 mm

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### < SERVICE INFOMATION >

### Spark should be generated.

#### OK or NG

OK >> GO TO 7.

NG >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-996</u>.

## 7. CHECK SPARK PLUG

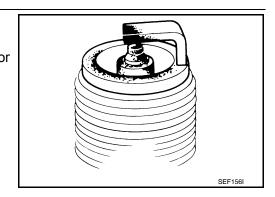
Check the initial spark plug for fouling, etc.

#### OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-227, "Standard and Limit".

NG >> 1. Repair or clean spark plug.

2. GO TO 8.



[MR TYPE 1]

## 8. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- Crank engine for about three 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 <u>EM-227</u>, "Standard and Limit".

## 9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-185, "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

- Install all removed parts.
- Release fuel pressure to zero. Refer to <u>EC-574, "Fuel Pressure Check"</u>.
- Install fuel pressure gauge and check fuel pressure. Refer to EC-574, "Fuel Pressure Check".

## At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 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-991.)
- Fuel pressure regulator (Refer to EC-574, "Fuel Pressure Check".)
- Fuel lines (Refer to EM-156.)
- Fuel filter for clogging

#### >> Repair or replace.

## 12. CHECK IGNITION TIMING

Check the following items. Refer to EC-566, "Basic Inspection".

# DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MIS-

[MR TYPE 1] < SERVICE INFOMATION >

Items	Specifications	
	A/T: 700 ± 50 rpm (in P or N position)	
Target idle speed	CVT: 700 ± 50 rpm (in P or N position)	
	M/T: 700 $\pm$ 50 rpm (in Neutral position)	
Ignition timing	A/T: 13 ± 5° BTDC (in P or N position)	
	CVT: 13 ± 5° BTDC (in Neutral position)	
	M/T: 13 ± 5° BTDC (in Neutral position)	

## OK or NG

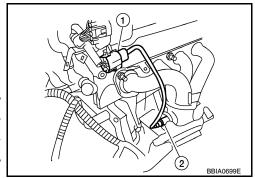
OK >> GO TO 13.

NG >> Follow the EC-566, "Basic Inspection".

13. Check air fuel ratio (a/f) sensor 1 circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor 1 (2)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53



## Continuity should exist.

5. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

#### Continuity should not exist.

Also check harness for short to power.

## OK or NG

OK >> GO TO 14.

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

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

Refer to EC-643, "Component Inspection".

## OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

15.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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

#### >> INSPECTION END

## 16. CHECK MASS AIR FLOW SENSOR

## With CONSULT-III

- Start engine and warm it up to normal operating temperature.
- Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-III.

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# DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

< SERVICE INFOMATION > [MR TYPE 1]

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

#### 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.

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

#### 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 <u>EC-655</u>.

## 17. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-583, "Symptom Matrix Chart".

## OK or NG

OK >> GO TO 18.

NG >> Repair or replace.

## 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. Refer to <u>EC-542</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".

>> GO TO 19.

## 19. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

>> INSPECTION END

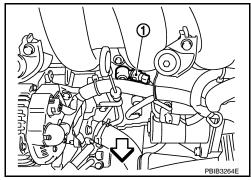
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## DTC P0327, P0328 KS

## **Component Description**

The knock sensor (1) 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.

• : Vehicle front



## On Board Diagnosis Logic

The MIL will not light up for these self-diagnoses.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Knock sensor circuit is open or shorted.)
P0328	Knock sensor circuit high	An excessively high voltage from the sensor is	Knock sensor     Knock sensor

## **DTC Confirmation Procedure**

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:**

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

- 1. Start engine 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-773, "Diagnosis Procedure".

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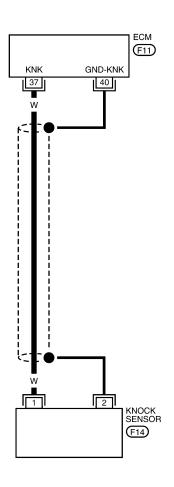
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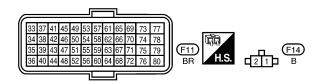
Wiring Diagram

INFOID:0000000004537260

## EC-KS-01

■ : DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC





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Specification data are reference values and are measured between each terminal and ground.

## **CAUTION:**

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

#### [MR TYPE 1]

#### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
37	W	Knock sensor	[Engine is running] • Idle speed	Approximately 2.5V
40	_	Sensor ground (Knock sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

## Diagnosis Procedure

INFOID:0000000004537261

## 1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check resistance between ECM terminal 37 and ground. Refer to Wiring Diagram.

#### NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .

#### Resistance: Approximately 532 - 588k $\Omega$ [at 20°C (68°F)]

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

### OK or NG

OK >> GO TO 4. NG >> GO TO 2.

## 2.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

- 1. Disconnect knock sensor (1) harness connector.
- : Vehicle front
- 2. Check harness continuity between ECM terminal 37 and knock sensor 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 3.

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

## 3.check knock sensor

Refer to EC-774, "Component Inspection".

### OK or NG

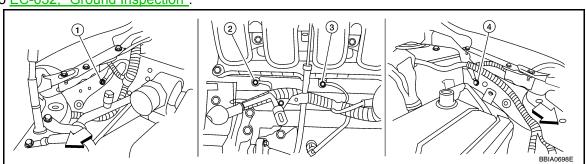
OK >> GO TO 6.

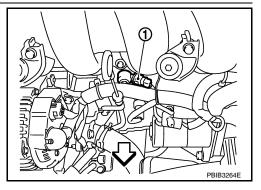
NG >> Replace knock sensor.

## 4. CHECK GROUND CONNECTIONS

Loosen and retighten ground screws on the body.

Refer to EC-632, "Ground Inspection".





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Body ground E15

: Vehicle front

1. Body ground E24

2. Engine ground F9

3. Engine ground F16

#### OK or NG

OK >> GO TO 5.

NG >> Repair or replace ground connections.

## 5. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Reconnect knock sensor harness connector.
- 2. Check harness continuity between ECM terminal 40 and knock sensor 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 >> Repair open circuit or short to ground or short to power in harness or connectors.

## 6. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

## Component Inspection

INFOID:0000000004537262

## **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  $\text{M}\Omega.$ 

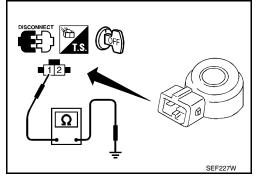
Resistance: Approximately 532 - 588k $\Omega$  [at 20°C (68°F)]

#### **CAUTION:**

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

2. If NG, replace knock sensor.

## Removal and Installation



INFOID:0000000004537263

### **KNOCK SENSOR**

Refer to EM-199.

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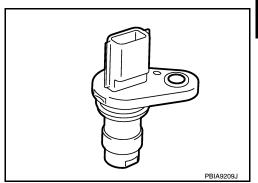
## DTC P0335 CKP SENSOR (POS)

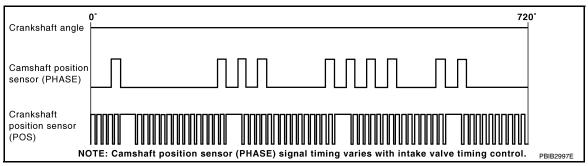
## Component Description

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution. The sensor consists of a permanent magnet and Hall IC.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change. The changing gap causes the magnetic field near the sensor to change. Due to the changing magnetic field, the voltage from the sensor changes. The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.





## CONSULT-III Reference Value in Data Monitor Mode

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	<ul> <li>The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.</li> <li>The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.</li> <li>The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.</li> </ul>	Harness or connectors [Crankshaft position sensor (POS) circuit is open or shorted.] (Accelerator pedal position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) Crankshaft position sensor (POS) Accelerator pedal position sensor Refrigerant pressure sensor EVAP control system pressure sensor Signal plate

## **DTC Confirmation Procedure**

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#### 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:**

## < SERVICE INFOMATION >

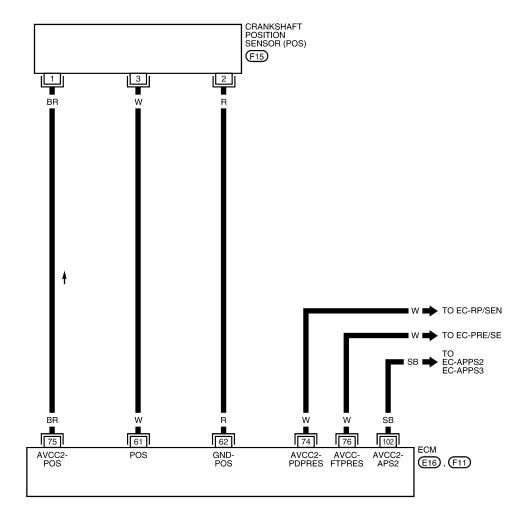
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

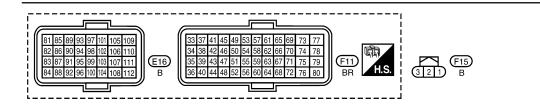
- Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
- 2. Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-777, "Diagnosis Procedure".

## Wiring Diagram

INFOID:0000000004537268

# EC-POS-01 : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC





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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	С	
		Crankshaft position sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	Approximately 4.0V  → 2.0 V/Dw 5 ms/Dw  PBIB2998E	D E	
61	W	(POS)		Approximately 4.0V	F	
				[Engine is running] • Engine speed: 2,000 rpm	>> 2.0 V/Dlv 5 ms/Div T  PBIB2999E	G
62	R	Sensor ground [Crankshaft position sensor (POS)]	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V	I	
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V	J	
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V	K	
76	W	EVAP control system pressure sensor power supply	[Ignition switch: ON]	Approximately 5V	1.	
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V	L	

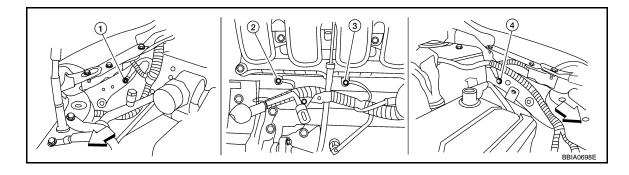
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten ground screws on the body. Refer to EC-632, "Ground Inspection".



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Vehicle front

1. Body ground E24

Body ground E15

2. Engine ground F9

3. Engine ground F16

#### OK or NG

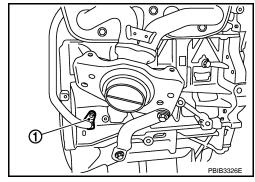
4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## $2. \mathsf{CHECK}$ CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

- Disconnect crankshaft position (CKP) sensor (POS) (1) harness connector.
- 2. Turn ignition switch ON.

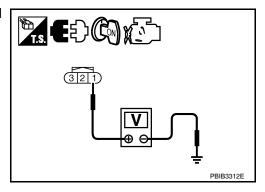


3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-III or tester.

## **Voltage: Approximately 5V**

### OK or NG

OK >> GO TO 8. NG >> GO TO 3.



## ${\bf 3.}{\tt CHECK\ CKP\ SENSOR\ (POS)\ POWER\ SUPPLY\ CIRCUIT-II}$

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between CKP sensor (POS) terminal 1 and ECM terminal 75. Refer to Wiring Diagram.

## Continuity should exist.

#### OK or NG

OK >> GO TO 4.

NG >> Repair open circuit.

## 4. CHECK COMPONENTS POWER SUPPLY

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

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1006, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-776, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-834, "Wiring Diagram"
102	APP sensor terminal 5	EC-949, "Wiring Diagram"

### OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

NG

>> Replace the signal plate.

[MR TYPE 1]

## 12. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

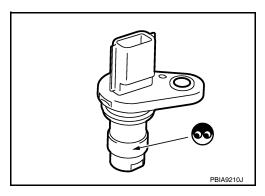
#### >> INSPECTION END

## **Component Inspection**

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## CRANKSHAFT POSITION SENSOR (POS)

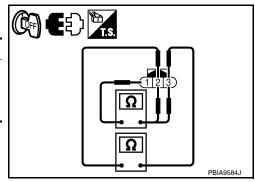
- 1. Loosen the fixing bolt of the sensor.
- 2. Disconnect crankshaft position sensor (POS) harness connector.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞
2 (+) - 3 (-)	

6. If NG, replace crankshaft position sensor (POS).



## Removal and Installation

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CRANKSHAFT POSITION SENSOR (POS) Refer to  $\underline{\mathsf{EM-}199}$ .

[MR TYPE 1]

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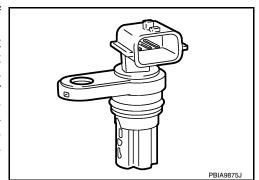
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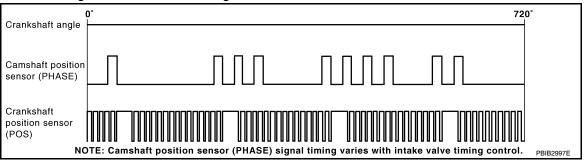
## DTC P0340 CMP SENSOR (PHASE)

## **Component Description**

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



ECM receives the signals as shown in the figure.



## CONSULT-III Reference Value in Data Monitor Mode

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

NOTE:

If DTC P0340 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-874.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	<ul> <li>The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.</li> <li>The cylinder No. signal is not set to ECM during engine running.</li> <li>The cylinder No. signal is not in the normal pattern during engine running.</li> </ul>	Harness or connectors [Camshaft position sensor (PHASE) circuit is open or shorted.] Camshaft position sensor (PHASE) Camshaft (INT) Starter motor (Refer to SC-9.) Starting system circuit (Refer to SC-9) Dead (Weak) battery

### **DTC Confirmation Procedure**

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INFOID:0000000004537273

INFOID:0000000004537274

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.

EC-781

## **DTC P0340 CMP SENSOR (PHASE)**

< SERVICE INFOMATION > [MR TYPE 1]

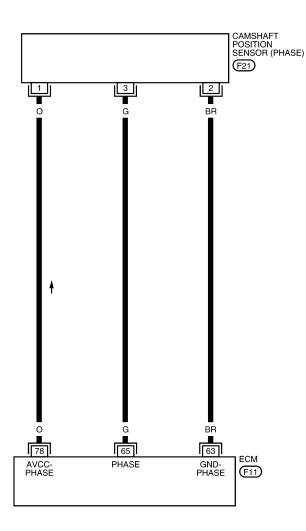
- Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to <a href="EC-783"><u>EC-783</a>, "Diagnosis Procedure"</u>. If 1st trip DTC is not detected, go to next step.
- 4. Maintain engine speed at more than 800 rpm for at least 5 seconds.
- 5. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-783</u>, "<u>Diagnosis Procedure</u>".

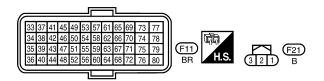
## Wiring Diagram

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## EC-PHASE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2639E

## < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	BR	Sensor ground [Camshaft position sensor (PHASE)]	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
65	G	Camshaft position sensor (PHASE)	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	1.0 - 2.0V
			[Engine is running] • Engine speed: 2,000 rpm.	1.0 - 2.0V
78	0	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5V

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

### Yes or No

>> GO TO 2. Yes

No >> Check starting system. (Refer to <u>SC-9</u>.)

## 2. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to EC-632, "Ground Inspection".

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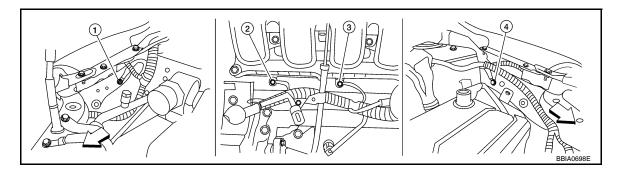
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- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

## OK or NG

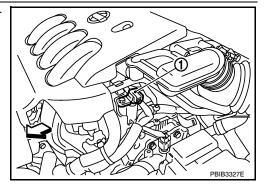
4.

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.
- : Vehicle front
- 2. Turn ignition switch ON.



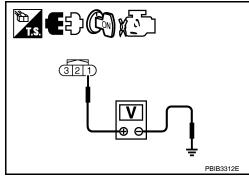
3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-III or tester.

## **Voltage: Approximately 5V**

### 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 CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between CMP sensor (PHASE) terminal 2 and ECM terminal 63. 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.

 ${f 5.}$ CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

## DTC P0340 CMP SENSOR (PHASE)

### < SERVICE INFOMATION >

[MR TYPE 1]

Check harness continuity between CMP sensor (PHASE) terminal 3 and ECM terminal 65. 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 6.

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

**6.**CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-785, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> Replace camshaft position sensor (PHASE).

7.CHECK CAMSHAFT (INTAKE)

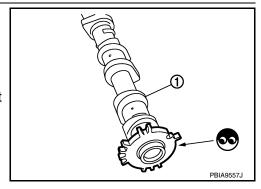
Check the following.

- · Accumulation of debris to the signal plate of camshaft (1) rear end
- · Chipping signal plate of camshaft rear end

## OK or NG

OK >> GO TO 8.

NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



## 8. CHECK INTERMITTENT INCIDENT

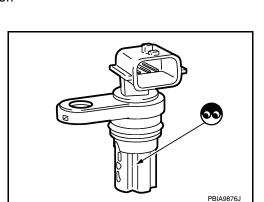
Refer to EC-626.

### >> INSPECTION END

## Component Inspection

**CAMSHAFT POSITION SENSOR (PHASE)** 

- 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.



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## **DTC P0340 CMP SENSOR (PHASE)**

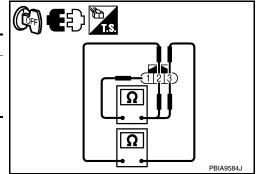
## < SERVICE INFOMATION >

[MR TYPE 1]

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞
2 (+) - 3 (-)	

6. If NG, replace camshaft position sensor (PHASE).



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## Removal and Installation

CAMSHAFT POSITION SENSOR (PHASE) Refer to <u>EM-170</u>.

INFOID:0000000004537280

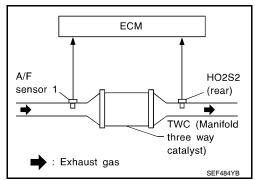
## DTC P0420 THREE WAY CATALYST FUNCTION

## On Board Diagnosis Logic

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	Three way catalyst (manifold) does not operate properly. Three way catalyst (manifold) does not have enough oxygen storage capacity.	Three way catalyst (manifold) Exhaust tube Intake air leaks Fuel injector Fuel injector leaks Spark plug Improper ignition timing

## **DTC Confirmation Procedure**

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.

#### WITH CONSULT-III

#### **TESTING CONDITION:**

#### Do not hold engine speed for more than the specified minutes below.

- 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.
- 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.
- 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).
- Open engine hood.
- Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-III.
- Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely. If "INCMP" of "CATALYST" changed to "CMPLT", go to step 12.
- 10. Wait 5 seconds at idle.
- 11. Rev engine up to 2,000 to 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).

If not "CMPLT", stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.

12. Check 1st trip DTC.

If 1st trip DTC is detected, go to EC-788, "Diagnosis Procedure".

## Overall Function Check

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.

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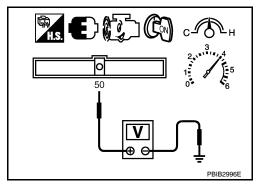
### < SERVICE INFOMATION >

### WITH GST

- 1. Start engine and warm it up to the normal operating temperature.
- 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 terminals 50 (HO2S2 signal) and ground.
- 7. Keep engine speed at 2,500 rpm constant under no load.
- Make sure that the voltage does not vary for more than 5 seconds

If the voltage fluctuation cycle takes less than 5 seconds, go to EC-788, "Diagnosis Procedure".

• 1 cycle:  $0.6 - 1.0 \rightarrow 0 - 0.3 \rightarrow 0.6 - 1.0$ 



## Diagnosis Procedure

## 1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

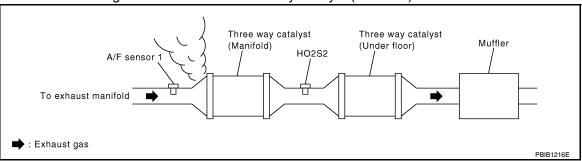
## OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

## 2. CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- Listen for an exhaust gas leak before the three way catalyst (manifold).



## OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

## 3. CHECK INTAKE AIR LEAK

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

#### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

## 4. CHECK IGNITION TIMING

Check the following items. Refer to EC-566, "Basic Inspection".

## DTC P0420 THREE WAY CATALYST FUNCTION

[MR TYPE 1] < SERVICE INFOMATION >

Items	Specifications
	A/T: 700 ± 50 rpm (in P or N position)
Target idle speed	CVT: 700 $\pm$ 50 rpm (in P or N position)
	M/T: 700 ± 50 rpm (in Neutral position)
	A/T: 13 ± 5° BTDC (in P or N position)
Ignition timing	CVT: $13 \pm 5^{\circ}$ BTDC (in P or N position)
	M/T: $13 \pm 5^{\circ}$ BTDC (in Neutral position)

OK or NG

OK >> GO TO 5.

NG >> Follow the EC-566, "Basic Inspection".

## 5. CHECK FUEL INJECTOR

- Stop engine and turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- 4. Check voltage between ECM terminals 25, 29, 30, 31 and ground with CONSULT-III or tester. Refer to Wiring Diagram for fuel injectors, EC-987, "Wiring Diagram".

## Voltage: Battery voltage

#### OK or NG

>> GO TO 6. OK

NG >> Perform <u>EC-988</u>, "Diagnosis Procedure".

## 6.CHECK FUNCTION OF IGNITION COIL-I

#### **CAUTION:**

Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- Remove fuel pump (1) fuse in IPDM E/R (2) to release fuel pressure.

## NOTE:

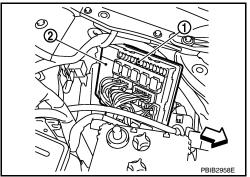
Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- : Vehicle front
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 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 about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

#### Spark should be generated.

### CAUTION:

 Do not approach to the spark plug and the ignition coil within 50cm. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.



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113 - 17 mm Grounded metal portion (Cylinder head, cylinder block, etc.)

 It might cause to damage the ignition coil if the gap of more than 17 mm is taken. NOTE:

When the gap is less than 13 mm, the 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

Turn ignition switch OFF.

< SERVICE INFOMATION >

- Disconnect spark plug and connect a known-good spark plug.
- Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

### Spark should be generated.

#### OK or NG

OK >> GO TO 8.

NG >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-996</u>.

## 8. CHECK SPARK PLUG

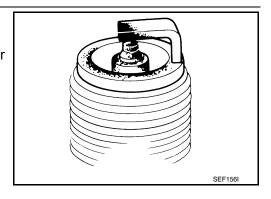
Check the initial spark plug for fouling, etc.

#### OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-227, "Standard and Limit".

>> 1. Repair or clean spark plug. NG

2. GO TO 9.



[MR TYPE 1]

## 9. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- 2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

### Spark should be generated.

#### OK or NG

>> INSPECTION END OK

NG >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-227, "Standard and Limit".

## 10. CHECK FUEL INJECTOR

- Turn ignition switch OFF.
- Remove fuel injector assembly.

Refer to EM-156.

Keep fuel hose and all fuel injectors connected to fuel tube.

- 3. Disconnect all ignition coil harness connectors.
- Reconnect all fuel injector harness connectors disconnected.
- Turn ignition switch ON.

Make sure 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-626.

## **DTC P0420 THREE WAY CATALYST FUNCTION**

DIC P0420 THREE WAT CATALTST FUNCTION

Trouble is fixed.>>INSPECTION END

< SERVICE INFOMATION >

Trouble is not fixed.>>Replace three way catalyst (manifold).

[MR TYPE 1]

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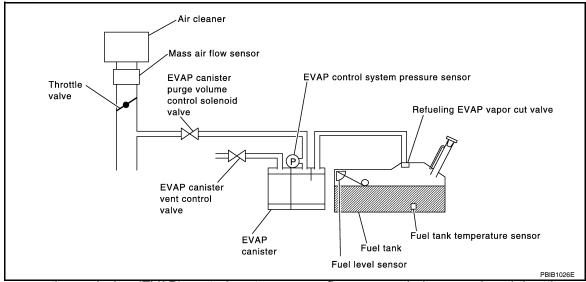
## DTC P0441 EVAP CONTROL SYSTEM

## System Description

INFOID:0000000004537284

#### NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123 P2127, P2128, 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.

## On Board Diagnosis Logic

INFOID:0000000004537285

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 in- correct purge flow	<ul> <li>EVAP control system does not operate properly.</li> <li>EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.</li> </ul>	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:0000000004537286

### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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

[MR TYPE 1]

#### < SERVICE INFOMATION >

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and let it idle for at least 70 seconds.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CON-SULT-III.
- Touch "START".
  - If "COMPLETED" is displayed, go to step 7.
- 6. When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

Shift lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,800 rpm
B/FUEL SCHDL	1.0 - 10.0 msec
COOLAN TEMP/S	More than 0°C

If TESTING is not changed for a long time, retry from step 2.

7. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to EC- 793, "Diagnosis Procedure".

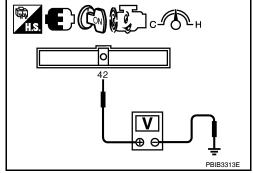
# **Overall Function Check**

Use this procedure 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.

## WITH GST

- 1. Lift up drive wheels.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and wait at least 70 seconds.
- 5. Set voltmeter probes to ECM terminals 42 (EVAP control system pressure sensor signal) and ground.
- Check EVAP control system pressure sensor value at idle speed and note it.
- 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
Shift lever	Any position other than P, N or R



- Verify 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.
- If NG, go to <u>EC-793</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

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

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#### With CONSULT-III

- 1. 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 <a href="EC-527">EC-527</a>, "Description".
- 2. Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- 4. Rev engine up to 2,000 rpm.
- 5. 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%	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.
- 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 <a href="EC-527">EC-527</a>, "Description".
- Start engine and let it idle.

## Do not depress accelerator pedal even slightly.

5. Check vacuum gauge indication before 60 seconds passed after starting engine.

#### Vacuum should not exist.

6. Revving engine up to 2,000 rpm after 100 seconds passed after starting engine.

## Vacuum should exist.

## OK or NG

OK >> GO TO 7. NG >> GO TO 4.

# 4. CHECK EVAP PURGE LINE

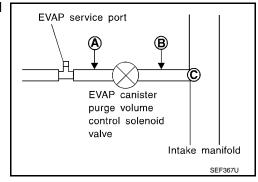
- 1. Turn ignition switch OFF.
- Check EVAP purge line for improper connection or disconnection. Refer to <u>EC-527</u>, "<u>Description</u>".

## OK or NG

OK >> GO TO 5. NG >> Repair it.

# 5.CHECK EVAP PURGE HOSE AND PURGE PORT

- 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**.



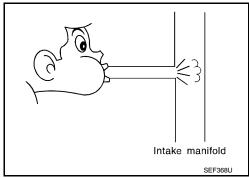
< SERVICE INFOMATION >

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

- 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-815, "Component Inspection".

#### OK or NG

OK

NG >> Replace EVAP canister purge volume control solenoid valve.

# f 8 .CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- 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-832 or DTC P0452 and EC-839 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.
- 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-821, "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.

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# **DTC P0441 EVAP CONTROL SYSTEM**

[MR TYPE 1]

#### DIC PU441 EVAP CONTROL SYSTEM

< SERVICE INFOMATION >
Refer to <u>EC-527</u>, "<u>Description</u>".

OK or NG

OK >> GO TO 13. NG >> Replace it.

13.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

>> INSPECTION END

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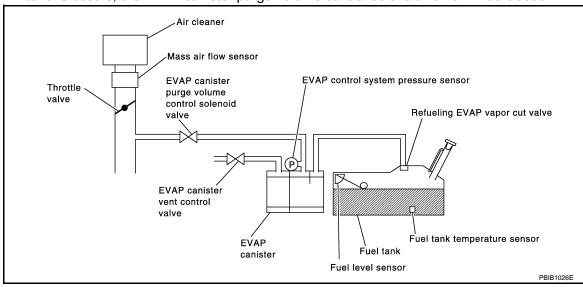
# DTC P0442 EVAP CONTROL SYSTEM

# On Board Diagnosis 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 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 fails to close. Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line rubber tube bent Loose or disconnected rubber tube EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit Fuel tank temperature sensor O-ring of EVAP canister vent control valve is missing or damaged EVAP canister is saturated with water EVAP control system pressure sensor 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 come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

## **DTC Confirmation Procedure**

INFOID:0000000004537290

## NOTE:

[MR TYPE 1]

#### < SERVICE INFOMATION >

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:**

- 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).
- Open engine hood before conducting following procedure.

# WITH CONSULT-III

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 4. Check the following conditions are met.

COOLAN TEMP/S: 0 - 70°C (32 - 158°F)

INT/A TEMP SE: 0 - 30°C (32 - 86°F)

Select "EVAP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

#### NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-566, "Basic Inspection".

6. Make sure that "OK" is displayed.

If "NG" is displayed, refer to EC-798, "Diagnosis Procedure".

#### NOTE:

Make sure that EVAP hoses are connected to the EVAP canister purge volume control solenoid valve properly.

## WITH GST

#### NOTE:

Be sure to read the explanation of Driving Pattern on <u>EC-542</u>, "<u>Emission-related Diagnostic Information</u>" before driving vehicle.

- 1. Start engine.
- Drive vehicle according to Driving Pattern, <u>EC-542</u>, "Emission-related Diagnostic Information".
- 3. Stop vehicle.
- Turn ignition switch OFF and wait at least 10 seconds and then turn ignition switch ON.
- 5. Select Service \$07 with GST.
- If P0442 is displayed on the screen, go to EC-798, "Diagnosis Procedure".
- If P0441 is displayed on the screen, go to EC-793, "Diagnosis Procedure" for DTC P0441.

# Diagnosis Procedure

INFOID:0000000004537291

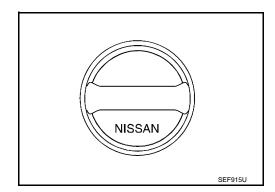
# 1. CHECK FUEL FILLER CAP DESIGN

- 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.

# **DTC P0442 EVAP CONTROL SYSTEM**

# < SERVICE INFOMATION >

[MR TYPE 1]

2. Retighten until reteaching sound is heard.

# 3.CHECK FUEL FILLER CAP FUNCTION

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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

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Refer to EC-529, "Component Inspection".

#### OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

# 5. INSTALL THE PRESSURE PUMP

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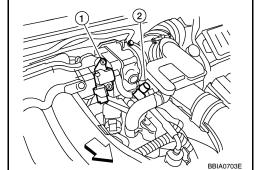
To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

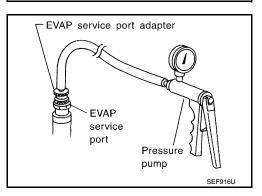
For the location of EVAP service port (2), refer to <u>EC-527</u>, "<u>Description</u>".

- EVAP canister purge volume control solenoid valve (1)
- Vehicle front

## NOTE:

Improper installation of the EVAP service port adapter 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

- Turn ignition switch ON.
- 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.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.

# [MR TYPE 1]

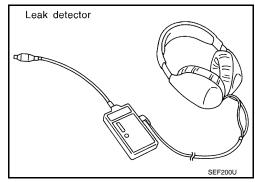
## < SERVICE INFOMATION >

Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-527, "Description".

#### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



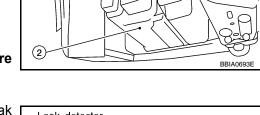
# 7. CHECK FOR EVAP LEAK

## Without CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
- EVAP control system pressure sensor (1)
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

#### **CAUTION:**

- · Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.

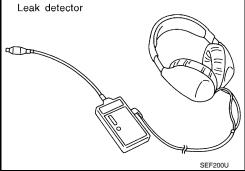


4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-527, "Description".

#### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



# 8. CHECK EVAP CANISTER VENT CONTROL VALVE

## Check the following,

- EVAP canister vent control valve is installed properly. Refer to EC-531, "Removal and Installation".
- · EVAP canister vent control valve. Refer to EC-821, "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 SATURATED WITH WATER

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

## DTC P0442 EVAP CONTROL SYSTEM

#### < SERVICE INFOMATION >

[MR TYPE 1]

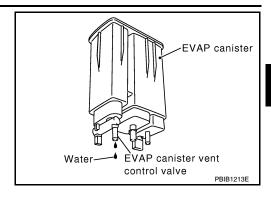
Does water drain from the EVAP canister?

#### Yes or No

>> GO TO 10. Yes

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 sen-

The weight should be less than 1.9 kg (4.2 lb).

## OK or NG

OK (With CONSULT-III)>>GO TO 12.

OK (Without CONSULT-III)>>GO TO 13.

>> GO TO 11.

# 11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- · EVAP hose connected to EVAP canister for clogging or poor connection

>> Repair hose or replace EVAP canister.

# 12.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

## With CONSULT-III

- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- Touch "Qu" on CONSULT-III screen to increase "PURG VOL CONT/V" opening to 100%.
- Check vacuum hose for vacuum.

#### Vacuum should exist.

#### 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.
- Stop engine.
- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 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 16.

NG >> GO TO 14.

# 14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-594, "Vacuum Hose Drawing".

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# < SERVICE INFOMATION > [MR TYPE 1]

OK >> GO TO 15.

NG >> Repair or reconnect the hose.

# 15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-815, "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-755, "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-838, "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 <u>EC-527</u>.

#### 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, kink, looseness and improper connection. For location, refer to <u>EC-533</u>.

## 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, kink, cracks, looseness and improper connection.

#### OK or NG

OK >> GO TO 22.

NG >> Repair or replace hoses, tubes or filler neck tube.

# 22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-535, "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 FL-5.

## OK or NG

OK >> GO TO 24.

# **DTC P0442 EVAP CONTROL SYSTEM**

[MR TYPE 1] < SERVICE INFOMATION > NG >> Replace fuel level sensor unit.

24.CHECK INTERMITTENT INCIDENT

Refer to EC-626.

# >> INSPECTION END

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# DTC P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID **VALVE**

Description INFOID:0000000004537292

#### SYSTEM DESCRIPTION

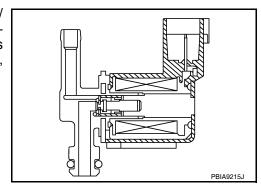
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position	EVAP can-	EVAP canister purge volume
Accelerator pedal position sensor	Accelerator pedal position	flow control control solenoid valve	
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		
ABS actuator and electric unit (control unit)	Vahiala anaad*2		
Combination meter	Vehicle speed* <sup>2</sup>		

<sup>\*1:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

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



# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537293

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V		Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%
	Air conditioner switch: OFF     No load	2,000 rpm	0 - 50%

<sup>\*2:</sup> This signal is sent to the ECM though CAN communication line.

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# On Board Diagnosis Logic

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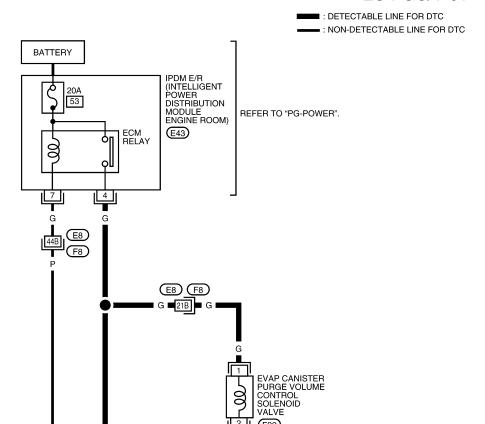
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0443 )443	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	EVAP control system pressure sensor     EVAP canister purge volume control solenoid valve     (EVAP canister purge volume control solenoid valve is stuck open.)     EVAP canister vent control valve     EVAP canister     Hoses     (Hoses are connected incorrectly or
	<u> </u>		clogged.)
TC Coi	nfirmation Proced	ure	INFOID:0000000004537295
ast 10 se	nfirmation Procedure hoconds before conducti	nas been previously conducted, alwaysing the next test.	turn ignition switch OFF and wait at
lways pe	erform test at a tempe	erature of 5°C (41°F) or more.	
	CONSULT-III	o normal operating temperature.	
	ngine and warm it up to unition switch OFF and		
_	nition switch ON.	wait at least 10 seconds.	
Turn ig Select	nition switch ON.	1444" of "EVAPORATIVE SYSTEM" in	"DTC WORK SUPPORT" mode with
Turn ig Select CONS Touch	gnition switch ON. "PURG VOL CN/V P'ULT-III. "START".	1444" of "EVAPORATIVE SYSTEM" in	
Turn ig Select CONS Touch Start e	gnition switch ON. "PURG VOL CN/V Poulled "START". engine and let it idle kimately 10 seconds.)	1444" of "EVAPORATIVE SYSTEM" in until "TESTING" on CONSULT-III cha	nges to "COMPLETED". (It will take
Turn ig Select CONS Touch Start e approx If "TES	gnition switch ON.  "PURG VOL CN/V Poull ULT-III.  "START".  engine and let it idle idimately 10 seconds.)  STING" is not display	1444" of "EVAPORATIVE SYSTEM" in	nges to "COMPLETED". (It will take
Turn ig Select CONS Touch Start e approx If "TES	gnition switch ON.  "PURG VOL CN/V POULT-III.  "START".  engine and let it idle idinately 10 seconds.)  STING" is not display sure that "OK" is display Diagnosis Procedure".	1444" of "EVAPORATIVE SYSTEM" in until "TESTING" on CONSULT-III charved after 5 minutes, retry from step 2.	nges to "COMPLETED". (It will take
Turn ig Select CONS Touch Start e approx If "TES Make s 807, "[	gnition switch ON.  "PURG VOL CN/V Poult-III.  "START".  engine and let it idle stimately 10 seconds.)  STING" is not display sure that "OK" is display Diagnosis Procedure".	1444" of "EVAPORATIVE SYSTEM" in until "TESTING" on CONSULT-III charved after 5 minutes, retry from step 2.	nges to "COMPLETED". (It will take
Turn ig Select CONS Touch Start e approx If "TES Make s 807, "I	gnition switch ON.  "PURG VOL CN/V POULT-III.  "START".  engine and let it idle simately 10 seconds.)  STING" is not display sure that "OK" is display Diagnosis Procedure".  GST	1444" of "EVAPORATIVE SYSTEM" in until "TESTING" on CONSULT-III charved after 5 minutes, retry from step 2 ayed after touching "SELF-DIAG RESUL	nges to "COMPLETED". (It will take
Turn ig Select CONS Touch Start e approx If "TES Make s 807, "I	gnition switch ON.  "PURG VOL CN/V POULT-III.  "START".  engine and let it idle stimately 10 seconds.)  STING" is not display sure that "OK" is display or any sure t	until "TESTING" on CONSULT-III chained after 5 minutes, retry from step 2 ayed after touching "SELF-DIAG RESULT on normal operating temperature. It wait at least 10 seconds.	nges to "COMPLETED". (It will take
Turn ig Select CONS Touch Start e approx If "TES Make s 807, "I	gnition switch ON.  "PURG VOL CN/V POULT-III.  "START".  engine and let it idle idinately 10 seconds.)  STING" is not display sure that "OK" is disp	until "TESTING" on CONSULT-III chained after 5 minutes, retry from step 2 ayed after touching "SELF-DIAG RESULT on normal operating temperature. It wait at least 10 seconds.	nges to "COMPLETED". (It will take

**EC-805** 

< SERVICE INFOMATION >

Wiring Diagram INFOID:0000000004537296

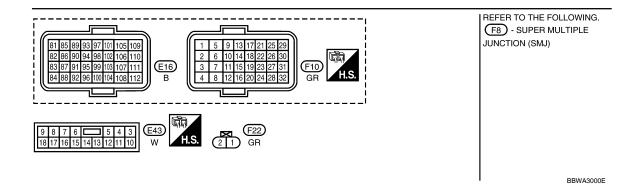
# EC-PGC/V-01



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EVAP

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Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

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< SERVICE INFOMATION >

[MR TYPE 1]

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.

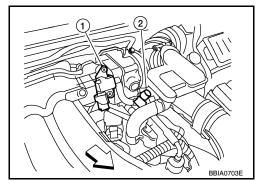
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	EC
9	9 P	EVAP canister purge volume control solenoid valve	<ul><li>[Engine is running]</li><li>Idle speed</li><li>Accelerator pedal: Not depressed even slightly, after engine starting.</li></ul>	BATTERY VOLTAGE  (11 - 14V)  10.0V/Div 50 ms/Div  PBIB0050E	C
			<ul><li>[Engine is running]</li><li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li></ul>	Approximately 10V  → 10.0 V/Div 50 ms/Div T  PBIB0520E	E F G
32	Р	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V	Н
		(Sell Silut-Oil)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)	I
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	J

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

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.
- EVAP service port (2)
- Vehicle front
- 3. Turn ignition switch ON.



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< SERVICE INFOMATION >

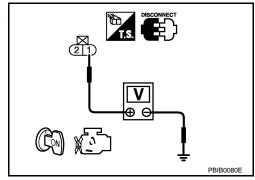
[MR TYPE 1]

 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 E8, F8
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
  - >> 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.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 9 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

- Disconnect EVAP control system pressure sensor harness connector.
- EVAP control system pressure sensor (1)
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 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-838, "Component Inspection".

## OK or NG

OK (With CONSULT-III)>>GO TO 6.

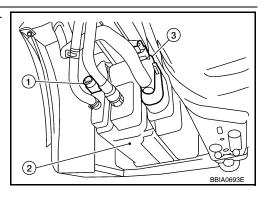
OK (Without CONSULT-III)>>GO TO 7.

NG >> Replace EVAP control system pressure sensor.

# 6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### With CONSULT-III

- Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- Start engine.



< SERVICE INFOMATION > [MR TYPE 1]

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-810, "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.
- 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-821, "Component Inspection".

# OK or NG

OK >> GO TO 10.

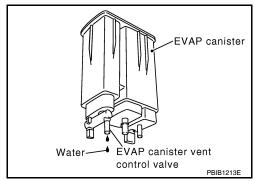
NG >> Replace EVAP canister vent control valve.

10.check if evap canister saturated with water

- 1. Remove EVAP canister with EVAP canister vent control valve attached.
- Does water drain from the EVAP canister?

#### 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 1.9 kg (4.2 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-626.

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< SERVICE INFOMATION >

#### >> INSPECTION END

# Component Inspection

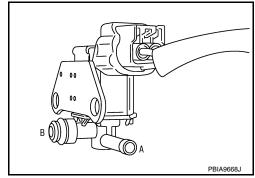
INFOID:0000000004537298

# 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.

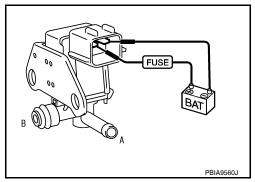
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100%	Yes
0%	No



## 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
12V direct current supply between terminals 1 and 2	Yes
No supply	No



# Removal and Installation

INFOID:0000000004537299

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE Refer to EM-141.

< SERVICE INFOMATION >

[MR TYPE 1]

# DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLE-**NOID VALVE**

Description INFOID:0000000004537300

## SYSTEM DESCRIPTION

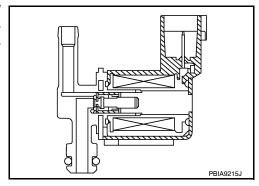
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1	EVAP canister	EVAP canister purge volume
Throttle position sensor	Throttle position	purge flow	control solenoid valve
Accelerator pedal position sensor	Accelerator pedal position control		
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		
ABS actuator and electric unit (control unit)	Vahiala araad*2		
Combination meter	Vehicle speed* <sup>2</sup>		

<sup>\*1:</sup> The ECM determines the start signal status by the signal of engine speed and battery voltage.

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



# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537301

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION	
PURG VOL C/V	Engine: After warming up     Shift lever: N (A/T, CVT),     Neutral (M/T)	Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%	F
	<ul><li> Air conditioner switch: OFF</li><li> No load</li></ul>	2,000 rpm	0 - 50%	

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<sup>\*2:</sup> This signal is sent to the ECM through CAN communication line.

# < SERVICE INFOMATION >

[MR TYPE 1]

# On Board Diagnosis Logic

INFOID:0000000004537302

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     (EVAP canister purge volume control 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     (EVAP canister purge volume control solenoid valve circuit is shorted.)     EVAP canister purge volume control solenoid valve

# **DTC Confirmation Procedure**

INFOID:0000000004537303

## NOTE:

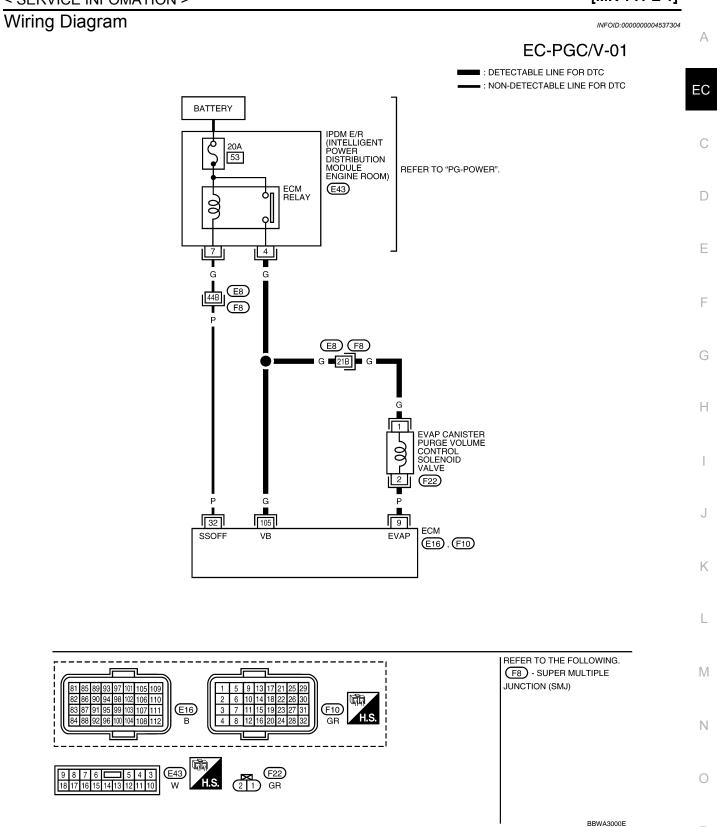
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

## **TESTING CONDITION:**

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

- 1. Start engine and let it idle for at least 13 seconds.
- Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-814, "Diagnosis Procedure".

< SERVICE INFOMATION > [MR TYPE 1]



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

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[MR TYPE 1]

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.

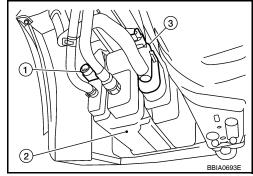
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
9	9 P EVAP canister purge volum control solenoid valve		<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Accelerator pedal: Not depressed even slightly, after engine starting.</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  >>> 10.0V/Div 50 ms/Div  PBIB0050E
		CONTROL SCIENCIA VAIVE	<ul><li>[Engine is running]</li><li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li></ul>	Approximately 10V  → 10.0 V/Div 50 ms/Div T  PBIB0520E
32 P	ECM relay	<ul><li>[Engine is running]</li><li>[Ignition switch: OFF]</li><li>For a few seconds after turning ignition switch OFF</li></ul>	0 - 1.0V	
		' (Self shut-off)	[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537305

- 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.
- ÈVAP canister port (2)
- 3. Turn ignition switch ON.



# < SERVICE INFOMATION >

[MR TYPE 1]

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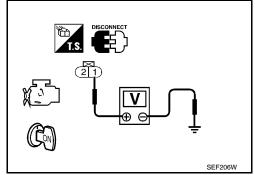
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 Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-III or tester.

# **Voltage: Battery voltage**

#### OK or NG

OK >> GO TO 3. NG >> GO TO 2.



# 2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
  - >> 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.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 9 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

- 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-815, "Component Inspection",

## OK or NG

OK >> GO TO 6.

NG >> Replace EVAP canister purge volume control solenoid valve.

# $oldsymbol{6}$ .CHECK INTERMITTENT INCIDENT

Refer to EC-626.

## >> INSPECTION END

# Component Inspection

INFOID:0000000004537306

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

**EC-815** 

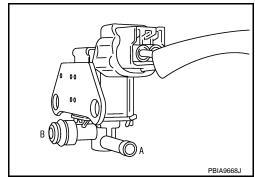
# < SERVICE INFOMATION >

[MR TYPE 1]

## With CONSULT-III

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

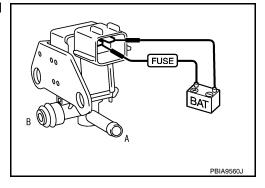
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100%	Yes
0%	No



# 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
12V direct current supply between terminals 1 and 2	Yes
No supply	No



# Removal and Installation

INFOID:0000000004537307

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE Refer to <u>EM-141</u>.

INFOID:0000000004537308

# DTC P0447 EVAP CANISTER VENT CONTROL VALVE

# **Component Description**

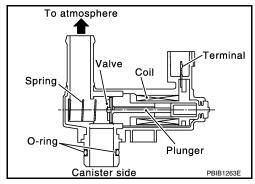
The EVAP canister vent control valve (3) is located on the EVAP canister (2) and is used to seal the canister vent.

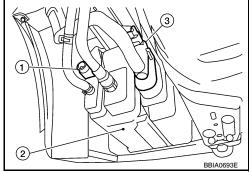
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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 diagnoses.

• EVAP control system pressure sensor (1)





# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V • Ignition switch: ON		OFF

# On Board Diagnosis Logic

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     (EVAP canister vent control valve circuit is open or shorted.)     EVAP canister vent control valve

# **DTC Confirmation Procedure**

## 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:**

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

- Start engine and wait at least 8 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-819</u>, "<u>Diagnosis Procedure</u>".

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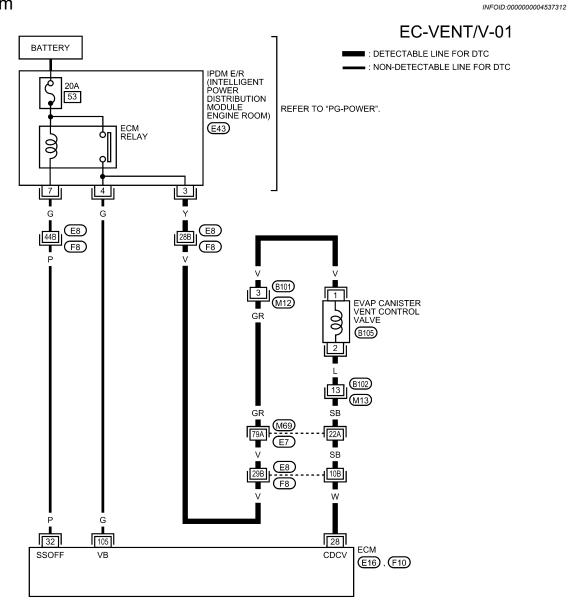
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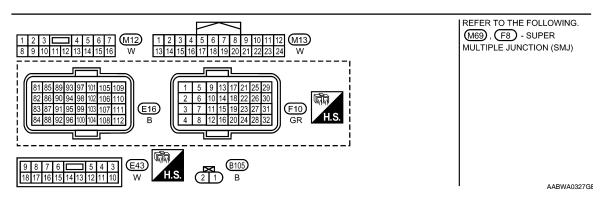
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< SERVICE INFOMATION > Wiring Diagram

[MR TYPE 1]





Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

# DTC P0447 EVAP CANISTER VENT CONTROL VALVE

< SERVICE INFOMATION >

[MR TYPE 1]

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
28	W	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
32 P	ECM relay	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V	
		(Self shut-off)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

Diagnosis Procedure

INFOID:0000000004537313

# 1. INSPECTION START

1. Do you have CONSULT-III?

## Yes or No

Yes >> GO TO 2. Nο >> GO TO 3.

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

## With CONSULT-III

- Turn ignition switch OFF and then turn ON.
- Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-III.
- Touch "ON/OFF" on CONSULT-III screen.
- Check for operating sound of the valve.

# Clicking noise should be heard.

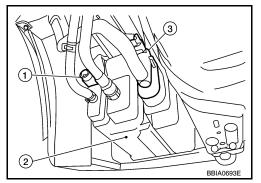
## OK or NG

OK >> GO TO 8. NG >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

- Disconnect EVAP canister vent control valve (3) harness con-2. nector.
- EVAP control system pressure sensor (1)
- EVAP canister (2)
- 3. Turn ignition switch ON.



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**EC-819** 

# DTC P0447 EVAP CANISTER VENT CONTROL VALVE

# < SERVICE INFOMATION >

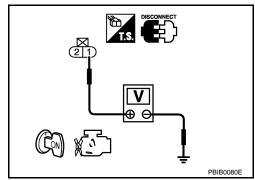
[MR TYPE 1]

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 E8, F8
- Harness connectors E7, M69
- · Harness connectors M12, B101
- 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.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 28 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 E8, F8
- Harness connectors E7, M69
- Harness connectors M13, B102
- · 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-821, "Component Inspection".

#### OK or NG

OK >> GO TO 9.

NG >> Replace EVAP canister vent control valve.

# 9. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

[MR TYPE 1]

#### >> INSPECTION END

# Component Inspection

#### INFOID:0000000004537314

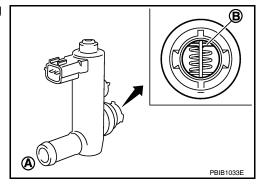
# EVAP CANISTER VENT CONTROL VALVE

#### With CONSULT-III

- 1. Remove EVAP canister vent control valve from EVAP canister.
- Check portion **B** of EVAP canister vent control valve for being rusted.

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.

  Make sure new O-ring is installed properly.

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

# Operation takes less than 1 second.

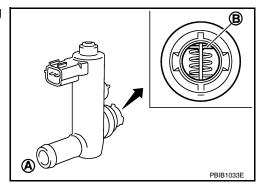
If NG, replace EVAP canister vent control valve.

If OK, 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.

## Without CONSULT-III

- 1. Remove EVAP canister vent control valve from EVAP canister.
- Check portion **B** of EVAP canister vent control valve for being rusted.



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# DTC P0447 EVAP CANISTER VENT CONTROL VALVE

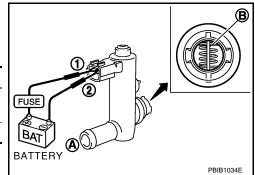
< SERVICE INFOMATION >

[MR TYPE 1]

3. Check air passage continuity and operation delay time under the following conditions.

Make sure new O-ring is installed properly.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes



#### Operation takes less than 1 second.

If NG, replace EVAP canister vent control valve. If OK, 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.

INFOID:0000000004537315

# DTC P0448 EVAP CANISTER VENT CONTROL VALVE

# Component Description

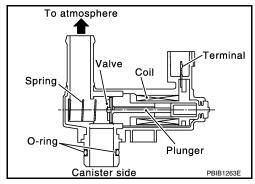
The EVAP canister vent control valve (3) is located on the EVAP canister (2) and is used to seal the canister vent.

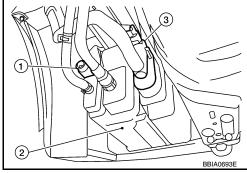
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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 diagnoses.

EVAP control system pressure sensor (1)





# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	Ignition switch: ON	OFF

# On Board Diagnosis Logic

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.	<ul> <li>EVAP canister vent control valve</li> <li>EVAP control system pressure sensor and the circuit</li> <li>Blocked rubber tube to EVAP canister vent control valve</li> <li>EVAP canister is saturated with water</li> </ul>

# **DTC Confirmation Procedure**

INFOID:0000000004537318

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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.

- 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.
- Repeat next procedures three times.
- Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.

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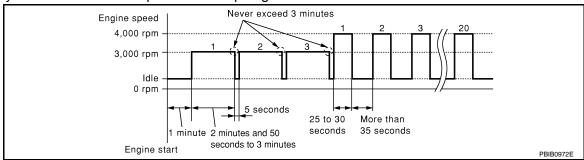
# DTC P0448 EVAP CANISTER VENT CONTROL VALVE

[MR TYPE 1]

## Never exceed 3 minutes.

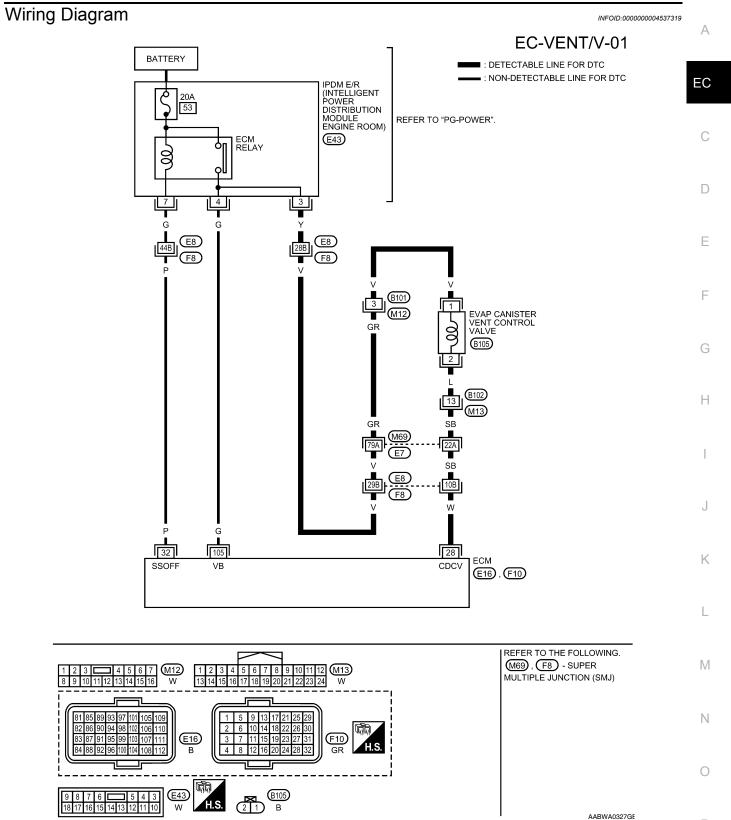
< SERVICE INFOMATION >

- b. Fully released accelerator pedal and keep engine idle for about 5 seconds.
- 5. Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-826. "Diagnosis Procedure". If 1st trip DTC is not detected, go to the next step.
- 7. Repeat next procedure 20 times.
- Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.
- Fully released accelerator pedal and keep engine idle for at least 35 seconds.



- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-826, "Diagnosis Procedure".





Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

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# [MR TYPE 1]

# < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
28	W	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
32	32 P ECM relay (Self shut-off)	,	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
		[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)	
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

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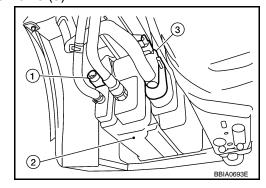
# 1. CHECK RUBBER TUBE

- 1. Turn ignition switch OFF.
- 2. Disconnect rubber tube connected to EVAP canister vent control valve (3).
- 3. Check the rubber tube for clogging.
- EVAP control system pressure sensor (1)
- EVAP canister (2)

#### OK or NG

OK >> GO TO 2.

NG >> Clean rubber tube using an air blower.



# $2.\mathsf{CHECK}$ EVAP CANISTER VENT CONTROL VALVE

Refer to EC-827, "Component Inspection".

# OK or NG

OK >> GO TO 3.

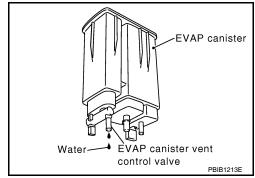
NG >> Replace EVAP canister vent control valve.

# 3.CHECK IF EVAP CANISTER SATURATED WITH WATER

- 1. Remove EVAP canister with EVAP canister vent control valve attached.
- 2. Does water drain from the EVAP canister.

#### 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 1.9 kg (4.2 lb).

#### OK or NG

# DTC P0448 EVAP CANISTER VENT CONTROL VALVE

[MR TYPE 1] < SERVICE INFOMATION >

OK >> GO TO 6. NG >> GO TO 5.

 ${f 5}$  . DETECT MALFUNCTIONING PART

Check the following.

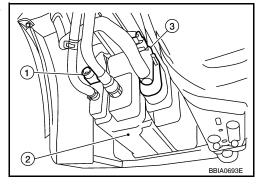
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

# 6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- Check connectors for water.

Water should not exist.



OK or NG

OK >> GO TO 7.

NG >> Replace EVAP control system pressure sensor.

# .CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-846, "Component Inspection".

#### OK or NG

OK >> GO TO 8.

NG >> Replace EVAP control system pressure sensor.

#### **O.**CHECK INTERMITTENT INCIDENT

Refer to EC-626.

## >> INSPECTION END

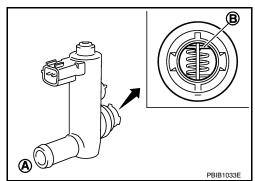
# Component Inspection

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 being rusted.

If NG, replace EVAP canister vent control valve. If OK, go to next step.

- Reconnect harness connectors disconnected.
- Turn ignition switch ON.



5. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

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## < SERVICE INFOMATION >

6. Check air passage continuity and operation delay time.

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

## Operation takes less than 1 second.

# Make sure new O-ring is installed properly.

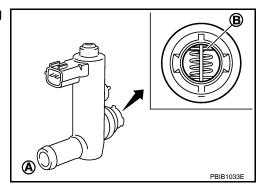
If NG, replace EVAP canister vent control valve.

If OK, 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 5 again.

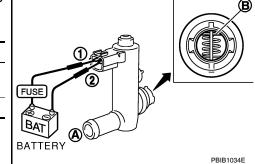
#### Without CONSULT-III

- 1. Remove EVAP canister vent control valve from EVAP canister.
- 2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes



# Operation takes less than 1 second. Make sure new O-ring is installed properly.

If NG, replace EVAP canister vent control valve.

If OK, 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.

< SERVICE INFOMATION >

[MR TYPE 1]

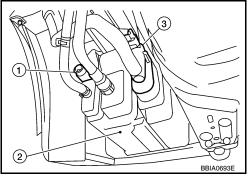
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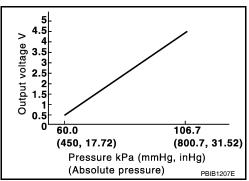
# DTC P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

# Component Description

The EVAP control system pressure sensor (1) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- EVAP canister (2)
- EVAP canister vent control valve (3)





## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	Ignition switch: ON	Approx. 1.8 - 4.8V

# On Board Diagnosis Logic

INFOID:0000000004537324

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 [Crankshaft position sensor (POS) circuit is shorted.]     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor

# **DTC Confirmation Procedure**

#### 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. Start engine and wait at least 40 seconds. NOTE:

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Do not depress accelerator pedal even slightly.

- 3. Check 1st trip DTC.
- 4. If 1st trip DTC is detected, go to EC-830, "Diagnosis Procedure".

## Diagnosis Procedure

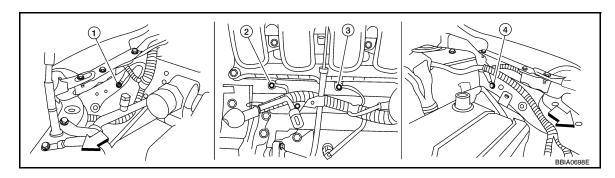
< SERVICE INFOMATION >

INFOID:0000000004537326

[MR TYPE 1]

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24
- Engine ground F9
- engine ground F16

Body ground E15 4.

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK EVPA CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 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 COMPONENTS POWER SUPPLY

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

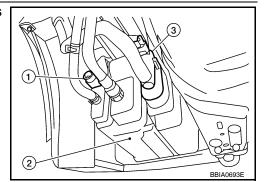
ECM terminal Sensor terminal		Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1006, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-776, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-834, "Wiring Diagram"
102	APP sensor terminal 5	EC-949, "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



[MR TYPE 1] < SERVICE INFOMATION >

- Refrigerant pressure sensor (Refer to MTC-37.)
- Crankshaft position sensor (POS) (Refer to <u>EC-780, "Component Inspection"</u>.)

#### OK or NG

OK >> GO TO 5.

NG >> Replace malfunctioning components.

## 5. CHECK APP SENSOR

Refer to EC-952, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

## 6. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- Perform <u>EC-572</u>, "<u>Accelerator Pedal Released Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
- 4. Perform EC-572, "Idle Air Volume Learning".

#### >> INSPECTION END

# 7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-831, "Component Inspection".

#### OK or NG

OK >> GO TO 8.

NG >> Replace EVAP control system pressure sensor.

# 8. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

For wiring diagram, refer to EC-834, "Wiring Diagram".

#### >> INSPECTION END

## Component Inspection

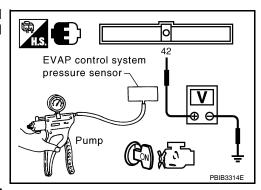
#### EVAP CONTROL SYSTEM PRESSURE SENSOR

- Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Always replace O-ring with a new one.
- 2. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM terminal 42 (EVAP control system pressure sensor signal) and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V	
Not applied	1.8 - 4.8	
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value	

#### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
- 4. If NG, replace EVAP control system pressure sensor.



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[MR TYPE 1]

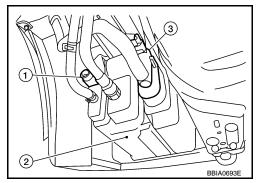
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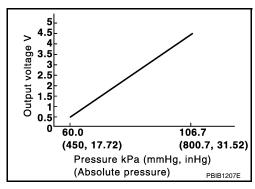
## DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

# Component Description

The EVAP control system pressure sensor (1) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- EVAP canister (2)
- EVAP canister vent control valve (3)





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537329

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	Ignition switch: ON	Approx. 1.8 - 4.8V

# On Board Diagnosis Logic

INFOID:0000000004537330

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     (EVAP control system pressure sensor circuit is open or shorted.)     [Crankshaft position sensor (POS) circuit is shorted.)     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor

# **DTC Confirmation Procedure**

INFOID:0000000004537331

#### 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.

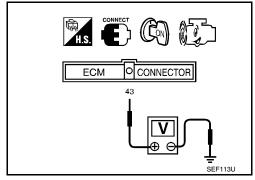
< SERVICE INFOMATION > [MR TYPE 1]

#### 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. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- Start engine and wait at least 20 seconds.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is detected, go to EC-835, "Diagnosis Procedure".

#### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check that voltage between ECM terminal 43 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and wait at least 20 seconds.
- Select Service \$07 with GST.
   If 1st trip DTC is detected, go to <u>EC-835</u>, "<u>Diagnosis Procedure</u>".



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Wiring Diagram

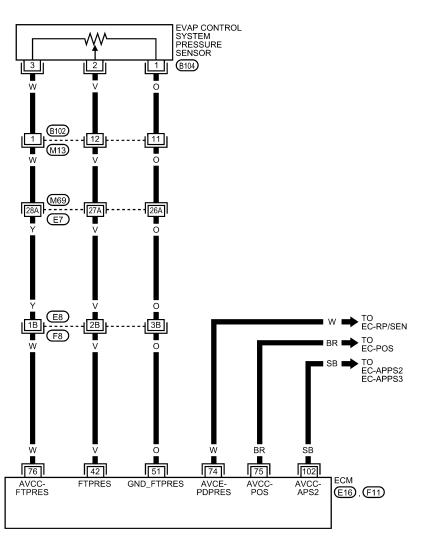
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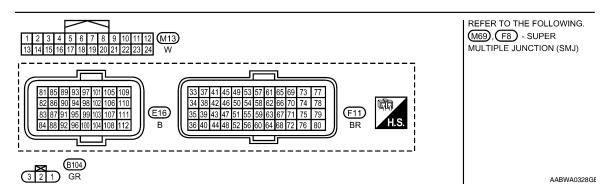
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[MR TYPE 1]

## EC-PRE/SE-01

■ : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC





Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

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

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TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	V	EVAP control system pres- sure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V
51	0	Sensor ground (EVAP control system pressure sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5V

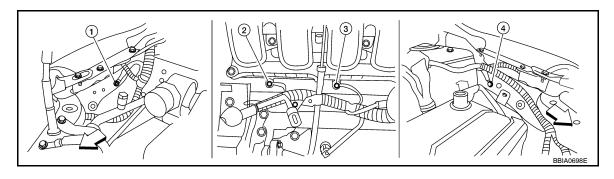
# Diagnosis Procedure

INFOID:0000000004537333

# 1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.

2. Loosen and retighten ground screws on the body. Refer to <u>EC-632</u>, "<u>Ground Inspection</u>".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

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#### < SERVICE INFOMATION >

[MR TYPE 1]

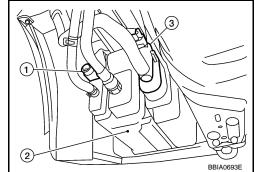
- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 2. Check sensor harness connector for water.

#### Water should not exist.

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace harness connector.



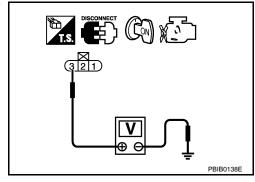
# 3.check evap control system pressure sensor power supply circuit-i

- 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 E8, F8
- Harness connectors M69. E7
- Harness connectors B102, M13
- 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 POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between EVAP control system pressure sensor terminal 3 and ECM terminal 76

#### Continuity should exist.

#### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

## 6.DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness connectors E8, F8
- · Harness connectors M69, E7
- · Harness connectors B102, M13
- 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 COMPONENTS POWER SUPPLY

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

< SERVICE INFOMATION >

SHORT

[MR TYPE 1]

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1006, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-776, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-834, "Wiring Diagram"
102	APP sensor terminal 5	EC-949, "Wiring Diagram"
<u>K or NG</u> DK       >> GO TO 8.		
	rt to ground or short to power in harness or	connectors.
.CHECK COMPONE	NTS	
heck the following.		
Refrigerant pressure s	sensor (Refer to MTC-37.)	(
•	ensor (POS) (Refer to <u>EC-780, "Componen</u>	t inspection".)
<u>VK or NG</u> OK        >> GO TO 9.		
	alfunctioning components.	
CHECK APP SENSO	OR	
efer to EC-952, "Com	ponent Inspection".	
K or NG		
OK >> GO TO 11.		
NG >> GO TO 10.	EDATOR REPAIL ASSEMBLY	
	ERATOR PEDAL ASSEMBLY	
. Replace accelerato	r pedal assembly.	na"
Replace accelerato Perform <u>EC-572</u> , "A. Perform <u>EC-572</u> , "I	r pedal assembly. Accelerator Pedal Released Position Learni Throttle Valve Closed Position Learning".	ng".
Replace accelerato Perform <u>EC-572</u> , "A. Perform <u>EC-572</u> , "I	r pedal assembly. Accelerator Pedal Released Position Learni	ng".
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< SERVICE INFOMATION >

[MR TYPE 1]

Check harness continuity between ECM terminal 42 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 15. NG >> GO TO 14.

# 14.DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- Harness for open or short between ECM and EVAP control system pressure sensor
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-838, "Component Inspection".

#### OK or NG

OK >> GO TO 16.

NG >> Replace EVAP control system pressure sensor.

# 16. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004537334

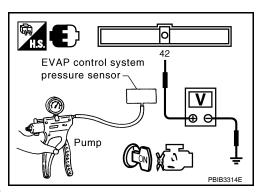
#### EVAP CONTROL SYSTEM PRESSURE SENSOR

- Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Always replace O-ring with a new one.
- 2. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM terminal 42 (EVAP control system pressure sensor signal) and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value

#### **CAUTION:**

- · Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
- If NG, replace EVAP control system pressure sensor.



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[MR TYPE 1]

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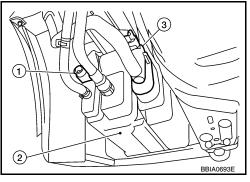
Е

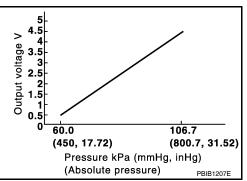
# DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

# **Component Description**

The EVAP control system pressure sensor (1) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- EVAP canister (2)
- EVAP canister vent control valve (3)





## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	Ignition switch: ON	Approx. 1.8 - 4.8V

# On Board Diagnosis Logic

INFOID:0000000004537337

INFOID:0000000004537336

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     (EVAP control system pressure sensor circuit is open or shorted.)     [Crankshaft position sensor (POS) circuit is shorted.)     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor     Refrigerant pressure sensor     EVAP canister vent control valve     EVAP canister     Rubber hose to EVAP canister vent control valve

#### **DTC Confirmation Procedure**

INFOID:0000000004537338

NOTE:

#### < SERVICE INFOMATION >

[MR TYPE 1]

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:**

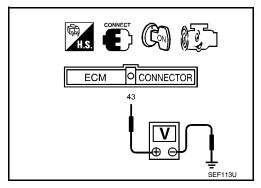
Always perform test at a temperature of 5°C (41°F) or more.

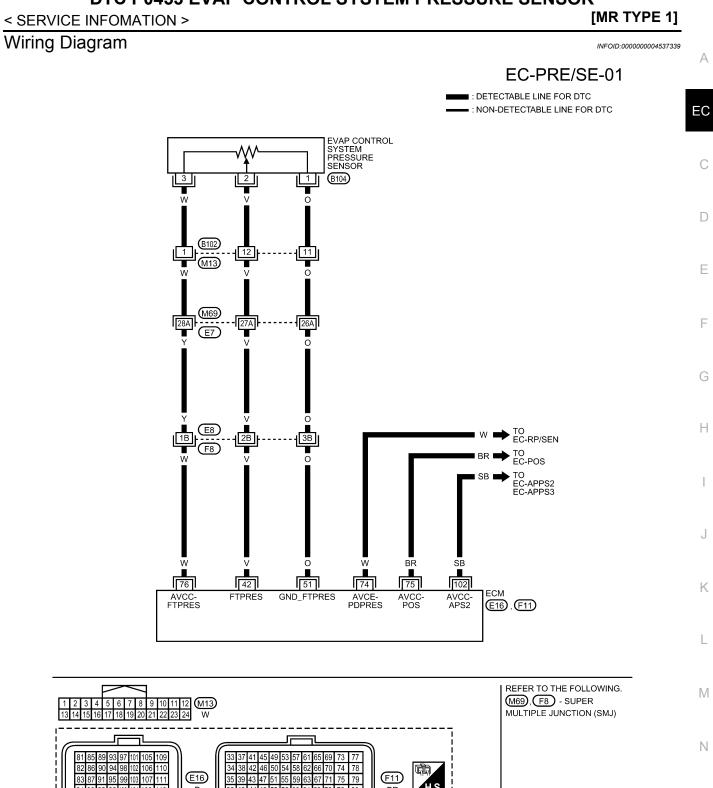
## WITH CONSULT-III

- 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 "DATA MONITOR" mode with CONSULT-III.
- 5. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- 6. Wait at least 10 seconds.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is detected, go to EC-842, "Diagnosis Procedure".

#### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check that voltage between ECM terminal 43 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Wait at least 10 seconds.
- Select Service \$07 with GST.
   If 1st trip DTC is detected, go to <u>EC-842</u>, "<u>Diagnosis Procedure</u>".





Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

(B104)

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.

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TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	٧	EVAP control system pres- sure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V
51	0	Sensor ground (EVAP control system pressure sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5V

# Diagnosis Procedure

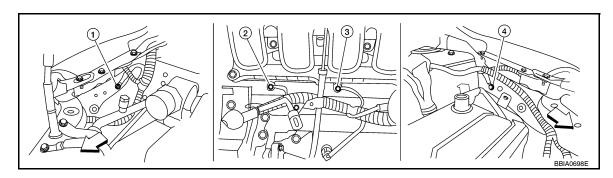
< SERVICE INFOMATION >

INFOID:0000000004537340

[MR TYPE 1]

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to <u>EC-632</u>, "<u>Ground Inspection</u>".



- Vehicle front
- Engine ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

< SERVICE INFOMATION >

[MR TYPE 1]

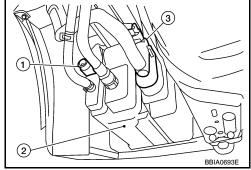
- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 2. Check sensor harness connector for water.

#### Water should not exist.

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace harness connector.



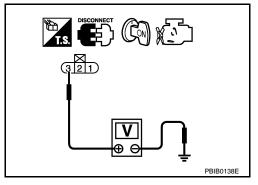
# $\overline{\bf 3}.$ CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

- 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 E8, F8
- Harness connectors M69. E7
- Harness connectors B102, M13
- 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 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between EVAP control system pressure sensor terminal 3 and ECM terminal 76.

#### Continuity should exist.

#### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

# 6. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- 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 COMPONENTS POWER SUPPLY

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

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[MR TYPE 1]

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1006, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-776, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-834, "Wiring Diagram"
102	APP sensor terminal 5	EC-949, "Wiring Diagram"

#### OK or NG

OK >> GO TO 8.

NG >> Repair short to ground or short to power in harness or connectors.

# 8. CHECK COMPONENTS

< SERVICE INFOMATION >

#### Check the following.

- Refrigerant pressure sensor (Refer to MTC-37.)
- Crankshaft position sensor (POS) (Refer to EC-780, "Component Inspection".)

#### OK or NG

OK >> GO TO 9.

NG >> Replace malfunctioning components.

#### 9.CHECK APP SENSOR

#### Refer to EC-952, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> GO TO 10.

# 10.REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- Perform EC-572, "Accelerator Pedal Released Position Learning".
- Perform EC-572, "Throttle Valve Closed Position Learning".
- 4. Perform EC-572, "Idle Air Volume Learning".

#### >> INSPECTION END

# 11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 51. 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 13.

NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E85, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- 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.
- 13.check evap control system pressure sensor input signal circuit for open and **SHORT**

< SERVICE INFOMATION >

[MR TYPE 1]

Check harness continuity between ECM terminal 42 and EVAP control system pressure sensor terminal 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 15. NG >> GO TO 14.

 $14.\mathsf{DETECT}$  MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- Harness for open or short between ECM and EVAP control system pressure sensor

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

# 15. CHECK RUBBER TUBE

- Disconnect rubber tube connected to EVAP canister vent control valve.
- Check the rubber tube for clogging, vent and kinked.

OK or NG

OK >> GO TO 16.

NG >> Clean the rubber tube using an air blower, repair or replace rubber tube.

16.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-821, "Component Inspection".

OK or NG

OK >> GO TO 17.

NG >> Replace EVAP canister vent control valve.

17 . CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-846, "Component Inspection".

OK or NG

>> GO TO 18. OK

NG >> Replace EVAP control system pressure sensor.

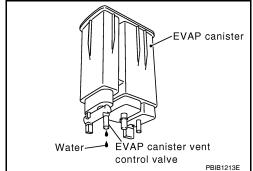
18. CHECK IF EVAP CANISTER SATURATED WITH WATER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 19.

>> GO TO 21. Nο



# 19. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensorattached.

The weight should be less than 1.9 kg (4.2 lb).

OK or NG

**EC-845** 

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< SERVICE INFOMATION > [MR TYPE 1]

OK >> GO TO 21. NG >> GO TO 20.

# 20. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose connected to EVAP canister for clogging or poor connection

>> Repair hose or replace EVAP canister.

# 21. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

## Component Inspection

INFOID:0000000004537341

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#### **EVAP CONTROL PRESSURE SENSOR**

- Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister.
   Always replace O-ring with a new one.
- Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM terminal 42 (EVAP control system pressure sensor signal) and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V	
Not applied	1.8 - 4.8	
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value	

# EVAP control system pressure sensor

#### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
- 4. If NG, replace EVAP control system pressure sensor.

[MR TYPE 1]

## DTC P0455 EVAP CONTROL SYSTEM

# On Board Diagnosis Logic

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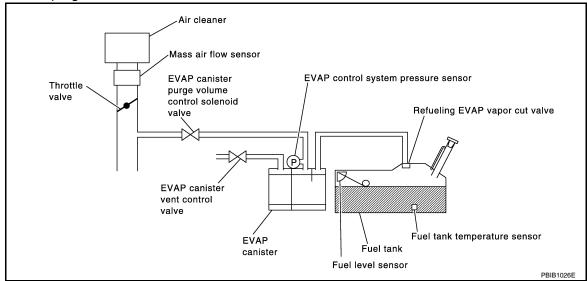
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This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



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 fails to 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 come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

#### **DTC Confirmation Procedure**

INFOID:0000000004537343

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#### **CAUTION:**

Never remove fuel filler cap during the DTC Confirmation Procedure. NOTE:

#### < SERVICE INFOMATION >

- Make sure that EVAP hose are connected to EVAP canister purge volume control solenoid valve properly.
- 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:**

- 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 reteaching 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. Make sure 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)

 Select "EVAP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

#### NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to <u>EC-566</u>, "Basic Inspection".

7. Make sure that "OK" is displayed.

If "NG" is displayed, select "SELF-DIAG RESULTS" mode with CONSULT-III and make sure that "EVAP GROSS LEAK [P0455]" is displayed. If it is displayed, refer to <a href="EC-848">EC-848</a>, "Diagnosis Procedure". If P0442 is displayed, perform Diagnostic Procedure for DTC P0442, <a href="EC-798">EC-798</a>, "Diagnosis Procedure".

#### WITH GST

#### NOTE:

Be sure to read the explanation of Driving Pattern on <u>EC-542</u>, "<u>Emission-related Diagnostic Information</u>" before driving vehicle.

- 1. Start engine.
- Drive vehicle according to Driving Pattern, <u>EC-542</u>, "<u>Emission-related Diagnostic Information</u>".
- Stop vehicle.
- 4. Turn ignition switch OFF, wait at least 10 seconds and then turn ignition switch ON.
- Select Service \$07 with GST.
- If P0441 is displayed on the screen, go to EC-793, "Diagnosis Procedure" for DTC P0441.
- If P0442 is displayed on the screen, go to <u>EC-798</u>, "<u>Diagnosis Procedure</u>" for DTC P0442.
- If P0455 is displayed on the screen, go to EC-848, "Diagnosis Procedure".

# Diagnosis Procedure

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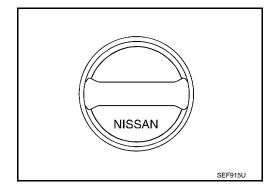
# 1.CHECK FUEL FILLER CAP DESIGN

- 1. Turn ignition switch OFF.
- Check for genuine NISSAN fuel filler cap design.

#### OK or NG

OK >> GO TO 2.

NG >> Replace with genuine NISSAN fuel filler cap.



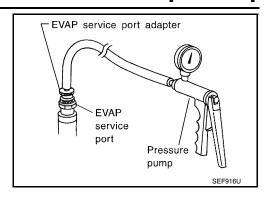
# 2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

#### **DTC P0455 EVAP CONTROL SYSTEM**

[MR TYPE 1] < SERVICE INFOMATION > OK or NG Α OK >> GO TO 3. NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. 2. Retighten until reteaching sound is heard. 3.CHECK FUEL FILLER CAP FUNCTION EC 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 D Refer to EC-529, "Component Inspection". OK or NG Е OK >> GO TO 5. NG >> Replace fuel filler cap with a genuine one.  ${f 5.}$ 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-527. OK or NG >> GO TO 6. OK NG >> Repair or reconnect the hose. Н O.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 is installed properly. Refer to EC-531, "Removal and Installation". EVAP canister vent control valve. Refer to EC-821, "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 leak, install EVAP service port adapter and pressure pump to EVAP service port securely. For the location of EVAP service port (2), refer to EC-527, "Description". EVAP canister purge volume control solenoid valve (1) Ν • : Vehicle front NOTE: Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking. Р

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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.

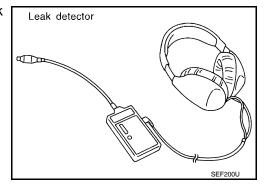
#### **CAUTION:**

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to <a href="EC-527">EC-527</a>, "Description".

#### OK or NG

OK >> GO TO 11.

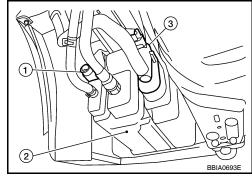
NG >> Repair or replace.



# 10. CHECK FOR EVAP LEAK

#### Without CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
- EVAP control system pressure sensor (1)
- EVAP canister (2)



- 3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

  CAUTION:
  - · Never use compressed air or a high pressure pump.
  - Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.

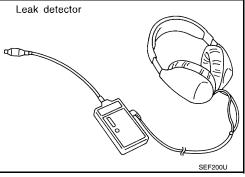
#### < SERVICE INFOMATION >

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-527, "Description".

#### OK or NG

OK >> GO TO 12.

NG >> Repair or replace.



# 11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### With CONSULT-III

- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine.
- Perform "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.

#### 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.
- Stop engine.
- 3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

#### Vacuum should exist.

## 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-594, "Vacuum Hose Drawing".

#### OK or NG

OK (With CONSULT-III)>>GO TO 14.

OK (Without CONSULT-III)>>GO TO 15.

>> Repair or reconnect the hose.

# 14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### With CONSULT-III

- Start engine.
- 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-815, "Component Inspection".

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# < SERVICE INFOMATION > [MR TYPE 1]

#### 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-755, "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-838, "Component Inspection".

#### OK or NG

OK >> GO TO 18.

NG >> Replace EVAP control system pressure sensor.

# 18. CHECK EVAP/ORVR LINE

Check refueling EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to  $\underline{\text{EC-533}}$ .

#### OK or NG

OK >> GO TO 19.

>> Repair or replace hoses and tubes.

## 19. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

#### OK or NG

OK >> GO TO 20.

>> Repair or replace hoses, tubes or filler neck tube.

# 20.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-535, "Component Inspection".

#### OK or NG

OK >> GO TO 21.

>> Replace refueling EVAP vapor cut valve with fuel tank.

# 21. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

#### [MR TYPE 1]

INFOID:0000000004537345

# DTC P0456 EVAP CONTROL SYSTEM

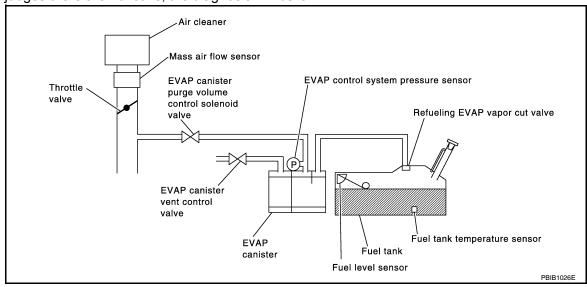
# On Board Diagnosis Logic

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 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 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.	<ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister purge volume control solenoid valve and the circuit</li> <li>Fuel tank temperature sensor</li> <li>O-ring of EVAP canister vent control valve is missing or damaged</li> <li>EVAP canister is saturated with water</li> <li>EVAP control system pressure sensor</li> <li>Refueling EVAP vapor cut valve</li> <li>ORVR system leaks</li> <li>Fuel level sensor and the circuit</li> <li>Foreign matter caught in EVAP canister purge volume control solenoid valve</li> </ul>

#### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

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#### **DTC Confirmation Procedure**

INFOID:0000000004537346

#### NOTE

- If DTC P0456 is displayed with P0442, first perform trouble diagnosis for DTC P0456.
- · After repair, make sure that the hoses and clips are installed properly.
- 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:**

- Open engine hood before conducting 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.
- Refilled or drained the fuel.
- EVAP component parts is/are removed.
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

#### WITH CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Make sure the following conditions are met.

**FUEL LEVEL SE: 0.25 - 1.4V** 

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 refilling/draining fuel until the output voltage condition 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" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

6. Make sure that "OK" is displayed.

If "NG" is displayed, refer to EC-855, "Diagnosis Procedure".

#### NOTE:

- If the engine speed cannot be maintained within the range displayed on CONSULT-III screen, go to EC-566, "Basic Inspection".
- Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

#### Overall Function Check

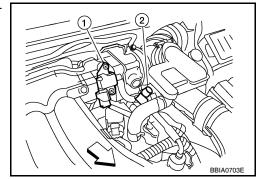
INFOID:0000000004537347

#### 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.
- Do not start engine.
- Do not exceeded 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi).
- 1. Attach the EVAP service port adapter securely to the EVAP service port (2).
- EVAP canister purge volume control solenoid valve (1)
- Vehicle front



#### **DTC P0456 EVAP CONTROL SYSTEM**

#### < SERVICE INFOMATION >

[MR TYPE 1]

- 2. Set the pressure pump and a hose.
- 3. Also set the pressure pump with pressure gauge to the EVAP service port adapter.
- Turn ignition switch ON.
- 5. Connect GST and select Service \$08.
- 6. Using Service \$08 control the EVAP canister vent control valve (close).
- Apply pressure and make sure the following conditions are satisfied.

Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg) 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 (3 mmHg, 0.12 inHg).

If NG, go to EC-855, "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:0000000004537348

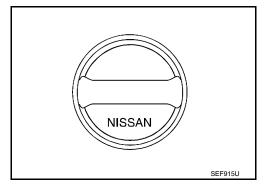
# 1. CHECK FUEL FILLER CAP DESIGN

- 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 reteaching 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-529, "Component Inspection".

#### OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

Adapter for EVAP service port

EVAP service port

Pressure pump

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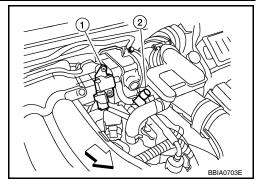
# 5.INSTALL THE PRESSURE PUMP

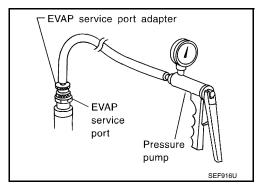
To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely. For the location of EVAP service port (2), refer to <u>EC-527</u>, "<u>Description</u>".

- EVAP canister purge volume control solenoid valve (1)
- : Vehicle front

#### NOTE:

Improper installation of the EVAP service port adapter 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.
- Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

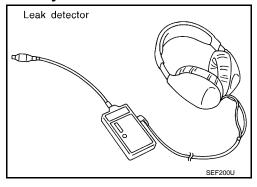
#### **CAUTION:**

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-527, "Description".

#### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



# 7.CHECK FOR EVAP LEAK

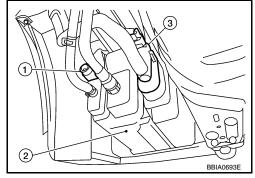
#### Without CONSULT-III

1. Turn ignition switch OFF.

Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)

EVAP control system pressure sensor (1)

EVAP canister (2)



3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter. **CAUTION:** 

· Never use compressed air or a high pressure pump.

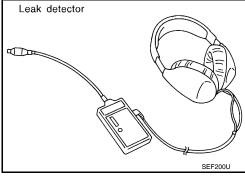
Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-527, "Description".

#### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



# 8.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

 EVAP canister vent control valve is installed properly. Refer to EC-531, "Removal and Installation".

· EVAP canister vent control valve. Refer to EC-821, "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 SATURATED WITH WATER

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

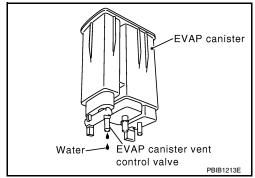
2. Does water drain from the EVAP canister?

#### Yes or No

Yes >> GO TO 10.

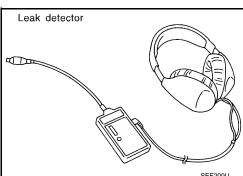
No (With CONSULT-III)>>GO TO 12.

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.



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#### < SERVICE INFOMATION >

#### The weight should be less than 1.9 kg (4.2 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 to EVAP canister purge volume control solenoid valve at EVAP service port.
- 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" opening to 100%.
- 5. Check vacuum hose for vacuum.

#### Vacuum should exist.

#### 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 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.

#### OK or NG

OK >> GO TO 16.

NG >> GO TO 14.

# 14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-594, "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-815, "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-755, "Component Inspection".

#### OK or NG

OK >> GO TO 17.

NG >> Replace fuel level sensor unit.

# **DTC P0456 EVAP CONTROL SYSTEM**

< SERVICE INFOMATION >	[MR TYPE 1]
17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR	
Refer to EC-838, "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	r connection
Refer to EC-527, "Description".	Connection.
OK or NG	
OK >> GO TO 19.  NG >> Repair or reconnect the hose.	
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, kink, looseness and nection. For location, refer to $\underline{\text{EC-}533}$ .	d improper con-
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, kink, cracks,	looseness and
improper connection.	
<u>OK or NG</u> OK >> GO TO 22.	
NG >> Repair or replace hose, tube or filler neck tube.	
22. CHECK REFUELING EVAP VAPOR CUT VALVE	
Refer to EC-535, "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 <u>FL-5</u> . <u>OK or NG</u>	
OK >> GO TO 24.	
NG >> Replace fuel level sensor unit.	
24.check intermittent incident	
Refer to EC-626.	
>> INCRECTION END	
>> INSPECTION END	

INFOID:0000000004537349

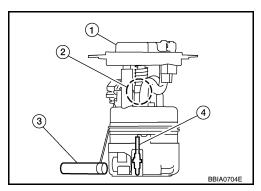
## DTC P0460 FUEL LEVEL SENSOR

## **Component Description**

The fuel level sensor (3) is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM 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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (4)



## On Board Diagnosis Logic

#### INFOID:0000000004537350

#### NOTE:

- If DTC P0460 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-633.
- If DTC P0460 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-635.
- When the vehicle is parked, naturally the fuel level in the fuel tank is 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 (CAN communication line is open or shorted) Harness or connectors (Fuel level sensor circuit is open or shorted) Combination meter Fuel level sensor

#### **DTC Confirmation Procedure**

INFOID:0000000004537351

#### 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.

- 1. Start engine and wait maximum of 2 consecutive minutes.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-860</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

INFOID:0000000004537352

# ${f 1}.$ CHECK FUEL GAUGE OPERATION

Refer to DI-10, "Self-Diagnosis Mode of Combination Meter".

#### OK or NG

OK >> GO TO 2.

NG >> Follow the instruction of DI-10, "Self-Diagnosis Mode of Combination Meter".

# 2.CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-16, "Fuel Level Sensor Signal Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning parts.

## **DTC P0460 FUEL LEVEL SENSOR**

DTC P0460 FUEL LEVEL SENSOR	
< SERVICE INFOMATION >	[MR TYPE 1]
3. CHECK INTERMITTENT INCIDENT	A
Refer to EC-626.	
>> INSPECTION END	EC
Removal and Installation	INFOID:000000004537353
FUEL LEVEL SENSOR	С
Refer to FL-5.	
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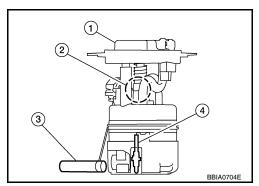
## DTC P0461 FUEL LEVEL SENSOR

## Component Description

The fuel level sensor (3) is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM 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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (4)



## On Board Diagnosis Logic

#### INFOID:0000000004537355

#### NOTE:

- If DTC P0461 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-633.
- If DTC P0461 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-635.
- This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven. Driving long distances naturally affect fuel gauge level.

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     (CAN communication line is open or shorted)     Harness or connectors     (Fuel level sensor circuit is open or shorted)     Combination meter     Fuel level sensor

#### **Overall Function Check**

INFOID:0000000004537356

Use this procedure to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

#### WARNING.

When performing following procedure, be sure to observe the handling of the fuel.

Refer to FL-4.

#### **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 (7-7/8 US gal, 6-5/8 lmp gal) in advance.

- 1. Prepare a fuel container and a spare hose.
- 2. Release fuel pressure from fuel line, refer to EC-574, "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 (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
- 10. Check "FUEL LEVEL SE" output voltage and note it.

# **DTC P0461 FUEL LEVEL SENSOR**

< SERVICE INFOMATION >	[MR TYPE 1]	
<ul> <li>11. Fill fuel into the fuel tank for 30 (7-7/8 US gal, 6-5/8 Imp gal).</li> <li>12. Check "FUEL LEVEL SE" output voltage and note it.</li> <li>13. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12. If NG, go to EC-863, "Diagnosis Procedure".</li> </ul>		Α
■ WITH GST		EC
NOTE: Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 (7-7/lmp gal) in advance.  1. Prepare a fuel container and a spare hose.  2. Release fuel pressure from fuel line, refer to EC-574, "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 (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 (7-7/8 US gal, 6-5/8 Imp gal).	- '	C D
9. Confirm that the fuel gauge indication varies.		
10. If NG, go to EC-863, "Diagnosis Procedure".  Diagnosis Procedure	INFOID:0000000004537357	F
	INFOID:0000000004537357	0
1.CHECK FUEL GAUGE OPERATION  Refer to DI-10, "Self-Diagnosis Mode of Combination Meter".		G
OK or NG		Н
OK >> GO TO 2.  NG >> Follow the instruction of DI-10, "Self-Diagnosis Mode of Combination Meter".		11
2.CHECK FUEL LEVEL SENSOR AND CIRCUIT		ı
Refer to DI-16, "Fuel Level Sensor Signal Inspection".		'
OK or NG		J
OK >> GO TO 3.  NG >> Repair or replace malfunctioning parts.		
3.CHECK INTERMITTENT INCIDENT		K
Refer to EC-626.		
>> INSPECTION END		L
Removal and Installation	INFOID:0000000004537358	
FUEL LEVEL SENSOR		M
Refer to FL-5.		
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INFOID:0000000004537359

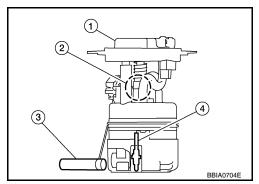
## DTC P0462, P0463 FUEL LEVEL SENSOR

## **Component Description**

The fuel level sensor (3) is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter. sends the fuel level sensor signal to the ECM 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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (4)



## On Board Diagnosis Logic

#### INFOID:0000000004537360

#### NOTE:

- If DTC P0462 or P0463 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001, Refer to EC-633.
- If DTC P0462 or P0463 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>EC-635</u>.

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     (CAN communication line is open or
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	shorted)  Harness or connectors (Fuel level sensor circuit is open or shorted)  Combination meter  Fuel level sensor

#### **DTC Confirmation Procedure**

INFOID:0000000004537361

#### 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:**

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

- 1. Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-864, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004537362

# 1. CHECK FUEL GAUGE OPERATION

Refer to DI-10, "Self-Diagnosis Mode of Combination Meter".

#### OK or NG

OK >> GO TO 2.

NG >> Follow the instruction of DI-10, "Self-Diagnosis Mode of Combination Meter".

# 2.CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-16, "Fuel Level Sensor Signal Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning parts.

# DTC P0462, P0463 FUEL LEVEL SENSOR

< SERVICE INFOMATION >	[MR TYPE 1]
3. CHECK INTERMITTENT INCIDENT	A
Refer to EC-626.	
>> INSPECTION END	EC
Removal and Installation	INFOID:000000004537363
FUEL LEVEL SENSOR Refer to <u>FL-5</u> .	С
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## DTC P0500 VSS

Description INFOID:000000004537364

#### NOTE:

- If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-633.
- If DTC P0500 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>EC-635</u>.

The vehicle speed signal is sent from "ABS actuator and electric unit (control unit)" or combination meter through CAN communication line.

## On Board Diagnosis Logic

INFOID:0000000004537365

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	Harness or connectors     (CAN communication line is open or shorted.)     Harness or connectors     (Vehicle speed signal circuit is open or shorted)     ABS actuator and electric unit (control unit)     Combination meter

#### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode.

Detected item	Engine operating condition in fail-safe mode
Vehicle speed sensor	When the fail-safe system for vehicle speed sensor is activated, the cooling fan operates (High) while engine is running.

## **DTC Confirmation Procedure**

INFOID:0000000004537366

#### **CAUTION:**

#### Always drive vehicle at a safe speed.

#### NOTÉ:

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:**

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

- Start engine.
- Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. The vehicle speed on CON-SULT-III should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

If NG, go to EC-867, "Diagnosis Procedure".

- If OK, go to following step.
- Select "DATA MONITOR" mode with CONSULT-III.
- Warm engine up to normal operating temperature.
- 5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	More than 1,600 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	5.5 - 31.8 msec
Shift lever	Suitable position
PW/ST SIGNAL	OFF

Check 1st trip DTC.

## **DTC P0500 VSS**

[MR TYPE 1] < SERVICE INFOMATION > 7. If 1st trip DTC is detected, go to EC-867, "Diagnosis Procedure". Α **Overall Function Check** INFOID:0000000004537367 Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip EC DTC might not be confirmed. WITH GST 1. Lift up drive wheels. C 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 D suitable gear position. 4. If NG, go to EC-867, "Diagnosis Procedure". Е Diagnosis Procedure INFOID:0000000004537368 1. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)" Refer to BRC-8. OK or NG OK >> GO TO 2. NG >> Repair or replace. 2.CHECK COMBINATION METER Н Refer to DI-3. >> INSPECTION END K L M Ν

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## DTC P0506 ISC SYSTEM

Description INFOID:000000004537369

#### 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 ECM calculates the actual engine speed from signals of crankshaft position sensor (POS) and camshaft position sensor (PHASE).

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:0000000004537370

DTC No.	No. Trouble diagnosis name DTC detecting condition		Possible cause	
P0506 0506	Idle speed control sys- tem RPM lower than ex- pected	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**

INFOID:0000000004537371

#### 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.
- If the target idle speed is out of the specified value, perform <u>EC-572</u>, "Idle Air Volume Learning", before conducting DTC Confirmation Procedure. For the target idle speed, refer to the <u>EC-1012</u>.

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.
- Always perform the test at a temperature above –10°C (14°F).
- Open engine hood.
- 2. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-868</u>, "<u>Diagnosis Procedure</u>".

## Diagnosis Procedure

INFOID:0000000004537372

# 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.

#### OK or NG

OK >> GO TO 2.

NG >> Discover air leak location and repair.

# 2.REPLACE ECM

- 1. Stop engine.
- Replace ECM.
- 3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249, "ECM Re-communicating Function".
- 4. Perform EC-572, "VIN Registration".
- 5. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-572. "Throttle Valve Closed Position Learning".

[MR TYPE 1]

7. Perform EC-572, "Idle Air Volume Learning".

## >> INSPECTION END

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## DTC P0507 ISC SYSTEM

Description INFOID.000000004537373

#### NOTE:

### If DTC P0507 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 ECM calculates the actual engine speed from signals of camshaft position sensor (POS) and camshaft position sensor (PHASE).

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:0000000004537374

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 leak     PCV system

## **DTC Confirmation Procedure**

INFOID:0000000004537375

### 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.
- If the target idle speed is out of the specified value, perform <u>EC-572</u>, "Idle Air Volume Learning", before conducting DTC Confirmation Procedure. For the target idle speed, refer to the <u>EC-1012</u>.
   TESTING CONDITION:
- Before performing the following procedure, confirm that battery voltage is more than 11V 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.
- Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-870, "Diagnosis Procedure"</u>.

## Diagnosis Procedure

INFOID:0000000004537376

# 1.check pcv hose connection

Confirm that PCV hose is connected correctly.

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

# 2.CHECK INTAKE AIR LEAK

- Start engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

#### OK or NG

OK >> GO TO 3.

NG >> Discover air leak location and repair.

## REPLACE ECM

1. Stop engine.

## **DTC P0507 ISC SYSTEM**

#### [MR TYPE 1] < SERVICE INFOMATION >

- Replace ECM.
- 3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249. "ECM Re-communicating Function".
  Perform EC-572. "VIN Registration".
  Perform EC-572. "Accelerator Pedal Released Position Learning".
  Perform EC-572. "Throttle Valve Closed Position Learning".
  Perform EC-572. "Idle Air Volume Learning".

### >> INSPECTION END

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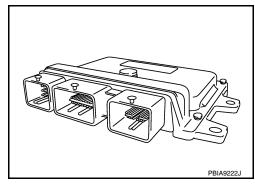
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## DTC P0605 ECM

## **Component Description**

INFOID:0000000004537377

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



## On Board Diagnosis Logic

INFOID:0000000004537378

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
D0005		A)	ECM calculation function is malfunctioning.	
P0605 0605	Engine control module	B)	ECM EEP-ROM system is malfunctioning.	• ECM
		C)	ECM self shut-off function is malfunctioning.	

### **FAIL-SAFE MODE**

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode		
Malfunction A	<ul> <li>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</li> <li>ECM deactivates ASCD operation.</li> </ul>		

## **DTC Confirmation Procedure**

INFOID:0000000004537379

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.

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

- 1. Turn ignition switch ON.
- 2. Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-873, "Diagnosis Procedure".

#### PROCEDURE FOR MALFUNCTION B

- 1. Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- Check 1st trip DTC.
- 4. If 1st trip DTC is detected, go to EC-873, "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 ON.
- 3. Repeat step 3 for 32 times.

## **DTC P0605 ECM**

# [MR TYPE 1] < SERVICE INFOMATION > Check 1st trip DTC. Α 5. If 1st trip DTC is detected, go to EC-873, "Diagnosis Procedure". Diagnosis Procedure INFOID:0000000004537380 EC 1.INSPECTION START Erase DTC. Perform DTC Confirmation Procedure. See EC-872, "DTC Confirmation Procedure". Is the 1st trip DTC P0605 displayed again? Yes or No D Yes >> GO TO 2. Nο >> INSPECTION END 2.REPLACE ECM Е 1. Replace ECM. 2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>". 3. Perform <u>EC-572</u>, "<u>VIN Registration</u>". F 4. Perform EC-572, "Accelerator Pedal Released Position Learning". 5. Perform EC-572, "Throttle Valve Closed Position Learning". 6. Perform EC-572, "Idle Air Volume Learning". >> INSPECTION END Н K L M Ν 0 Р

# DTC P0643 SENSOR POWER SUPPLY

## On Board Diagnosis Logic

< SERVICE INFOMATION >

INFOID:0000000004537381

[MR TYPE 1]

### 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 a voltage of power source for sensor is excessively low or high.	Harness or connectors (APP sensor 1 circuit is shorted.) (Throttle position sensor circuit is shorted.) [Camshaft position sensor (PHASE) circuit is shorted.] Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE)

### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

#### 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:0000000004537382

#### NOTE:

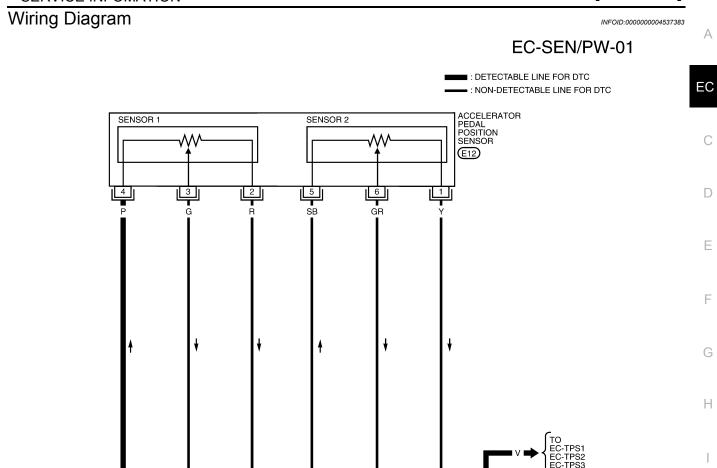
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

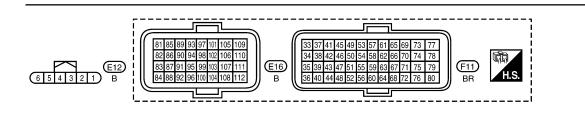
### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- Start engine and let it idle for 1 second.
- Check 1st trip DTC.
- If DTC is detected, go to EC-876, "Diagnosis Procedure".

[MR TYPE 1] < SERVICE INFOMATION >





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AVCC-APS1

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AVCC-PHASE

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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

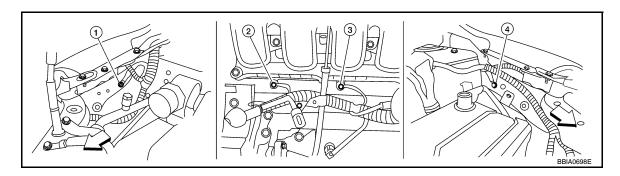
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
72	٧	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V	
78	О	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5V	
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V	
103		Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V	
103	GR		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V	
104	Y	Sensor ground (APP sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V	
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V	
110	110	Accelerator pedal position sensor 1	[Ignition switch: ON]	Engine stopped	0.6 - 0.9V
110 G	G		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V	
111	R	Sensor ground (APP sensor 1)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V	

# Diagnosis Procedure

INFOID:0000000004537384

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screws on the body. Refer to <u>EC-632</u>, "<u>Ground Inspection</u>".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

# OK or NG

4.

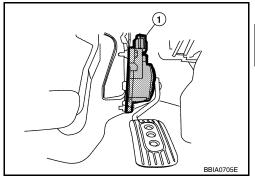
OK >> GO TO 2.

NG >> Repair or replace ground connections.

< SERVICE INFOMATION > [MR TYPE 1]

# $\overline{2}$ .check accelerator pedal position sensor 1 power supply circuit

- 1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
- 2. Turn ignition switch ON.

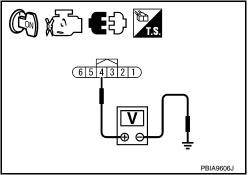


3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

**Voltage: Approximately 5V** 

## OK or NG

OK >> GO TO 8. NG >> GO TO 3.



3. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between APP sensor terminal 4 and ECM terminal 106. Refer to Wiring Diagram.

### Continuity should exist.

#### 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 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
72	Throttle position sensor terminal 1	EC-955, "Wiring Diagram"
78	Camshaft position sensor (PHASE) terminal 1	EC-782, "Wiring Diagram"
106	APP sensor terminal 4	EC-875, "Wiring Diagram"

### OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

# 5. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-785, "Component Inspection".

## OK or NG

OK >> GO TO 6.

NG >> Replace camshaft position sensor (PHASE).

## 6. CHECK THROTTLE POSITION SENSOR

Refer to EC-958, "Component Inspection".

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## **DTC P0643 SENSOR POWER SUPPLY**

[MR TYPE 1] < SERVICE INFOMATION >

### OK or NG

OK >> GO TO 8. NG >> GO TO 7.

# 7.replace electric throttle control actuator

- Replace the electric throttle control actuator.
- Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Idle Air Volume Learning</u>".

#### >> INSPECTION END

# 8. CHECK APP SENSOR

Refer to EC-965, "Component Inspection".

### OK or NG

OK >> GO TO 10. NG >> GO TO 9.

## 9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- Perform <u>EC-572</u>, "Accelerator Pedal Released Position Learning".
- Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Idle Air Volume Learning</u>".

### >> INSPECTION END

# 10. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

## >> INSPECTION END

[MR TYPE 1] < SERVICE INFOMATION >

## DTC P0850 PNP SWITCH

## Component Description

INFOID:0000000004537385

When the shift lever position is P or N (A/T, CVT), Neutral (M/T), park/neutral position (PNP) switch is ON. ECM detects the position because the continuity of the line (the ON signal) exists.

## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537386

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
P/N POSI SW	Ignition switch: ON	Shift lever: P or N (A/T, CVT), Neutral (M/T)	ON
		Shift lever: Except above	OFF

## On Board Diagnosis Logic

INFOID:0000000004537387

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850 0850	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	Harness or connectors     [Park/neutral position (PNP) switch circuit is open or shorted.]     Park/neutral position (PNP) switch     TCM (CVT models)

## **DTC Confirmation Procedure**

INFOID:0000000004537388

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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.

### WITH CONSULT-III

- Turn ignition switch ON.
- Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. Then check the "P/N POSI SW" signal under the following conditions.

Position (Shift lever)	Known-good signal
N or P position (A/T, CVT) Neutral position (M/T)	ON
Except above	OFF

If NG, go to EC-882, "Diagnosis Procedure".

If OK, go to following step.

- Select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to normal operating temperature.
- Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	More than 1,100 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.5 - 31.8 msec
VHCL SPEED SE	More than 64km/h (29 MPH)
Shift lever	Suitable position

- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-882, "Diagnosis Procedure".

**EC-879** 

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## **Overall Function Check**

INFOID:0000000004537389

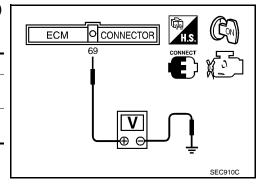
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

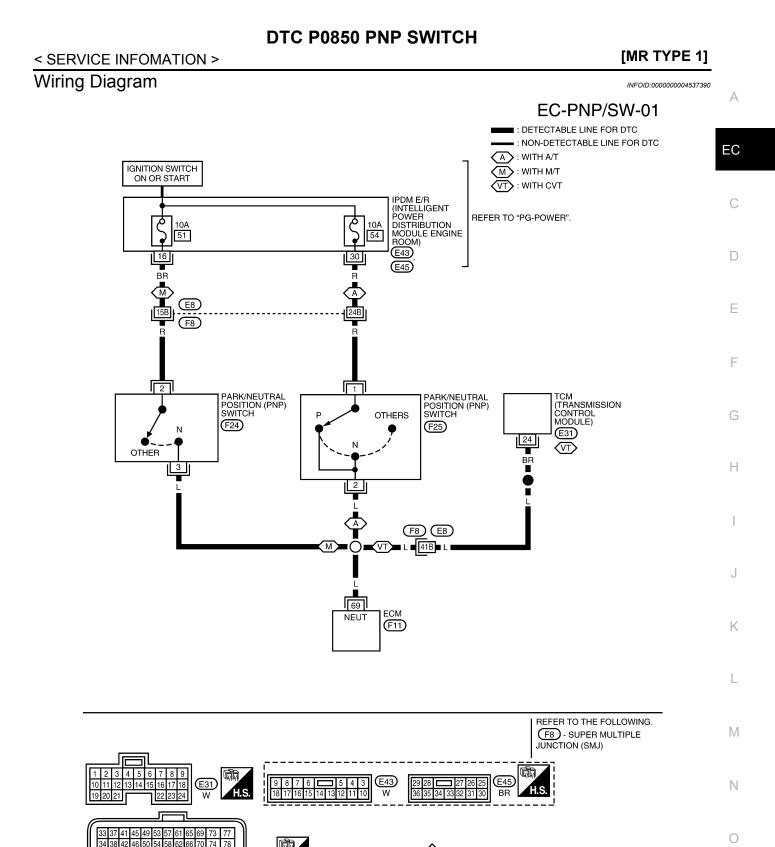
## WITH GST

- 1. Turn ignition switch ON.
- 2. Check voltage between ECM terminal 69 (PNP switch signal) and ground under the following conditions.

Condition (Shift lever)	Voltage V (Known-good data)	
P or N position (A/T, CVT) Neutral position (M/T)	Approx. 0	
Except above	BATTERY VOLTAGE (11 - 14V)	







Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

BBWA3002E

#### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
69	L	Park/neutral position (PNP) switch	<ul><li>[Ignition switch: ON]</li><li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li></ul>	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch: ON] • Except above	Approximately 0V

## Diagnosis Procedure

INFOID:0000000004537391

### A/T MODELS

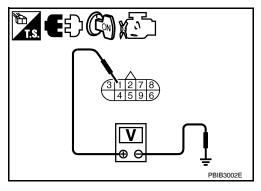
# 1. CHECK PNP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect PNP switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check voltage between PNP switch 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 E8, F8
- Harness for open or short between PNP switch and fuse
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 3.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between PNP switch terminal 2 and ECM terminal 69. 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 PNP SWITCH

### Refer to AT-95, "Component Inspection".

#### OK or NG

OK >> GO TO 5.

NG >> Replace PNP switch.

# 5. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

## M/T MODELS

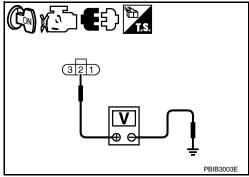
# 1. CHECK PNP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect PNP switch harness connector.
- Turn ignition switch ON.
- 4. Check voltage between PNP switch terminal 2 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 E8, F8
- · Harness for open or short between PNP switch and fuse

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

# 3.check pnp switch input signal circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between PNP switch terminal 3 and ECM terminal 69. 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 PNP SWITCH

Refer to MT-54.

#### OK or NG

OK >> GO TO 5.

NG >> Replace PNP switch.

## 5. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### >> INSPECTION END

## **CVT MODELS**

## 1. CHECK DTC WITH TCM

Refer to CVT-209, "OBD-II Diagnostic Trouble Code (DTC)".

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

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# $\overline{2}$ .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 <u>SC-9</u>.

# $3. \mathsf{CHECK}$ PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM and TCM harness connectors.
- 3. Check harness continuity between TCM terminal 24 and ECM terminal 69. 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 >> GO TO 4.

# 4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F8, E8
- · Harness for open or short between TCM and ECM.
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### >> INSPECTION END

## **DTC P1148 CLOSED LOOP CONTROL**

< SERVICE INFOMATION >

[MR TYPE 1]

# DTC P1148 CLOSED LOOP CONTROL

# On Board Diagnosis Logic

INFOID:0000000004537392

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148	Closed loop control function	The closed loop control function does not operate even when vehicle is driving in the specified condition.	<ul> <li>Harness or connectors [Air fuel ratio (A/F) sensor 1 circuit is open or shorted.]</li> <li>Air fuel ratio (A/F) sensor 1</li> <li>Air fuel ratio (A/F) sensor 1 heater</li> </ul>

#### NOTE:

DTC P1148 is displayed with another DTC for air fuel ratio (A/F) sensor 1. Perform the trouble diagnosis for the corresponding DTC.

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# DTC P1217 ENGINE OVER TEMPERATURE

## System Description

#### INFOID:0000000004537393

#### SYSTEM DESCRIPTION

#### NOTE:

- If DTC P1217 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to <u>EC-633</u>.
- If DTC P1217 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>EC-635</u>.

Cooling Fan Control

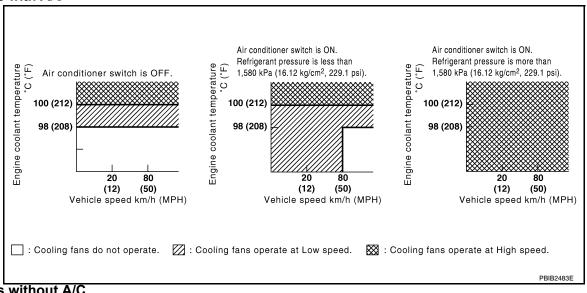
Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1			
Battery	Battery voltage*1			
ABS actuator and electric unit (control unit)	Vahiala anaad*2	Cooling fan control	IPDM E/R (Cooling fan relays)	
Combination meter	Vehicle speed*2			
Engine coolant temperature sensor	Engine coolant temperature			
Air conditioner switch	Air conditioner ON signal*2			
Refrigerant pressure sensor	Refrigerant pressure			

<sup>\*1:</sup> The ECM determines the start signal status by the signals of engine speed and battery voltage.

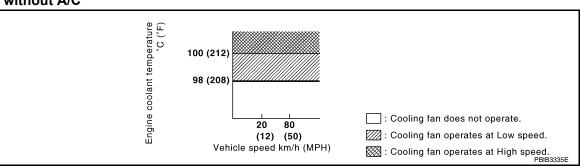
The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

#### Cooling Fan Operation

### Models with A/C



### Models without A/C



<sup>\*2:</sup> This signal is sent to ECM through CAN communication line.

## DTC P1217 ENGINE OVER TEMPERATURE

Cooling Fan Relay Operation

< SERVICE INFOMATION >

The ECM controls cooling fan relays in the IPDM E/R through CAN communication line.

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

## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537394

[MR TYPE 1]

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
	Engine: After warming up, idle	Air conditioner switch: OFF	OFF
AIR COND SIG	the engine	Air conditioner switch: ON (Compressor operates.)	ON
	<ul> <li>Engine: After warming up, idle the engine</li> <li>Air conditioner switch: OFF</li> </ul>	Engine coolant temperature: 97°C (207°F) or less	OFF
COOLING FAN		Engine coolant temperature: Between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature: 100°C (212°F) or more	HIGH

## On Board Diagnosis Logic

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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

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)	<ul> <li>Cooling fan does not operate properly (Overheat).</li> <li>Cooling fan system does not operate properly (Overheat).</li> <li>Engine coolant was not added to the system using the proper filling method.</li> <li>Engine coolant is not within the specified range.</li> </ul>	Harness or connectors (Cooling fan circuit is open or shorted.) Cooling fan IPDM E/R (Cooling fan relays) Radiator hose Radiator Reservoir tank Radiator cap Water pump Thermostat Water control valve For more information, refer to EC-893, "Main 13 Causes of Overheating".	K L M

#### **CAUTION:**

When a malfunction is indicated, be sure to replace the coolant. Refer to CO-35, "Changing Engine Coolant". Also, replace the engine oil. Refer to LU-17, "Changing Engine Oil".

- Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-15, "Anti-freeze Coolant Mixture Ratio".
- 2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

### Overall Function Check

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Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

#### **WARNING:**

**EC-887** 

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#### < SERVICE INFOMATION >

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the reservoir tank or the radiator.

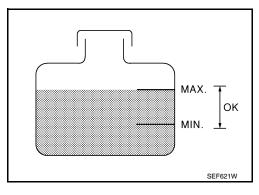
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

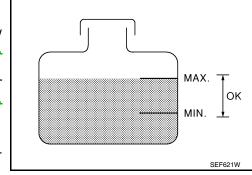
#### WITH CONSULT-III

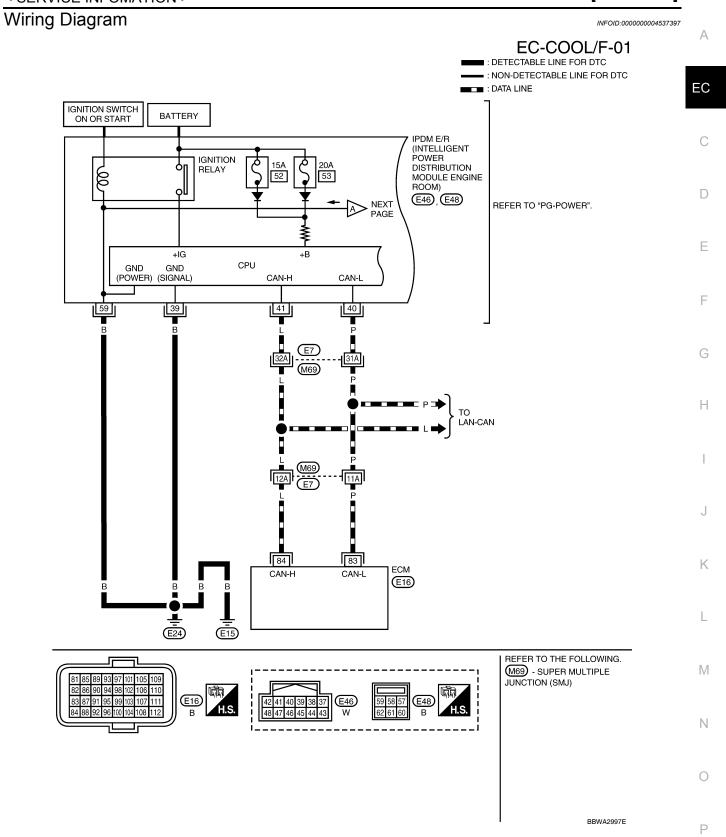
- Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to <u>EC-890</u>. "Diagnosis Procedure"
- 2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to <a href="EC-890">EC-890</a>, "Diagnosis Procedure".
- 3. Turn ignition switch ON.
- Perform "COOLING FAN" in "ACTIVE TEST" mode with CON-SULT-III.
- 5. If the results are NG, go to EC-890, "Diagnosis Procedure" or EC-890, "Diagnosis Procedure".

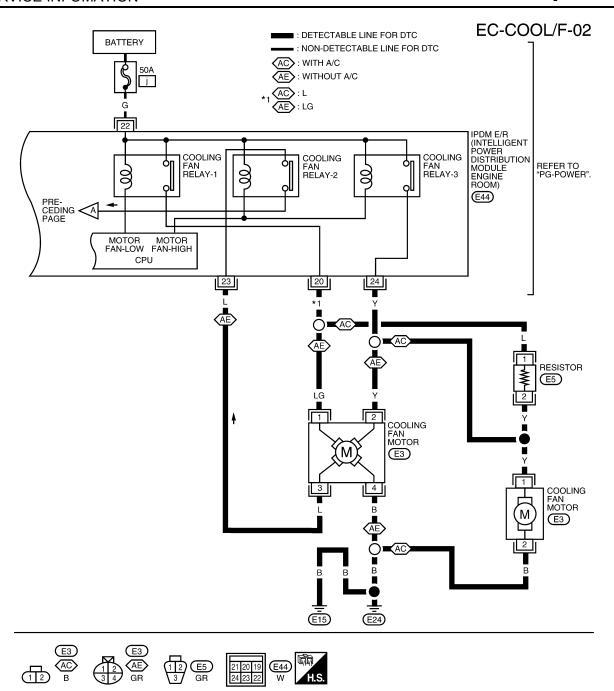


- Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to <a href="EC-890">EC-890</a>, <a href=""">"Diagnosis Procedure"</a>.
- 2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to <a href="EC-890">EC-890</a>, <a href=""">"Diagnosis Procedure"</a>.
- 3. Perform IPDM/ER auto active test and check cooling fan motor operation. Refer to <a href="PG-19">PG-19</a>, "Auto Active Test".
- If NG, go to <u>EC-890</u>. "<u>Diagnosis Procedure</u>".









Diagnosis Procedure

1.INSPECTION START

Do you have CONSULT-III?

Yes or No

Yes >> GO TO 2. No >> GO TO 3. BBWA3001E

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## **DTC P1217 ENGINE OVER TEMPERATURE**

[MR TYPE 1] < SERVICE INFOMATION > 2.check cooling fan operation With CONSULT-III 1. Turn ignition switch ON. 2. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-III. EC Make sure that cooling fan operates at each speed. OK or NG OK >> GO TO 4. NG >> GO TO 8. 3.CHECK COOLING FAN OPERATION D Without CONSULT-III Perform IPDM E/R auto active test and check cooling fan operation. Refer to PG-19, "Auto Active Test". Е Make sure that cooling fan operates at each speed. OK or NG OK >> GO TO 4. F NG >> GO TO 8. 4. CHECK COOLING SYSTEM FOR LEAK Refer to CO-35, "Inspection". OK or NG OK >> GO TO 5. NG >> Check the following for leak. Refer to CO-35, "Inspection". Н Hose Radiator Water pump CHECK RADIATOR CAP Refer to CO-40, "Checking Radiator Cap". OK or NG OK >> GO TO 6. NG >> Replace radiator cap. K O.CHECK COMPONENT PARTS Check the following. Thermostat. (Refer to <u>CO-45</u>.) • Water control valve. (Refer to CO-47.) Engine coolant temperature sensor. (Refer to <u>EC-678</u>.) OK or NG OK >> GO TO 7. NG >> Replace malfunctioning component. 7. CHECK MAIN 13 CAUSES Ν If the cause cannot be isolated, go to EC-893, "Main 13 Causes of Overheating". >> INSPECTION END 0 8.CHECK IPDM E/R POWER SUPPLY CIRCUIT Turn ignition switch OFF. Р Disconnect IPDM E/R harness connector E44.

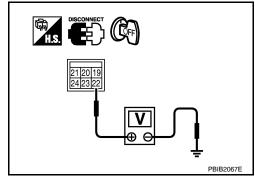
Check voltage between IPDM E/R terminal 22 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

### OK or NG

OK >> GO TO 10. NG >> GO TO 9.

< SERVICE INFOMATION >



[MR TYPE 1]

# 9. DETECT MALFUNCTIONING PART

Check the following.

- 50A fusible link
- Harness for open or short between IPDM E/R and battery

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

# 10.CHECK IPDM E/R GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connectors E46 and E48.
- Check harness continuity between IPDM E/R terminals 59, 39 and ground. Refer to Wiring Diagram.

### Continuity should exist.

Also check harness for short to power.

#### OK or NG

OK (Models with A/C)>>GO TO 11.

OK (Models without A/C)>>GO TO 13.

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

# 11. CHECK COOLING FAN MOTOR CIRCUIT

- Disconnect cooling fan motor harness connector.
- Check harness continuity between the followings;

Cooling fan motor terminal 1 and IPDM E/R terminals 20, 24.

Cooling fan motor terminal 2 and ground.

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 15.

NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

## Check the following.

- · Harness for open or short between cooling fan motor and IPDM E/R
- · Harness for open or short between cooling fan motor and ground
- Resistor E5

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

# 13. CHECK COOLING FAN MOTOR CIRCUIT

- Disconnect cooling fan motor harness connector.
- Check harness continuity between the followings; Cooling fan motor terminal 1 and IPDM E/R terminal 20.

**EC-892** 

## DTC P1217 ENGINE OVER TEMPERATURE

# < SERVICE INFOMATION >

Cooling fan motor terminal 2 and IPDM E/R terminal 24. Cooling fan motor terminal 3 and IPDM E/R terminal 23.

Cooling fan motor terminal 4 and ground.

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 15.

NG >> GO TO 14.

# 14. DETECT MALFUNCTIONING PART

## Check the following.

- Harness for open or short between cooling fan motor and IPDM E/R
- Harness for open or short between cooling fan motor and ground

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

# 15. CHECK COOLING FAN MOTOR

Refer to EC-894, "Component Inspection".

#### OK or NG

OK >> GO TO 16.

NG >> Replace cooling fan motor.

# 16. CHECK INTERMITTENT INCIDENT

Perform EC-626.

## 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 connector.

## Main 13 Causes of Overheating

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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	See MA-15, "Anti-freeze C	oolant Mixture Ratio".
	3	Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See CO-35, "Inspection".
	4	Radiator cap	Pressure tester	See CO-40, "Checking Rad	diator Cap".
ON* <sup>2</sup>	5	Coolant leaks	Visual	No leaks	See CO-35, "Inspection".
ON* <sup>2</sup>	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	See <u>CO-45</u> , and <u>CO-47</u>
ON* <sup>1</sup>	7	Cooling fan	CONSULT-III	Operating	See trouble diagnosis for DTC P1217 (EC-890, "Diagnosis Procedure").
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON* <sup>3</sup>	9	Coolant temperature gauge	Visual	Gauge less than 3/4 when driving	_
		Coolant overflow to reservoir tank	Visual	No overflow during driving and idling	See CO-35, "Changing Engine Coolant".

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**EC-893** 

## **DTC P1217 ENGINE OVER TEMPERATURE**

## < SERVICE INFOMATION >

[MR TYPE 1]

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF* <sup>4</sup>	10	Coolant return from reservoir tank to radiator	Visual	Should be initial level in reservoir tank	See CO-35, "Inspection".
OFF	11	Water control valve	Remove and inspect the valve	Within the specified value	See CO-47, "Removal and Installation"
OFF	12	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See <u>EM-185</u> .
	13	Cylinder block and pistons	Visual	No scuffing on cylinder walls or piston	See <u>EM-199</u> .

<sup>\*1:</sup> Turn the ignition switch ON.

For more information, refer to CO-32.

## Component Inspection

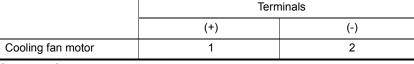
INFOID:0000000004537400

## **COOLING FAN MOTOR**

#### Model with A/C

- 1. Disconnect cooling fan motor harness connectors.
- Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(-)
Cooling fan motor	1	2



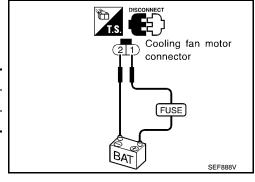
## Cooling fan motor should operate.

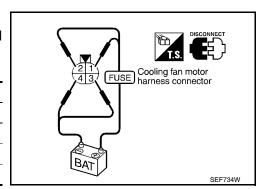
If NG, replace cooling fan motor.

#### Models without A/C

- Disconnect cooling fan motor harness connectors.
- Supply cooling fan motor terminals with battery voltage and check operation.

	Speed -	terminals	
		(+)	(-)
	Low	1	4
Cooling fan motor	LOW	2	3
	High	1 and 2	3 and 4





## Cooling fan motor should operate.

If NG, replace cooling fan motor.

<sup>\*2:</sup> Engine running at 3,000 rpm for 10 minutes.

<sup>\*3:</sup> Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

<sup>\*4:</sup> After 60 minutes of cool down time.

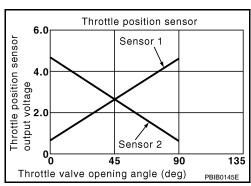
INFOID:0000000004537401

## DTC P1225 TP SENSOR

## Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



# On Board Diagnosis Logic

The MIL will not light up 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**

#### 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:**

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

- Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-895</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

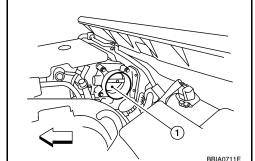
# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.
- Vehicle front

#### 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.
- Perform <u>EC-572</u>, "Throttle Valve Closed Position Learning".
- 3. Perform EC-572, "Idle Air Volume Learning".

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## **DTC P1225 TP SENSOR**

< SERVICE INFOMATION > [MR TYPE 1]

## >> INSPECTION END

Removal and Installation

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ELECTRIC THROTTLE CONTROL ACTUATOR Refer to <u>EM-141</u>.

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INFOID:0000000004537408

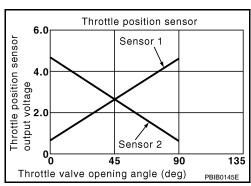
INFOID:0000000004537409

## DTC P1226 TP SENSOR

## Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



## On Board Diagnosis Logic

The MIL will not light up 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**

#### 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:**

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

- Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Repeat steps 3 and 4 for 32 times.
- 5. Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-897, "Diagnosis Procedure".

# Diagnosis Procedure

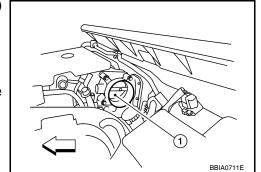
# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- Remove the intake air duct. 2.
- Check if foreign matter is caught between the throttle valve (1) and the housing.
- : Vehicle front

## 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

- Replace the electric throttle control actuator.
- Perform EC-572, "Throttle Valve Closed Position Learning".

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## **DTC P1226 TP SENSOR**

< SERVICE INFOMATION > [MR TYPE 1]

3. Perform EC-572, "Idle Air Volume Learning".

## >> INSPECTION END

Removal and Installation

INFOID:0000000004537410

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to <u>EM-141</u>.

**IMR TYPE 11** < SERVICE INFOMATION >

## DTC P1421 COLD START CONTROL

Description INFOID:0000000004537411

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

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	Lack of intake air volume     Fuel injection system

prewarming up condition.

## DTC Confirmation Procedure

#### 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.
- If DTC P1421 is displayed with other DTC, first perform the trouble diagnosis for other DTC. **TESTING CONDITION:**

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

#### WITH CONSULT-III

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON. 2.
- Select "DATA MONITOR" mode with CONSULT-III. 3.
- Check that the "COOLAN TEMP/S" indication is between 4°C (39°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.
- Start engine and let it idle for 5 minutes.
- Check 1st trip DTC.
- 7. If 1st trip DTC is detected, go to EC-899, "Diagnosis Procedure".

## Diagnosis Procedure

## 1.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-572, "Idle Air Volume Learning".

#### Is Idle Air Volume Learning carried out successfully?

#### Yes or No

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

## OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning part

## 3.CHECK FUEL INJECTION SYSTEM FUNCTION

Perform EC-740, "DTC Confirmation Procedure" for DTC P0171.

#### OK or NG

OK >> GO TO 4. EC

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## DTC P1421 COLD START CONTROL

#### [MR TYPE 1] < SERVICE INFOMATION >

>> Go to EC-743, "Diagnosis Procedure" for DTC P0171.

# 4. PERFORM DTC CONFIRMATION PROCEDURE

1. Erase DTC.

Perform DTC Confirmation Procedure.

See EC-899, "DTC Confirmation Procedure".

Is the 1st trip DTC P1421 displayed again?

### Yes or No

Yes >> GO TO 5.

No >> INSPECTION END

# 5.REPLACE ECM

- Replace ECM.
- Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>".

  3. Perform <u>EC-572</u>, "<u>VIN Registration</u>".
- Perform <u>EC-572</u>, "<u>Accelerator Pedal Released Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
- 6. Perform EC-572, "Idle Air Volume Learning".

#### >> INSPECTION END

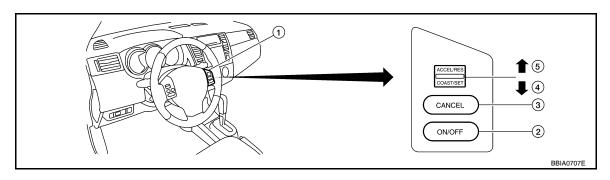
CANCEL switch

# < SERVICE INFOMATION >

# DTC P1564 ASCD STEERING SWITCH

# **Component Description**

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



- 1. ASCD steering switch
- MAIN switch
- SET/COAST switch
- RESUME/ACCELERATE switch

Refer to EC-524 for the ASCD function.

# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM		CONDITION	
AAA IAI OVA	- Ignition quitable ON	MAIN switch: Pressed	ON
MAIN SW	Ignition switch: ON	MAIN switch: Released	OFF
CANCEL CW	- Ignition quitable ON	CANCEL switch: Pressed	ON
CANCEL SW	Ignition switch: ON	CANCEL switch: Released	OFF
	- Ignition quitable ON	RESUME/ACCELERATE switch: Pressed	ON
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Released	OFF
OFT OW	- Ignition quitable ON	SET/COAST switch: Pressed	ON
SET SW	Ignition switch: ON	SET/COAST switch: Released	OFF

# On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

The MIL will not light up for this diagnosis.

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-872.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ASCD steering switch	<ul> <li>An excessively high voltage signal from the ASCD steering switch is sent to ECM.</li> <li>ECM detects that input signal from the ASCD steering switch is out of the specified range.</li> <li>ECM detects that the ASCD steering switch is stuck ON.</li> </ul>	Harness or connectors     (ASCD switch circuit is open or shorted.)     ASCD steering switch     ECM

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**EC-901** 

# **DTC P1564 ASCD STEERING SWITCH**

# < SERVICE INFOMATION >

[MR TYPE 1]

# **DTC Confirmation Procedure**

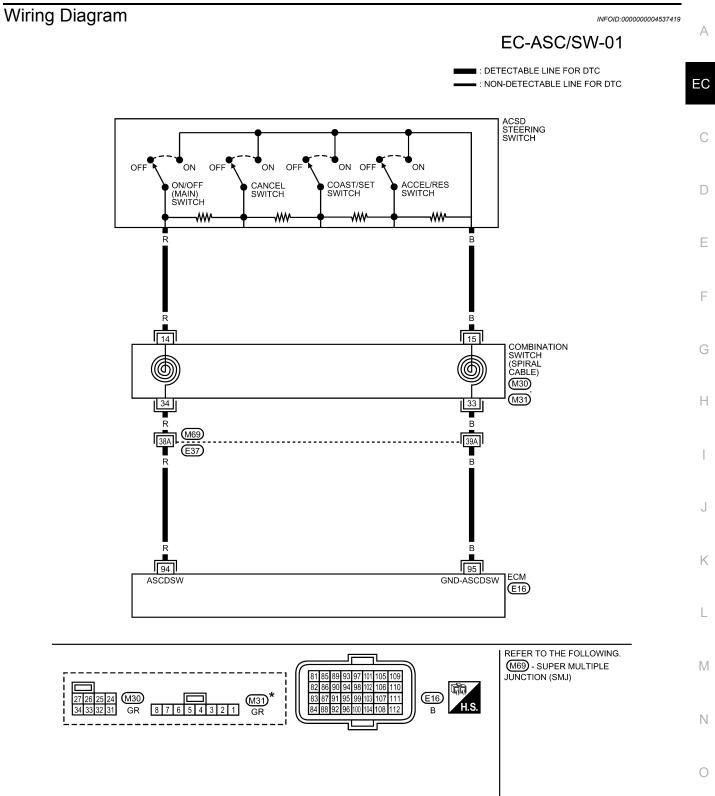
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#### NOTE

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

- 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.
- 7. If DTC is detected, go to EC-904, "Diagnosis Procedure".

[MR TYPE 1] < SERVICE INFOMATION >



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

\*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

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.

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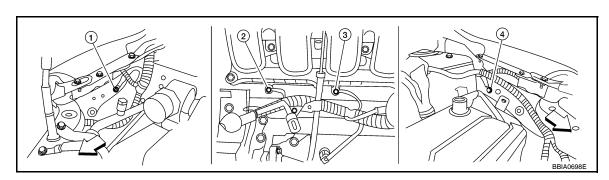
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
			[Ignition switch: ON]  • ASCD steering switch: OFF	Approximately 4V
		R ASCD steering switch	[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0V
94	R		[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1V
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 2V
95	В	Sensor ground	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

# Diagnosis Procedure

INFOID:0000000004537420

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

# 4. Body ground E15

# 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", "RESUME/ACC SW", "SET SW and "CANCEL 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
MAIN SWILCH	IVIAIN SVV	Released	OFF
CANCEL switch	CANCEL SW	Pressed	ON
CANCEL SWITCH		Released	OFF

# **DTC P1564 ASCD STEERING SWITCH**

< SERVICE INFOMATION >

[MR TYPE 1]

Switch	Monitor item	Condition	Indication
RESUME/AC-	DE01114E/4.00.014/	Pressed	ON
CELERATE switch	RESUME/ACC SW	Released	OFF
SET/COAST	SET SW	Pressed	ON
switch	SET SW	Released	OFF

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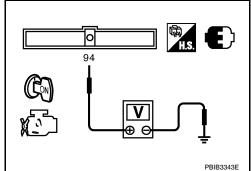
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#### Without CONSULT-III

- 1. Turn ignition switch ON.
- Check voltage between ECM terminal 94 and ground with pressing each button.

Switch	Condition	Voltage [V]
MAIN switch	Pressed	Approx. 0
WAIN SWILCH	Released	Approx. 4.0
CANCEL switch	Pressed	Approx. 1.0
CANCEL SWITCH	Released	Approx. 4.0
RESUME/ACCELER-	Pressed	Approx. 3.0
ATE switch	Released	Approx. 4.0
SET/COAST switch	Pressed	Approx. 2.0
SET/COAST SWILLI	Released	Approx. 4.0



### OK or NG

OK >> GO TO 8. NG >> GO TO 3.

# ${f 3.}$ CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect combination switch harness connector M31.
- Disconnect ECM harness connector.
- Check harness continuity between combination switch terminal 15 and ECM terminal 95. Refer to Wiring Diagram.

### Continuity should exist.

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

### OK or NG

OK >> GO TO 5. NG >> GO TO 4.

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# 4. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors M69, E7
- 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.

# $5.\mathsf{check}$ ascd steering switch input signal circuit for open and short

Check harness continuity between ECM terminal 94 and combination switch terminal 14. Refer to Wiring Diagram.

### Continuity should exist.

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

### OK or NG

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# **DTC P1564 ASCD STEERING SWITCH**

< SERVICE INFOMATION > [MR TYPE 1]

OK >> GO TO 7. NG >> GO TO 6.

# 6.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- · 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-906, "Component Inspection".

### OK or NG

OK >> GO TO 8.

NG >> Replace ASCD steering switch.

# 8. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### >> INSPECTION END

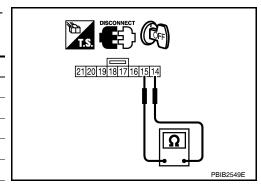
# Component Inspection

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### ASCD STEERING SWITCH

- 1. Disconnect combination switch (spiral cable) harness connector M31.
- Check continuity between combination switch (spiral cable) terminals 14 and 15 with pushing each switch.

Switch	Condition	Resistance [ $\Omega$ ]
MAIN switch	Pressed	Approx. 0
WAIN SWILCH	Released	Approx. 4,000
CANCEL switch	Pressed	Approx. 250
CANCLE SWILLI	Released	Approx. 4,000
RESUME/ACCELERATE	Pressed	Approx. 1,480
switch	Released	Approx. 4,000
SET/COAST switch	Pressed	Approx. 660
OL 1700A01 SWIICH	Released	Approx. 4,000



If NG, replace ASCD steering switch.

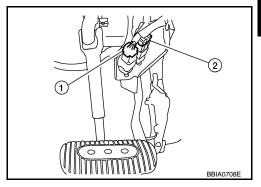
[MR TYPE 1]

INFOID:0000000004537422

# DTC P1572 ASCD BRAKE SWITCH

# Component Description

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 this input of two kinds (ON/OFF signal). Refer to EC-524 for the ASCD function.



# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537423

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
DDAKE OWA		Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	
BRAKE SW1 (ASCD brake switch)	Ignition switch: ON	Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	OFF
BRAKE SW2	Ignition switch: ON	Brake pedal: Fully released	OFF
(Stop lamp switch)	- ignition switch. On	Brake pedal: Slightly depressed	ON

# On Board Diagnosis Logic

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This self-diagnosis has the one trip detection logic. The MIL will not light up for this diagnosis.

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-872</u>.
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble Diagnosis Name		DTC Detecting Condition	Possible Cause	
		A)	When the vehicle speed is above 30km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	Harness or connectors     (Stop lamp switch circuit is shorted.)     Harness or connectors     (ASCD brake switch circuit is shorted.)     Harness or connectors	N O
P1572 1572	ASCD brake switch	В)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving	(ASCD clutch switch circuit is shorted.) (M/T) • Stop lamp switch • ASCD brake switch • ASCD clutch switch (M/T) • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • Incorrect ASCD clutch switch installation (M/T) • ECM	Ρ

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# < SERVICE INFOMATION >

# **DTC Confirmation Procedure**

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#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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 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.

### **TESTING CONDITION:**

Steps 4 and 5 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

# **■ WITH CONSULT-III**

- 1. Start engine.
- 2. Select "DATA MONITOR" mode with CONSULT-III.
- 3. Press MAIN switch and make sure that CRUISE indicator lights up.
- 4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Shift lever	Suitable position

### 5. Check 1st trip DTC.

If 1st trip DTC is detected, go to <u>EC-910</u>, "<u>Diagnosis Procedure</u>". 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 condition.

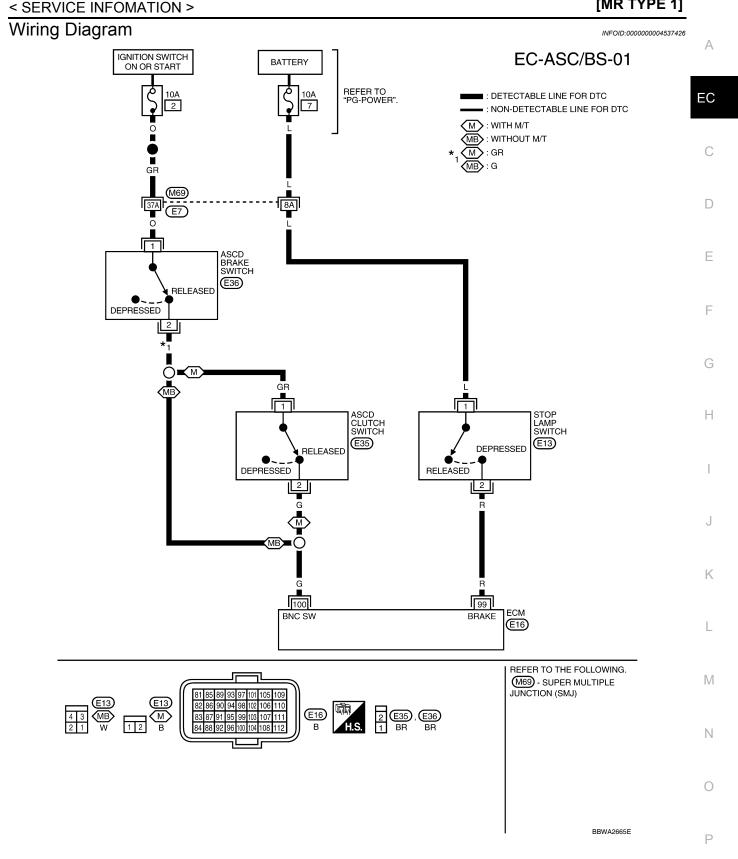
VHCL SPEED SE	More than 30 km/h (19 MPH)
Shift lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

- 7. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-910, "Diagnosis Procedure"</u>.

# WITH GST

Follow the procedure "WITH CONSULT-III" above.

[MR TYPE 1]



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

# < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
99	OO D Oten laws with		[Ignition switch: ON] • Brake pedal: Fully released	Approximately 0V
99 R	Stop lamp switch	[Ignition switch: ON] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)	
100 G	ASCD brake switch	Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	Approximately 0V	
	O	ASCD brake switch	Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

INFOID:0000000004537427

# 1. CHECK OVERALL FUNCTION-I

### With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.
   M/T models

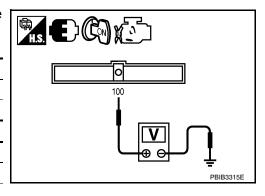
CONDITION	INDICATION		
Clutch pedal and/or brake pedal: Slightly depressed OFF			
Clutch pedal and brake pedal: Fully released ON			
A/T and CVT models			
CONDITION	INDICATION		
Brake pedal: Slightly depressed	OFF		
Brake pedal: Fully released	ON		

### Without CONSULT-III

- 1. Turn ignition switch ON.
- Check voltage between ECM terminal 100 and ground under the following conditions.

### M/T models

CONDITION	VOLTAGE		
Clutch pedal and/or brake pedal: Slightly depressed	Approximately 0V		
Clutch pedal and brake pedal: Fully released Battery voltage			
A/T and CVT models			
CONDITION	VOLTAGE		
Brake pedal: Slightly depressed	Approximately 0V		
Brake pedal: Fully released	Battery voltage		



### OK or NG

OK >> GO TO 2.

NG (M/T models) >>GO TO 3.

NG (A/T and CVT models) >>GO TO 4.

# 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

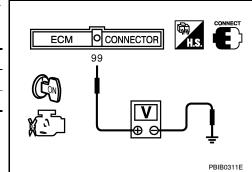
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### Without CONSULT-III

Check voltage between ECM terminal 99 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0V
Brake pedal: Slightly depressed	Battery voltage

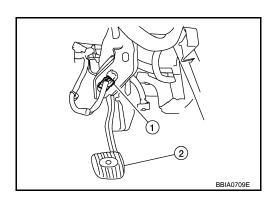


# OK or NG

OK >> GO TO 15. NG >> GO TO 11.

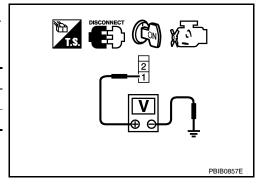
# 3.check ascd clutch switch power supply circuit

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch (1) harness connector.
- Clutch pedal (2)
- 3. Turn ignition switch ON.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-III or tester.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approx. 0V



# OK or NG

OK >> GO TO 9. NG >> GO TO 4.

# 4. CHECK ASCD BRAKE SWITCH POWER SUPPLY

1. Turn ignition switch OFF.

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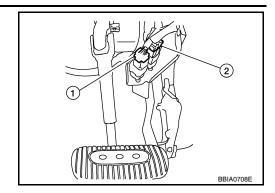
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### [MR TYPE 1]

### < SERVICE INFOMATION >

- Disconnect ASCD brake switch (2) harness connector.
- Stop lamp switch (1)
- 3. Turn ignition switch ON.



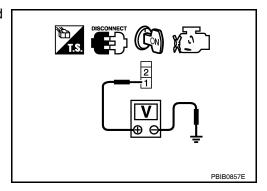
4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK (M/T models) >>GO TO 6.
OK (A/T and CVT models) >>GO TO 7.

NG >> GO TO 5.



# 5. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- 10A 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.

# 6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch 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 8.

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

# 7.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 100 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 8.

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

# 8.CHECK ASCD BRAKE SWITCH

Refer to EC-914, "Component Inspection".

# DTC P1572 ASCD BRAKE SWITCH

# < SERVICE INFOMATION > [MR TYPE 1]

### OK or NG

OK >> GO TO 15.

NG >> Replace ASCD brake switch.

# 9.check ascd clutch 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 100 and ASCD clutch 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 10.

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

# 10. CHECK ASCD CLUTCH SWITCH

# Refer to EC-914, "Component Inspection"

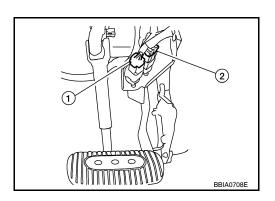
### OK or NG

OK >> GO TO 15.

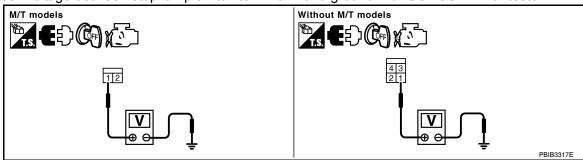
NG >> Replace ASCD clutch switch.

# 11. 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 13.

NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

# Check the following.

- Harness connectors M69, E7
- 10A fuse

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- · 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.

# 13.check stop lamp switch input signal circuit for open and short

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 99 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 14.

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

# 14. CHECK STOP LAMP SWITCH

Refer to EC-914, "Component Inspection"

### OK or NG

OK >> GO TO 15.

NG >> Replace stop lamp switch.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### >> INSPECTION END

# Component Inspection

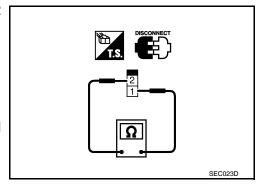
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### ASCD BRAKE SWITCH

- 1. Turn ignition switch OFF.
- 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.

If NG, adjust ASCD brake switch installation, refer to  $\underline{\mathsf{BR-6}}$ , and perform step 3 again.



### ASCD CLUTCH SWITCH

- 1. Turn ignition switch OFF.
- Disconnect ASCD clutch switch harness connector.

# **DTC P1572 ASCD BRAKE SWITCH**

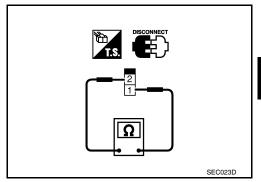
# < SERVICE INFOMATION >

[MR TYPE 1]

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

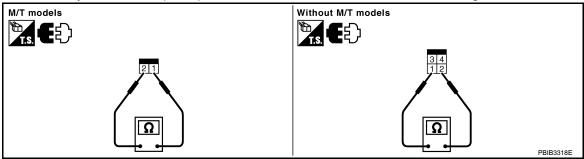
Condition	Continuity
Clutch pedal: Fully released.	Should exist.
Clutch pedal: Slightly depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to  $\underline{\text{CL-5}}$ , 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.	

If NG, adjust stop lamp switch installation, refer to BR-6, and perform step 3 again.

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# DTC P1574 ASCD VEHICLE SPEED SENSOR

# **Component Description**

INFOID:0000000004537429

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from "ABS actuator and electric unit (control unit)" or combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to <a href="EC-524"><u>EC-524</u></a> for ASCD functions.

# On Board Diagnosis Logic

INFOID:0000000004537430

This self-diagnosis has the one trip detection logic.

The MIL will not light up for this diagnosis.

### NOTE:

- If DTC P1574 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to <u>EC-633</u>.
- If DTC P1574 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-635.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to <u>EC-866</u>.
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-872</u>.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	Harness or connectors (CAN communication line is open or shorted.) Harness or connectors (Combination meter circuit is open or shorted.) TCM (A/T and CVT models) ABS actuator and electric unit (control unit) Combination meter ECM

# **DTC Confirmation Procedure**

INFOID:0000000004537431

#### **CAUTION:**

Always drive vehicle at a safe speed.

### 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:**

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.

- Start engine.
- 2. Drive the vehicle at more than 40 km/h (25MPH).
- Check DTC.
- If DTC is detected, go to <u>EC-916</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

INFOID:0000000004537432

# 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-39 (A/T) or CVT-209 (CVT).

### OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT"

Refer to BRC-8.

OK or NG

DTC P1574 ASCD VEHICLE SPEED SENSOR		
< SERVICE INFOMATION >	[MR TYPE 1]	
OK >> GO TO 3. NG >> Repair or replace.		Α
3. CHECK COMBINATION METER		
Check combination meter function. Refer to DI-3.		EC
>> INSPECTION END		С
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# DTC P1715 INPUT SPEED SENSOR (TURBINE REVOLUTION SENSOR)

< SERVICE INFOMATION >

[MR TYPE 1]

# DTC P1715 INPUT SPEED SENSOR (TURBINE REVOLUTION SENSOR)

Description INFOID:000000004537433

ECM receives turbine revolution sensor signal from TCM through CAN communication line. ECM uses this signal for engine control.

# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537434

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
I/P PULLY SPD	Vehicle speed: More than 20 km/h (12MPH)	Almost the same speed as the tachometer indication

# On Board Diagnosis Logic

INFOID:0000000004537435

### NOTE:

- If DTC P1715 is displayed with DTC U1000, U1001 first perform the trouble diagnosis for DTC U1000, U1001. Refer to <u>EC-633</u>.
- If DTC P1715 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-635.
- If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-775.
- If DTC P1715 is displayed with DTC P0340 first perform the trouble diagnosis for DTC P0340. Refer to EC-781.
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-872.

The MIL will not lights up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715 1715	Input speed sensor (Turbine revolution sen- sor) (TCM output)	Turbine revolution sensor signal is different from the theoretical value calculated by ECM from revolution sensor signal and engine rpm signal.	Harness or connectors     (CAN communication line is open or shorted)     Harness or connectors     (Turbine revolution sensor circuit is open or shorted)     TCM

# Diagnosis Procedure

INFOID:0000000004537436

# 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-39.

### OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

### 2.REPLACE TCM

Replace TCM. Refer to AT-42.

#### >> INSPECTION END

# DTC P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

< SERVICE INFOMATION >

[MR TYPE 1]

# DTC P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

Description INFOID:0000000004537437

ECM receives primary speed sensor signal from TCM through CAN communication line.

# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537438

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Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
I/P PULLY SPD	Vehicle speed: More than 20 km/h (12MPH)	Almost the same speed as the tachometer indication

# On Board Diagnosis Logic

INFOID:0000000004537439

### NOTE:

- If DTC P1715 is displayed with DTC U1000 or U1001 first perform the trouble diagnosis for DTC U1000, U1001. Refer to <a href="EC-633"><u>EC-633</u></a>.
- If DTC P1715 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-635.
- If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-775.
- If DTC P1715 is displayed with DTC P0340 first perform the trouble diagnosis for DTC P0340.
   Refer to EC-781.
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-872</u>.

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715 1715	Input speed sensor (Primary speed sensor) (TCM output)	Primary speed sensor signal is different from the theoretical value calculated by ECM from secondary speed sensor signal and engine rpm signal.	Harness or connectors     (CAN communication line is open or shorted)     Harness or connectors     (Primary speed sensor circuit is open or shorted)     TCM

### **DTC Confirmation Procedure**

INFOID:0000000004537440

### **CAUTION:**

Always drive vehicle at a safe speed.

### 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.

- Start engine.
- 2. Drive vehicle at a speed of more than 50 km/h (31 MPH) for at least 5 seconds.
- 3. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-919</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

INFOID:0000000004537441

# 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to CVT-209.

### OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

# 2.REPLACE TCM

Replace TCM. Refer to CVT-340.

**EC-919** 

# DTC P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

< SERVICE INFOMATION > [MR TYPE 1]

>> INSPECTION END

< SERVICE INFOMATION > [MR TYPE 1]

# DTC P1805 BRAKE SWITCH

Description INFOID:0000000004537442

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

# sea. EC

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# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	Ignition switch: ON	Brake pedal: Fully released	OFF
DIVARL SW	s ignition switch. ON	Brake pedal: Slightly depressed	ON

# On Board Diagnosis Logic

The MIL will not light up for this self-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 driving.	Harness or connectors     (Stop lamp switch circuit is open or shorted.)     Stop lamp switch

# **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters in fail-safe mode.

Engine operation condition in fail-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		
Engine: Idling Normal		
Accelerating	Poor acceleration	

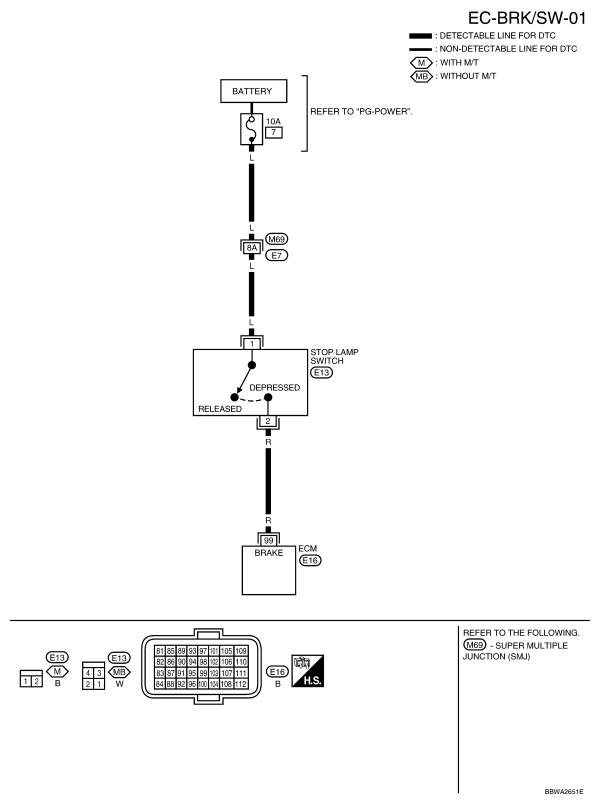
# **DTC Confirmation Procedure**

- 1. Turn ignition switch ON.
- 2. Fully depress the brake pedal for at least 5 seconds.
- 3. Erase the DTC.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-923, "Diagnosis Procedure"</u>.

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Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

[MR TYPE 1]

### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
99 R	R	Stop lamp switch	[Ignition switch: OFF]  • Brake pedal: Fully released	Approximately 0V
99	IX	Stop famp switch	[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

INFOID:0000000004537447

# 1. CHECK STOP LAMP SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check the stop lamp when depressing and releasing the brake pedal.

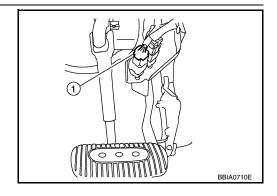
Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

### OK or NG

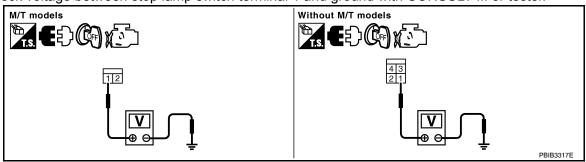
OK >> GO TO 4. NG >> GO TO 2.

# 2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Disconnect stop lamp switch (1) harness connector.
- Brake pedal (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.

- Harness connectors M69, E7
- 10A fuse
- · Harness for open and short between stop lamp switch and battery

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

# 4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect stop lamp switch (1) harness connector.
- 2. Disconnect ECM harness connector.
- Check harness continuity between stop lamp switch terminal 2 and ECM terminal 99. 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 connectors.

# 5. CHECK STOP LAMP SWITCH

Refer to EC-924, "Component Inspection".

### OK or NG

OK >> GO TO 6.

NG >> Replace stop lamp switch.

# 6. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

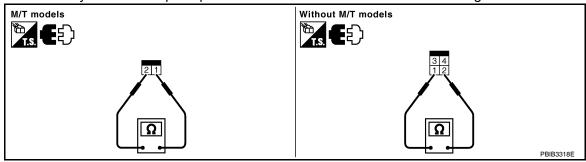
### >> INSPECTION END

# Component Inspection

INFOID:0000000004537448

### 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.

If NG, adjust stop lamp switch installation, refer to BR-6, and perform step 3 again.

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< SERVICE INFOMATION >

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

# Component Description

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.

# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	Ignition switch: ON	ON

# On Board Diagnosis Logic

These self-diagnoses have one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100 2100	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	Harness or connectors     (Throttle control motor relay circuit is open)     Throttle control motor relay
P2103 2103	Throttle control motor relay circuit short	ECM detects 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 lights up.

# 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

#### 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 DTC P2100

- Turn ignition switch ON and wait at least 2 seconds.
- Start engine and let it idle for 5 seconds.
- Check 1st trip DTC.
- If DTC is detected, go to EC-927, "Diagnosis Procedure".

# PROCEDURE FOR DTC P2103

### **TESTING CONDITION:**

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

- Turn ignition switch ON and wait at least 1 second.
- Check DTC.
- If DTC is detected, go to EC-927, "Diagnosis Procedure".

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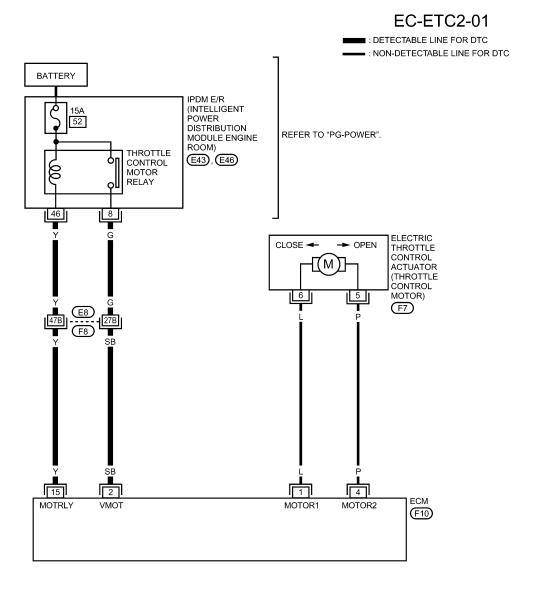
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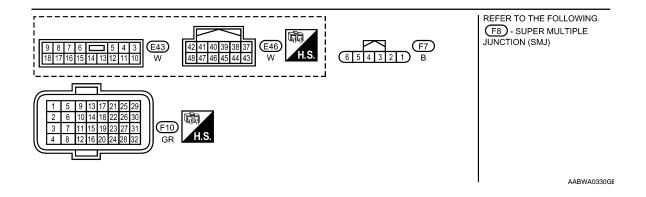
Wiring Diagram

< SERVICE INFOMATION >

INFOID:0000000004537453

[MR TYPE 1]





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< SERVICE INFOMATION >

[MR TYPE 1]

INFOID:0000000004537454

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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.

TERMI-					
NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	EC
1	L	Throttle control motor (Open)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	Approximately 3.2V  >>> 5V/Div 1ms/Div T  PBIA8150J	C
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Е
4	Р	Throttle control motor (Close)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully released	Approximately 1.8V  → 5V/Div 1ms/Div T	F
-				BATTERY VOLTAGE	Н
15 Y	Υ	Y Throttle control motor relay	[Ignition switch: OFF]	(11 - 14V)	
			[Ignition switch: ON]	0 - 1.0V	

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

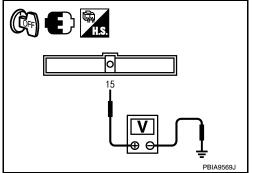
 $1. {\sf check\ Throttle\ Control\ Motor\ Relay\ power\ supply\ circuit-i}$ 

- 1. Turn ignition switch OFF.
- Check voltage between ECM terminal 15 and ground with CON-SULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 5. NG >> GO TO 2.



# 2.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E46.
- Check continuity between ECM terminal 15 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 4. NG >> GO TO 3.

**EC-927** 

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< SERVICE INFOMATION >

[MR TYPE 1]

# $\overline{3}$ .DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- · 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 15A fuse.
- 2. Check 15A fuse for blown.

### OK or NG

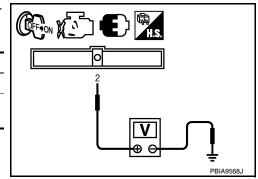
OK >> GO TO 8.

NG >> Replace 15A fuse.

# 5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check voltage between ECM terminal 2 and ground under the following conditions with CONSULT-III or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)



### 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.
- Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector E43.
- Check continuity between ECM terminal 2 and IPDM E/R terminal 8. 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.

### .DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- · 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-626.

### 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.

**IMR TYPE 11** < SERVICE INFOMATION >

# DTC P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description INFOID:0000000004537455

#### NOTE:

If DTC P2101 is displayed with DTC P2100 or P2119, first perform the trouble diagnosis for DTC P2100 or P2119. Refer to EC-925or EC-940.

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

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

# On Board Diagnosis Logic

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, the ECM enters fail-safe mode and the MIL lights up.

### 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**

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 11V when engine is runnina.

- Turn ignition switch ON and wait at least 2 seconds.
- Start engine and let it idle for 5 seconds.
- Check DTC. 3.
- If DTC is detected, go to EC-931, "Diagnosis Procedure".

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**EC-929** 

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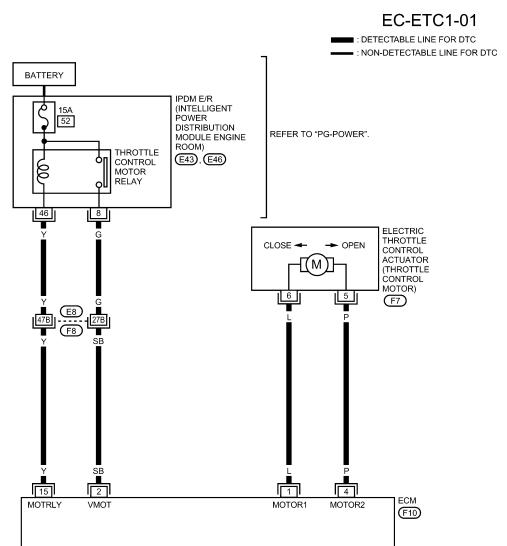
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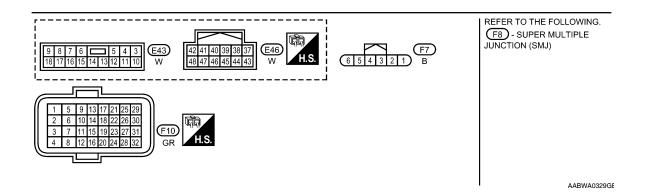
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[MR TYPE 1]

Wiring Diagram INFOID:0000000004537458

< SERVICE INFOMATION >





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

< SERVICE INFOMATION >

[MR TYPE 1]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	L	Throttle control motor (Open)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully depressed	Approximately 3.2V
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
4	Р	Throttle control motor (Close)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully released	Approximately 1.8V
15	Y	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch: ON]	0 - 1.0V

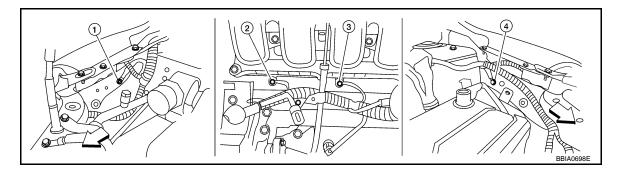
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537459

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

**EC-931** 

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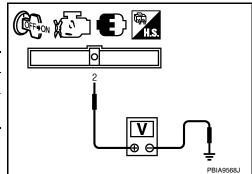
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# < SERVICE INFOMATION >

[MR TYPE 1]

Check voltage between ECM terminal 2 and ground under the following conditions with CONSULT-III or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)



### 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 E43.
- Check continuity between ECM terminal 2 and IPDM E/R terminal 8. 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 E8, F8
- 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.

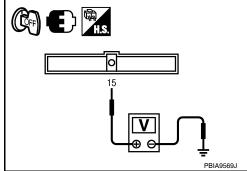
# 5. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Reconnect all harness connectors disconnected.
- Check voltage between ECM terminal 15 and ground with CON-SULT-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 E46.
- Check harness continuity between ECM terminal 15 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 8. NG >> GO TO 7.

< SERVICE INFOMATION >

[MR TYPE 1]

# 7.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- · 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 15A fuse.
- 2. Check 15A fuse for blown.

### OK or NG

OK >> GO TO 9.

NG >> Replace 15A fuse.

# 9. CHECK INTERMITTENT INCIDENT

### Refer to EC-626.

### OK or NG

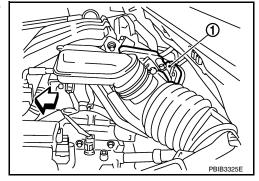
OK >> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R".

NG >> Repair or replace harness or connectors.

# 10.check throttle control motor output signal circuit for open or short

- 1. Turn ignition switch OFF.
- Disconnect electric throttle control actuator (1) harness connector.
- Vehicle front
- 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	1	Should not exist.
3	4	Should exist.
6	1	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.

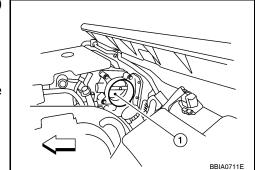
# 11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Remove the intake air duct.
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.
- Vehicle front

### 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

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# < SERVICE INFOMATION >

Refer to EC-934, "Component Inspection".

### OK or NG

OK >> GO TO 13. >> GO TO 14. NG

# 13. CHECK INTERMITTENT INCIDENT

### Refer to EC-626.

### OK or NG

OK >> GO TO 14.

NG >> Repair or replace harness or connectors.

# 14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>". Perform <u>EC-572</u>, "<u>Idle Air Volume Learning</u>".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004537460

[MR TYPE 1]

### THROTTLE CONTROL MOTOR

- Disconnect electric throttle control actuator harness connector.
- Check resistance between terminals 5 and 6.

# Resistance: Approximately 1 - 15 $\Omega$ [at 25 °C (77°F)]

- If NG, replace electric throttle control actuator and go to next step.
- 4. Perform EC-572, "Throttle Valve Closed Position Learning".
- 5. Perform EC-572, "Idle Air Volume Learning".

# PBIB2909I

# Removal and Installation

INFOID:0000000004537461

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to EM-141.

# **DTC P2118 THROTTLE CONTROL MOTOR**

< SERVICE INFOMATION >

[MR TYPE 1]

# DTC P2118 THROTTLE CONTROL MOTOR

# **Component Description**

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The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

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

# On Board Diagnosis Logic

INFOID:0000000004537463

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 lights up.

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:0000000004537464

### 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.

- 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-937, "Diagnosis Procedure".

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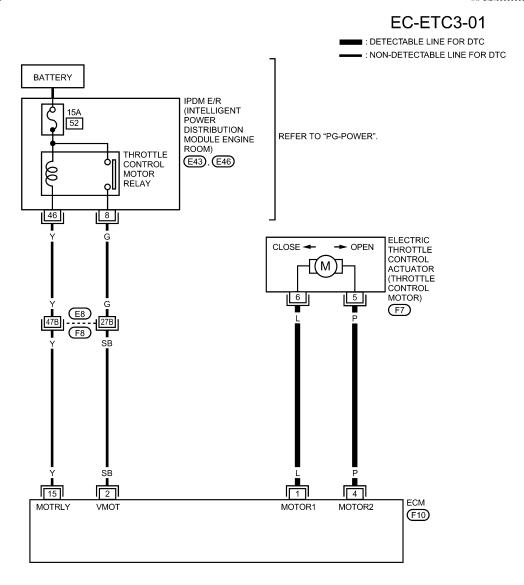
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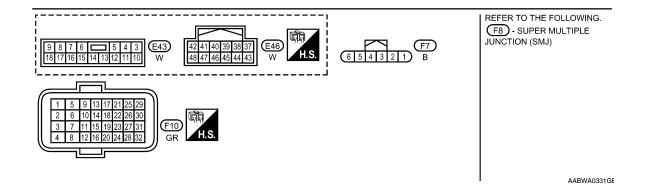
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Wiring Diagram

INFOID:0000000004537465





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

**CAUTION:** 

[MR TYPE 1]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	EC
1	L	Throttle control motor (Open)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	Approximately 3.2V	C
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Е
4	P	Throttle control motor (Close)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully released	Approximately 1.8V  SV/Div Ims/Div T  PBIA8149J	F
15	Υ	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)	Н
			[Ignition switch: ON]	0 - 1.0V	

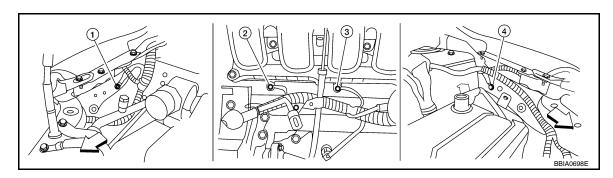
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten engine screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

**EC-937** 

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INFOID:0000000004537466

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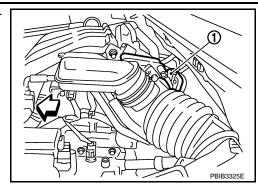
### **DTC P2118 THROTTLE CONTROL MOTOR**

#### < SERVICE INFOMATION >

[MR TYPE 1]

- Disconnect electric throttle control actuator (1) harness connector
- : Vehicle front
- 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	1	Should not exist.
3	4	Should exist.
6	1	Should exist.
0	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 open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK THROTTLE CONTROL MOTOR

Refer to EC-938, "Component Inspection".

#### OK or NG

OK >> GO TO 4. NG >> GO TO 5.

### 4. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

### 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 <u>EC-572</u>, "Throttle Valve Closed Position Learning".
- 3. Perform EC-572, "Idle Air Volume Learning".

#### >> INSPECTION END

# Component Inspection

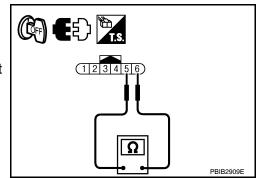
INFOID:0000000004537467

## THROTTLE CONTROL MOTOR

- 1. Disconnect electric throttle control actuator harness connector.
- 2. Check resistance between terminals 5 and 6.

## Resistance: Approximately 1 - 15 $\Omega$ [at 25 °C (77°F)]

- 3. If NG, replace electric throttle control actuator and go to next step.
- 4. Perform EC-572, "Throttle Valve Closed Position Learning".
- 5. Perform EC-572, "Idle Air Volume Learning".



Removal and Installation

INFOID:0000000004537468

## **DTC P2118 THROTTLE CONTROL MOTOR**

< SERVICE INFOMATION >

Refer to EM-141.

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#### DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< SERVICE INFOMATION >

[MR TYPE 1]

## DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

## **Component Description**

INFOID:0000000004537469

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## On Board Diagnosis Logic

INFOID:0000000004537470

### This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P2119		A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	
2119		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	Electric throttle control actuator
		C)	ECM detects the throttle valve is stuck open.	

#### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode		
Malfunction A	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 N or P position (A/T, CVT), neutral (M/T), and engine speed will not exceed 1,000 rpm or more.		

### **DTC Confirmation Procedure**

INFOID:0000000004537471

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

#### PROCEDURE FOR MALFUNCTION A AND B

- Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to D position (A/T, CVT) or 1st position (M/T), and wait at least 3 seconds.
- 3. Set shift lever to P position (A/T, CVT) or Neutral position (M/T).
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON and wait at least 1 second.
- 6. Set shift lever to D position (A/T, CVT) or 1st position (M/T), and wait at least 3 seconds.
- 7. Set shift lever to P position (A/T, CVT) or Neutral position (M/T).
- 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-941, "Diagnosis Procedure".

#### PROCEDURE FOR MALFUNCTION C

- Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to D position (A/T, CVT) or 1st position (M/T) and wait at least 3 seconds.

### DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

[MR TYPE 1] < SERVICE INFOMATION >

- Set shift lever to N, P position (A/T, CVT) or Neutral (M/T) position.
- 4. Start engine and let it idle for 3 seconds.
- 5. Check DTC.
- If DTC is detected, go to <u>EC-941, "Diagnosis Procedure"</u>.

## Diagnosis Procedure

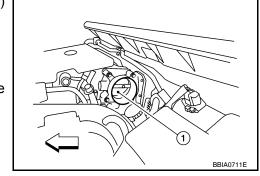
# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if a foreign matter is caught between the throttle valve (1) and the housing.
- : Vehicle front

#### 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

- Replace the electric throttle control actuator.
- Perform <u>EC-572</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-572</u>, "<u>Idle Air Volume Learning</u>".

#### >> INSPECTION END

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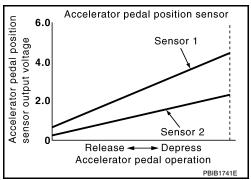
INFOID:0000000004537473

## DTC P2122, P2123 APP SENSOR

## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM Leaves this signal for the engine operation such as fuel cut.

#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537474

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 1	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Fully released	ON
CLOD THE PUS	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF

<sup>\*:</sup> Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

## On Board Diagnosis Logic

INFOID:0000000004537475

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 <u>EC-874</u>.

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)	
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	Accelerator pedal position sensor (APP sensor 1)	

### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

### Engine operating condition in fail-safe mode

## **DTC Confirmation Procedure**

INFOID:0000000004537476

#### NOTE:

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.

[MR TYPE 1]

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

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

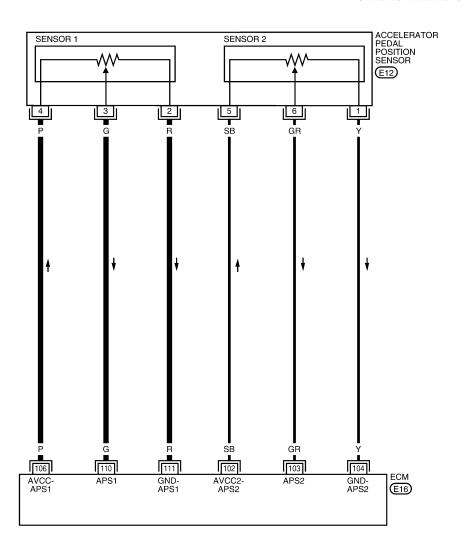
- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-944, "Diagnosis Procedure".

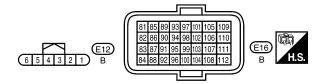
## Wiring Diagram

INFOID:0000000004537477

## EC-APPS1-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

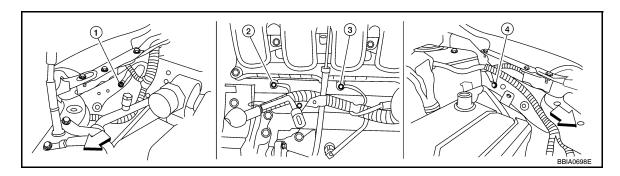
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
103	GR	Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	GK		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Y	Sensor ground (APP sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
110	G	Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110	G		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	R	Sensor ground (APP sensor 1)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

## Diagnosis Procedure

INFOID:0000000004537478

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

#### OK or NG

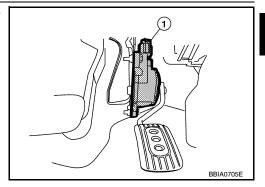
OK >> GO TO 2.

[MR TYPE 1] < SERVICE INFOMATION >

NG >> Repair or replace ground connections.

# 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect accelerator pedal position (APP) sensor (1) harness connector.
- 2. Turn ignition switch ON.



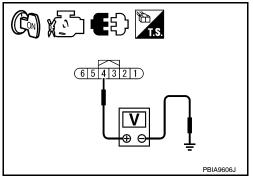
3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 3.

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



## ${f 3}$ .CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 111 and APP sensor 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

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

## f 4.CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 110 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

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

## 5. CHECK APP SENSOR

Refer to EC-946, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

1. Replace accelerator pedal assembly.

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#### < SERVICE INFOMATION >

- 2. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 3. Perform EC-572, "Throttle Valve Closed Position Learning".
- 4. Perform EC-572, "Idle Air Volume Learning".

#### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

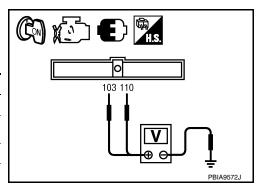
## Component Inspection

INFOID:0000000004537479

#### ACCELERATOR PEDAL POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Check voltage between ECM terminals 110 (APP sensor 1 signal), 103 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
110	Fully released	0.6 - 0.9V
(Accelerator pedal position sensor 1)	Fully depressed	3.9 - 4.7V
103	Fully released	0.3 - 0.6V
(Accelerator pedal position sensor 2)	Fully depressed	1.95 - 2.4V



- 4. If NG, replace accelerator pedal assembly and go to next step.
- 5. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-572, "Throttle Valve Closed Position Learning".
- 7. Perform EC-572, "Idle Air Volume Learning".

### Removal and Installation

INFOID:0000000004537480

ACCELERATOR PEDAL Refer to ACC-3.

INFOID:0000000004537481

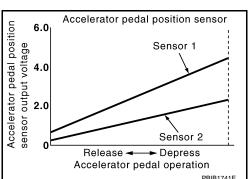
## DTC P2127, P2128 APP SENSOR

## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN I	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Fully released	ON
CLSD THE FOS	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF

<sup>\*:</sup> Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

## On Board Diagnosis Logic

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)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	<ul> <li>[Crankshaft position sensor (POS) circuit is shorted.]</li> <li>(EVAP control system pressure sensor circuit is shorted.)</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>EVAP control system pressure sensor</li> <li>Accelerator pedal position sensor (APP sensor 2)</li> <li>Crankshaft position sensor (POS)</li> <li>Refrigerant pressure sensor</li> </ul>

#### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

#### Engine operating condition in fail-safe mode

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The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.

So, the acceleration will be poor.

## DTC P2127, P2128 APP SENSOR

< SERVICE INFOMATION >

[MR TYPE 1]

## **DTC Confirmation Procedure**

INFOID:0000000004537484

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.
- If DTC is detected, go to <u>EC-950, "Diagnosis Procedure"</u>.

[MR TYPE 1]

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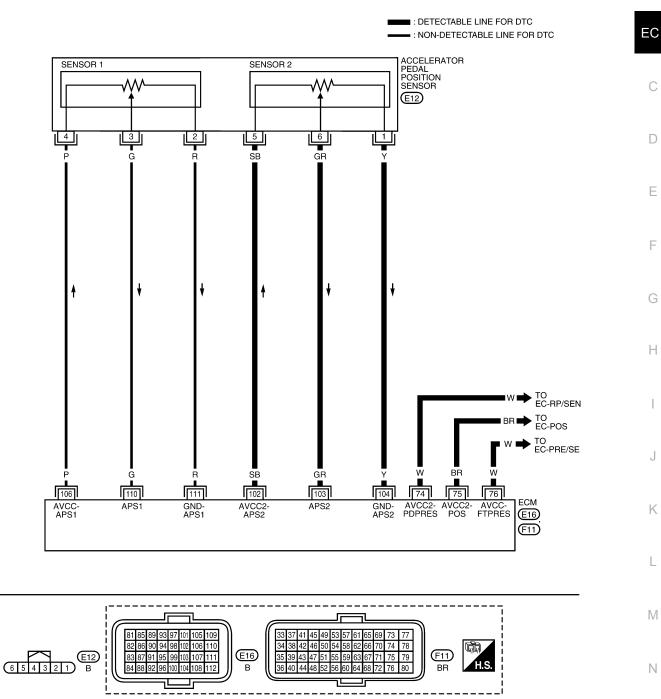
BBWA3074E

Wiring Diagram

< SERVICE INFOMATION >

INFOID:0000000004537485

## EC-APPS2-01



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

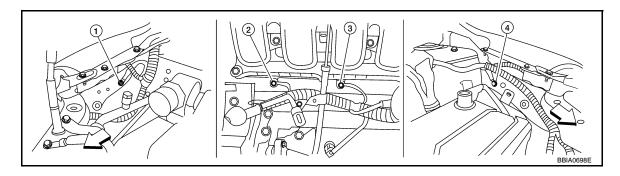
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
103	GR	Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103			[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Υ	Sensor ground (APP sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
110	G	G Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110			[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	R	Sensor ground (APP sensor 1)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

## Diagnosis Procedure

INFOID:0000000004537486

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to <u>EC-632</u>. "Ground Inspection".



- : Vehicle front
- 1. Body ground E24
- 4. Body ground E15
- 2. Engine ground F9
- 3. Engine ground F16

< SERVICE INFOMATION > [MR TYPE 1]

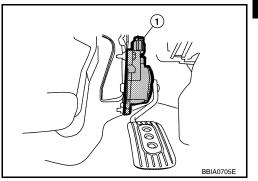
#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Disconnect accelerator pedal position (APP) sensor (1) harness connector.
- 2. Turn ignition switch ON.

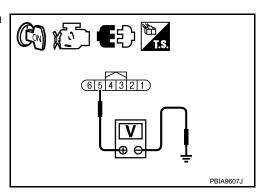


3. Check voltage between APP sensor terminal 5 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 6. NG >> GO TO 3.



# 3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between APP sensor terminal 5 and ECM terminal 102. Refer to Wiring Diagram.

#### Continuity should exist.

#### 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 COMPONENTS POWER SUPPLY CIRCUIT

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

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1006, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-776, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-834, "Wiring Diagram"
102	APP sensor terminal 5	EC-949, "Wiring Diagram"

#### OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

### **5.**CHECK COMPONENTS

#### Check the following.

- Crankshaft position sensor (POS) (Refer to EC-780, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-831, "Component Inspection".)

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## DTC P2127, P2128 APP SENSOR

# < SERVICE INFOMATION >

Refrigerant pressure sensor (Refer to MTC-37.)

#### OK or NG

OK >> GO TO 10.

NG >> Replace malfunctioning component.

## 6.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 104 and APP sensor 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 7.

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

## .CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 103 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 8.

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

## 8.CHECK APP SENSOR

Refer to EC-952, "Component Inspection".

#### OK or NG

OK >> GO TO 10.

#### NG >> GO TO 9.

## 9.replace accelerator pedal assembly

- Replace accelerator pedal assembly.
- Perform <u>EC-572</u>, "Accelerator <u>Pedal Released Position Learning"</u>. Perform <u>EC-572</u>, "Throttle Valve Closed Position Learning".
- 4. Perform EC-572, "Idle Air Volume Learning".

#### >> INSPECTION END

## 10. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

## Component Inspection

INFOID:0000000004537487

**IMR TYPE 11** 

#### ACCELERATOR PEDAL POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- Turn ignition switch ON.

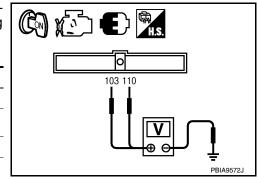
## DTC P2127, P2128 APP SENSOR

### < SERVICE INFOMATION >

[MR TYPE 1]

Check voltage between ECM terminals 110 (APP sensor 1 signal), 103 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
110	Fully released	0.6 - 0.9V
(Accelerator pedal position sensor 1)	Fully depressed	3.9 - 4.7V
103	Fully released	0.3 - 0.6V
(Accelerator pedal position sensor 2)	Fully depressed	1.95 - 2.4V



- 4. If NG, replace accelerator pedal assembly and go to next step.
- 5. Perform EC-572, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-572, "Throttle Valve Closed Position Learning".
- 7. Perform EC-572, "Idle Air Volume Learning".

### Removal and Installation

ACCELERATOR PEDAL

Refer to ACC-3.

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EC-953

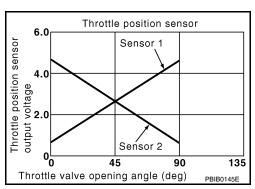
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### DTC P2135 TP SENSOR

## Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537490

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TP SEN 1-B1 TP SEN 2-B1*	Ignition switch: ON     (Engine stopped)	Accelerator pedal: Fully released	More than 0.36V
II OLIVE-DI	Shift lever: D (A/T, CVT), 1st (M/T)	Accelerator pedal: Fully depressed	Less than 4.75V

<sup>\*:</sup> Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

INFOID:0000000004537491

This self-diagnosis has the one trip detection logic.

NOTE:

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-874.

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.	<ul> <li>Harness or connector (TP sensor 1 and 2 circuit is open or shorted.)</li> <li>Electric throttle control actuator (TP sensor 1 and 2)</li> </ul>

#### **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

#### 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

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:0000000004537492

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- Start engine and let it idle for 1 second.
- Check DTC. 2.
- If DTC is detected, go to EC-956, "Diagnosis Procedure".

[MR TYPE 1] < SERVICE INFOMATION > Wiring Diagram INFOID:0000000004537493 Α EC-TPS3-01 ■ : DETECTABLE LINE FOR DTC EC : NON-DETECTABLE LINE FOR DTC ELECTRIC THROTTLE CONTROL ACTUATOR (THROTTLE POSITION SENSOR) SENSOR 1 SENSOR 2 (F7) 3 4 D LG Е F Н 34 72 33 36 ECM AVCC-TPS GND-TPS (F11) M 6 5 4 3 2 1 B (F11) Ν

Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

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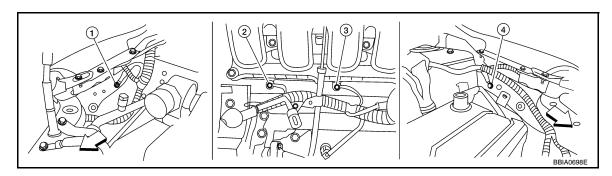
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	LG		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36V
33	33 LG Throttle position s	Througe position sensor 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75V
34		The title and title and the control of	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	Less than 4.75V
J4	0	Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36V
36	Y	Sensor ground (Throttle position sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V

## Diagnosis Procedure

INFOID:0000000004537494

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-632</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

#### OK or NG

OK >> GO TO 2.

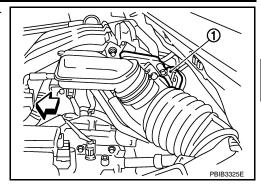
NG >> Repair or replace ground connections.

# 2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

[MR TYPE 1] < SERVICE INFOMATION >

Disconnect electric throttle control actuator (1) harness connec-

- : Vehicle front
- 2. Turn ignition switch ON.



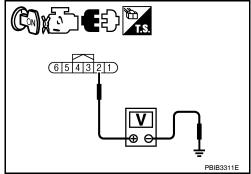
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT-III or tester.

### Voltage: Approximately 5V

#### OK or NG

OK >> GO TO 3.

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



# ${f 3.}$ CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 36. 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.

## $oldsymbol{4}.$ CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between the following; electric throttle control actuator terminal 1 and ECM terminal 33, electric throttle control actuator terminal 3 and ECM terminal 34. 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 5.

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

## 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-958, "Component Inspection".

### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

## **6.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- 2. Perform EC-572, "Throttle Valve Closed Position Learning".

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Perform <u>EC-572</u>, "Idle Air Volume Learning".

#### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

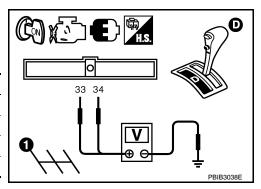
## Component Inspection

#### INFOID:0000000004537495

#### THROTTLE POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Perform EC-572, "Throttle Valve Closed Position Learning".
- 3. Turn ignition switch ON.
- 4. Set shift lever to D position (A/T, CVT) or 1st position (M/T).
- Check voltage between ECM terminals 33 (TP sensor 1 signal), 34 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
33 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
34	Fully released	Less than 4.75V
(Throttle position sensor 2)	Fully depressed	More than 0.36V



- 6. If NG, replace electric throttle control actuator and go to the next step.
- 7. Perform EC-572, "Throttle Valve Closed Position Learning".
- 8. Perform EC-572, "Idle Air Volume Learning".

#### Removal and Installation

INFOID:0000000004537496

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to EM-141.

INFOID:0000000004537497

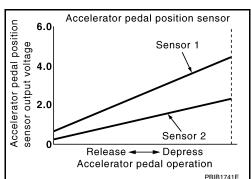
### DTC P2138 APP SENSOR

## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Fully released	ON
CLSD THE POS	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF

<sup>\*:</sup> Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

## On Board Diagnosis Logic

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-874.

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 and 2 circuit is open or shorted.)     [Crankshaft position sensor (POS) circuit is shorted.]     (EVAP control system pressure sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     Accelerator pedal position sensor (APP sensor 1 and 2)     Crankshaft position sensor (POS)     EVAP control system pressure sensor     Refrigerant pressure sensor

#### FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

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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:0000000004537500

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- Start engine and let it idle for 1 second.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-962, "Diagnosis Procedure".

Wiring Diagram

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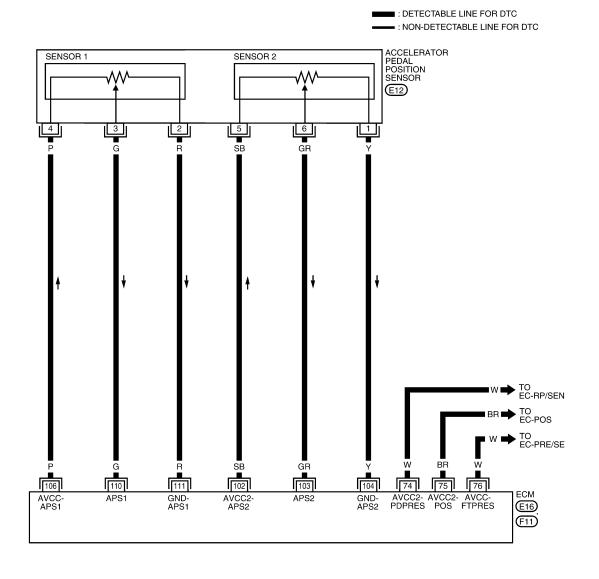
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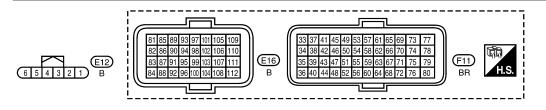
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## EC-APPS3-01





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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

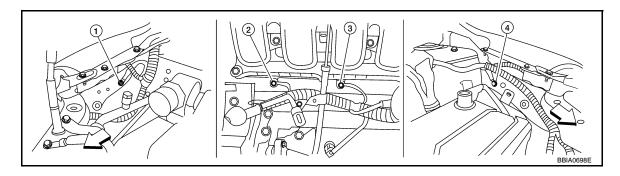
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TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V	
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V	
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V	
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V	
103	A	Accelerator pedal position	Coelerator pedal position     Accelerator pedal position     Accelerator pedal	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	GR	sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V	
104	Υ	Sensor ground (APP sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V	
110		Accelerator pedal position sensor 1	Accelerator pedal position	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110	G		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V	
111	R	Sensor ground (APP sensor 1)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	

## Diagnosis Procedure

INFOID:0000000004537502

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to <u>EC-632</u>. "Ground Inspection".



- . Vehicle front
- 1. Body ground E24
- 4. Body ground E15
- 2. Engine ground F9
- 3. Engine ground F16

[MR TYPE 1]

#### < SERVICE INFOMATION >

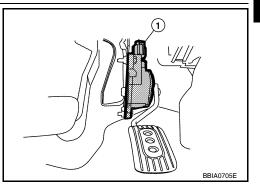
#### OK or NG

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.



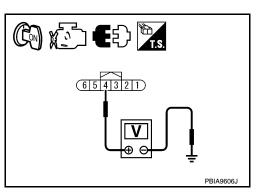
3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 3.

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



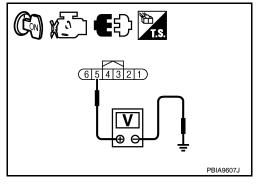
## 3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch ON.
- Check voltage between APP sensor terminal 5 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

### OK or NG

OK >> GO TO 7. NG >> GO TO 4.



## 4. 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 102. Refer to Wiring Diagram.

#### Continuity should exist.

#### OK or NG

OK >> GO TO 5.

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

### CHECK COMPONENTS POWER SUPPLY CIRCUIT

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

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ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1006, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-776, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-834, "Wiring Diagram"
102	APP sensor terminal 5	EC-961, "Wiring Diagram"

#### OK or NG

OK >> GO TO 6.

NG >> Repair short to ground or short to power in harness or connectors.

## 6. CHECK COMPONENTS

#### Check the following.

- Crankshaft position sensor (POS) (Refer to EC-780, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-831, "Component Inspection".)
- Refrigerant pressure sensor (Refer to MTC-37.)

#### OK or NG

OK >> GO TO 11.

NG >> Replace malfunctioning component.

## 7.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between the following;

ECM terminal 111 and APP sensor terminal 2,

ECM terminal 104 and APP sensor 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 8.

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

## 8.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between the following;

ECM terminal 110 and APP sensor terminal 3.

ECM terminal 103 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 9.

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

### 9.CHECK APP SENSOR

Refer to EC-965, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> GO TO 10.

## 10.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- Perform <u>EC-572</u>, "Accelerator <u>Pedal Released Position Learning"</u>.
- 3. Perform EC-572, "Throttle Valve Closed Position Learning".
- 4. Perform EC-572, "Idle Air Volume Learning".

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#### >> INSPECTION END

# 11. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

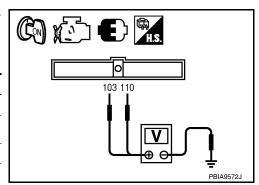
### >> INSPECTION END

## Component Inspection

#### ACCELERATOR PEDAL POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- Check voltage between ECM terminals 110 (APP sensor 1 signal), 103 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
110	Fully released	0.6 - 0.9V
(Accelerator pedal position sensor 1)	Fully depressed	3.9 - 4.7V
103	Fully released	0.3 - 0.6V
(Accelerator pedal position sensor 2)	Fully depressed	1.95 - 2.4V



- 4. If NG, replace accelerator pedal assembly and go to next step.
- 5. Perform <u>EC-572</u>, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-572, "Throttle Valve Closed Position Learning".
- 7. Perform EC-572, "Idle Air Volume Learning".

### Removal and Installation

ACCELERATOR PEDAL

Refer to ACC-3.

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### DTC P2A00 A/F SENSOR 1

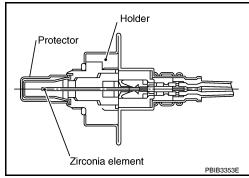
## Component Description

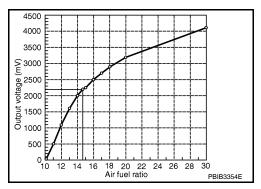
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

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

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





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537506

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

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To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not to be shifted to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P2A00 2A00	Air fuel ratio (A/F) sensor 1 circuit range/performance	<ul> <li>The output voltage computed by ECM from the A/F sensor 1 signal is shifted to the lean side for a specified period.</li> <li>The A/F signal computed by ECM from the A/F sensor 1 signal is shifted to the rich side for a specified period.</li> </ul>	<ul> <li>Air fuel ratio (A/F) sensor 1</li> <li>Air fuel ratio (A/F) sensor 1 heater</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

### **DTC Confirmation Procedure**

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#### 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:**

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

### DTC P2A00 A/F SENSOR 1

## < SERVICE INFOMATION > [MR TYPE 1]

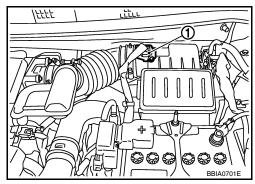
3. Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.

- 4. Clear the self-learning coefficient by touching "CLEAR".
- 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 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- Check 1st trip DTC.
- 10. If 1st trip DTC is detected, go to EC-969, "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 harness connector.
- 4. Start engine and let it idle for at least 5 seconds.
- 5. Stop engine and reconnect mass air flow sensor (1) harness connector.
- Select Service \$03 with GST and make sure that DTC P0102 is detected.
- 7. Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
- 9. Let engine idle for 1 minute.
- 10. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- 11. Select Service \$07 with GST.

  If 1st trip DTC is detected, go to <u>EC-969</u>, "<u>Diagnosis Procedure</u>".



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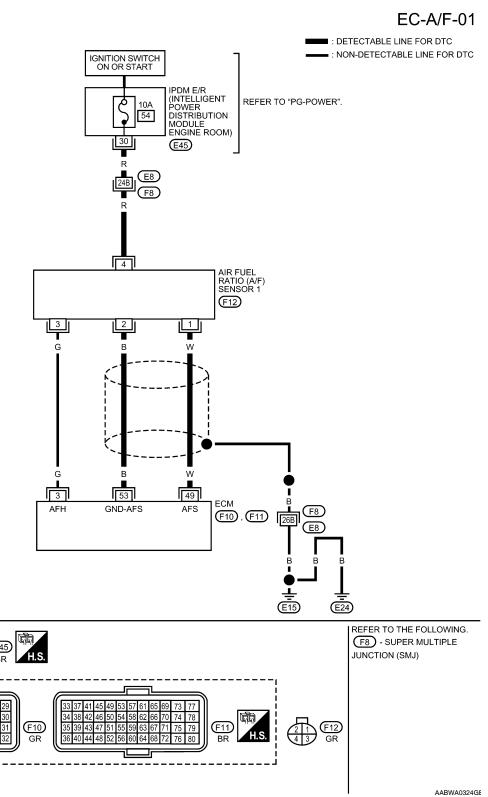
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Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

#### < SERVICE INFOMATION >

[MR TYPE 1]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

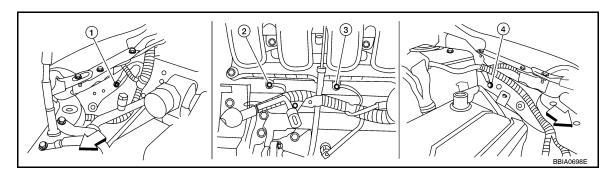
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten ground screws on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- Body ground E24
- Engine ground F9
- Engine ground F16

Body ground E15

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

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

Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-144, "Removal and Installation".

>> GO TO 3.

# 3. CHECK FOR INTAKE AIR LEAK

- Start engine and run it at idle.
- 2. Listen for an intake air leak after the mass air flow sensor.

#### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

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## f 4.CLEAR THE SELF-LEARNING DATA

#### With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- 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 and P0172 detected?

Is it difficult to start engine?

#### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF.
   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. Make sure DTC P0102 is displayed.
- 7. Erase the DTC memory. Refer to EC-542. "Emission-related Diagnostic Information".
- 8. Make sure DTC P0000 is displayed.
- 9. Run engine for at least 10 minutes at idle speed. Is the 1st trip DTC P0171 and P0172 detected? Is it difficult to start engine?



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#### Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-740 or EC-746.

>> GO TO 5. No

# 5. CHECK HARNESS CONNECTOR

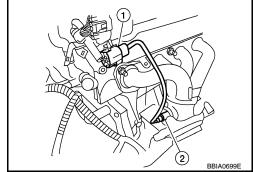
- 1. Turn ignition switch OFF.
- 2. Disconnect A/F sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor (2)
- 3. Check harness connector for water.

#### Water should no exist.

#### OK or NG

OK >> GO TO 6.

NG >> Repair or replace harness connector.



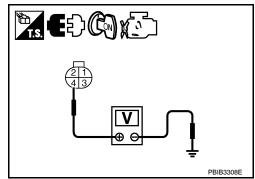
# 6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Turn ignition switch ON.
- 2. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### **Voltage: Battery voltage**

#### OK or NG

OK >> GO TO 8. >> GO TO 7. NG



## 7. DETECT MALFUNCTIONING PART

#### Check the following.

Harness connectors E8, F8



[MR TYPE 1] < SERVICE INFOMATION >

· 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

Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal	
1	49	
2	53	

#### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

#### Continuity should not exist.

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-643, "Component Inspection".

#### OK or NG

OK >> GO TO 10.

NG >> GO TO 11.

## 10.CHECK INTERMITTENT INCIDENT

#### Perform EC-626.

### OK or NG

OK >> GO TO 11.

NG >> Repair or replace.

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

Replace air fuel ratio (A/F) sensor 1.

#### **CAUTION:**

- Discard any air fuel ratio (A/F) sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new air fuel ratio (A/F) sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> GO TO 12.

# 12.CONFIRM A/F ADJUSTMENT DATA

- Turn ignition switch ON.
- Select "A/F ADJ-B1" in "DATA MONITOR" mode with CONSULT-III.
- Make sure that "0.000" is displayed on CONSULT-III screen.

#### OK or NG

OK >> INSPECTION END

NG >> GO TO 13.

13.clear the self-learngin data

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#### < SERVICE INFOMATION >

- Start engine and warm it up to normal operating temperature.
- Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- Clear the self-learning control coefficient by touching "CLEAR".

#### Without CONSULT-III

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF.
- Disconnect mass air flow sensor harness (1) connector.
- Restart engine and let it idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- 6. Make sure DTC P0102 is displayed.
- 7. Erase the DTC memory. Refer to EC-542, "Emission-related Diagnostic Information".
- 8. Make sure DTC P0000 is displayed.

>> GO TO 14.

## 14. CONFIRM A/F ADJUSTMENT DATA

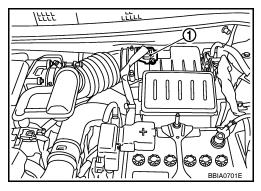
- Turn ignition switch OFF and then ON.
- Select "A/F ADJ-B1" in "DATA MONITOR" mode with CONSULT-III.
- Make sure that "0.000" is displayed on CONSULT-III screen.

#### >> INSPECTION END

Removal and Installation

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AIR FUEL RATIO SENSOR Refer to EM-144.



[MR TYPE 1]

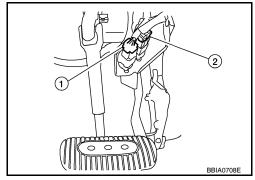
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# **ASCD BRAKE SWITCH**

# **Component Description**

When depress on the brake pedal, ASCD brake switch (2) is turned OFF and stop lamp switch (1) is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal) Refer to EC-524 for the ASCD function.



# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM		CONDITION	SPECIFICATION
BRAKE SW1 (ASCD brake switch)  • Ignition switch: ON	a lanition quitable ON	Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	ON
	• ignition switch. ON	<ul> <li>Brake pedal: Slightly depressed (A/T, CVT)</li> <li>Brake pedal and/or clutch pedal: Slightly depressed (M/T)</li> </ul>	OFF
BRAKE SW2	- Ignition quitable ON	Brake pedal: Fully released	OFF
(Stop lamp switch)	Ignition switch: ON	Brake pedal: Slightly depressed	ON

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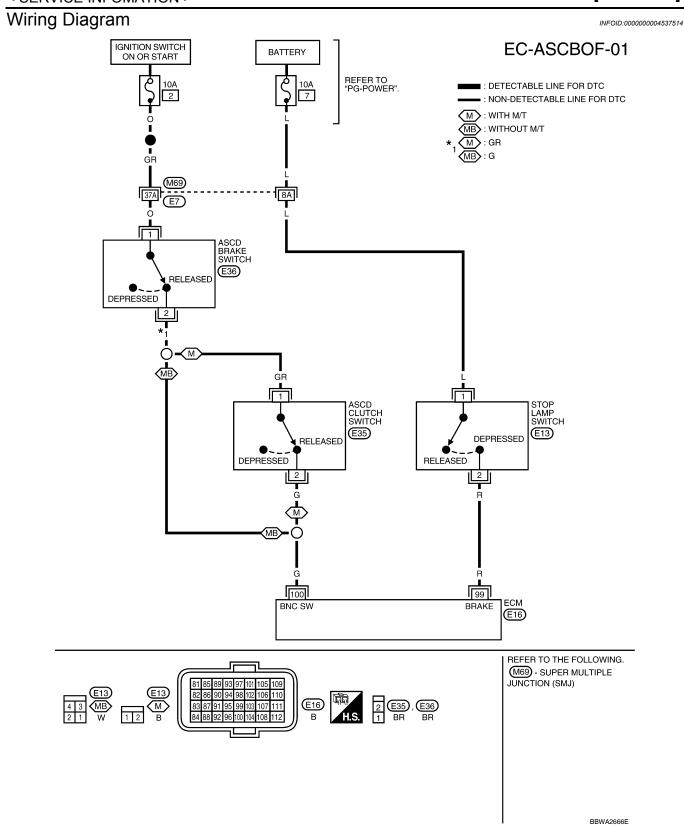
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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

## < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
			[Ignition switch: ON]  • Brake pedal: Fully released	Approximately 0V
99 R Stop lamp switch	[Ignition switch: ON] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)		
100	C	ASCD broke quitab	<ul> <li>[Ignition switch: ON]</li> <li>Brake pedal: Slightly depressed (A/T, CVT)</li> <li>Brake pedal and/or clutch pedal: Slightly depressed (M/T)</li> </ul>	Approximately 0V
100 G ASCD brake switch	ASCD DIAKE SWILCTI	[Ignition switch: ON]  • Brake pedal: Fully released (A/T, CVT)  • Brake pedal and clutch pedal: Fully released (M/T)	BATTERY VOLTAGE (11 - 14V)	

# Diagnosis Procedure

# 1. CHECK OVERALL FUNCTION-I

#### With CONSULT-III

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions. M/T models

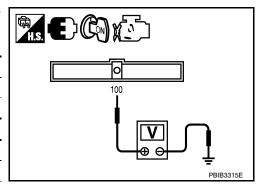
CONDITION	INDICATION
Clutch pedal and/or brake pedal: Slightly depressed	OFF
Clutch pedal and brake pedal: Fully released	ON
A/T and CVT models	
CONDITION	INDICATION
Brake pedal: Slightly depressed	OFF
Brake pedal: Fully released	ON

#### Without CONSULT-III

- Turn ignition switch ON.
- Check voltage between ECM terminal 100 and ground under the following conditions.

#### M/T models

CONDITION	VOLTAGE
Clutch pedal and/or brake pedal: Slightly depressed	Approximately 0V
Clutch pedal and brake pedal: Fully released	Battery voltage
A/T and CVT models	
CONDITION	VOLTAGE
Brake pedal: Slightly depressed	Approximately 0V
Brake pedal: Fully released	Battery voltage



## OK or NG

OK >> GO TO 2.

NG (M/T models) >>GO TO 3.

NG (A/T and CVT models) >>GO TO 4.

# 2.CHECK OVERALL FUNCTION-II

#### With CONSULT-III

Check "BRAKE SW2" indication in "DATA MONITOR" mode.

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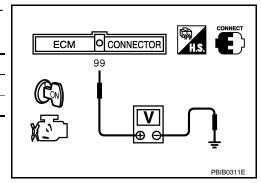
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CONDITION	INDICATION
Brake pedal: Fully released	OFF
Brake pedal: Slightly depressed	ON

#### Without CONSULT-III

Check voltage between ECM terminal 99 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0V
Brake pedal: Slightly depressed	Battery voltage



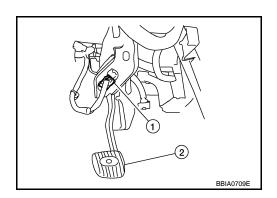
## OK or NG

OK >> INSPECTION END.

NG >> GO TO 11.

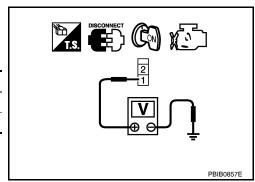
3. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch (1) harness connector.
- Clutch pedal (2)
- 3. Turn ignition switch ON.



 Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-III or tester.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approx. 0V



## OK or NG

OK >> GO TO 9. NG >> GO TO 4.

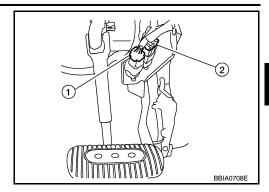
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY

1. Turn ignition switch OFF.

[MR TYPE 1] < SERVICE INFOMATION >

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.

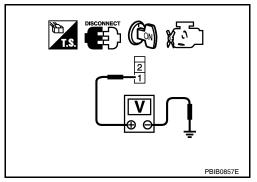
## Voltage: Battery voltage

#### OK or NG

OK (M/T models) >>GO TO 6.

OK (A/T and CVT models) >>GO TO 7.

NG >> GO TO 5.



# 5. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- 10A 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.

# 6.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch 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 8.

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

# 7.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 100 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 8.

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

# 8.CHECK ASCD BRAKE SWITCH

Refer to EC-914, "Component Inspection".

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[MR TYPE 1]

#### < SERVICE INFOMATION >

#### OK or NG

OK >> GO TO 15.

NG >> Replace ASCD brake switch.

# $9.\mathsf{CHECK}$ ASCD CLUTCH 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 100 and ASCD clutch 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 10.

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

# 10. CHECK ASCD CLUTCH SWITCH

Refer to EC-914, "Component Inspection"

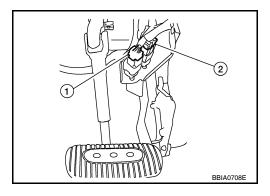
#### OK or NG

OK >> GO TO 15.

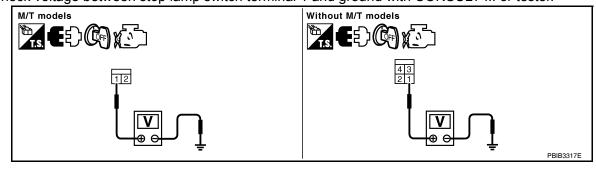
NG >> Replace ASCD clutch switch.

# 11. 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 13.

NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M69, E7
- 10A fuse

# ASCD BRAKE SWITCH

## < SERVICE INFOMATION >

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- 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.

# 13.check stop lamp switch input signal circuit for open and short

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 99 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 14

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

# 14. CHECK STOP LAMP SWITCH

Refer to EC-914, "Component Inspection".

#### OK or NG

OK >> GO TO 15.

NG >> Replace stop lamp switch.

# 15. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

## >> INSPECTION END

# Component Inspection

## ASCD BRAKE SWITCH

- 1. Turn ignition switch OFF.
- 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.

If NG, adjust ASCD brake switch installation, refer to BR-6, and perform step 3 again.

# SEC023D

#### ASCD CLUTCH SWITCH

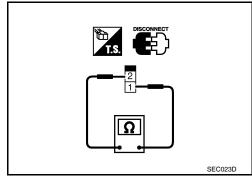
- Turn ignition switch OFF.
- Disconnect ASCD clutch switch harness connector.

## < SERVICE INFOMATION >

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

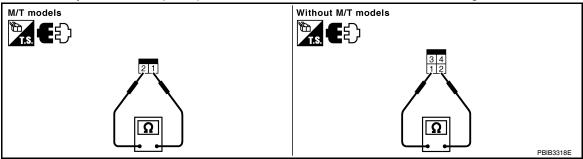
Condition	Continuity
Clutch pedal: Fully released.	Should exist.
Clutch pedal: Slightly depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to <u>CL-5</u>, 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.

If NG, adjust stop lamp switch installation, refer to BR-6, and perform step 3 again.

< SERVICE INFOMATION > [MR TYPE 1]

# **ASCD INDICATOR**

# Component Description

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.

CRUISE indicator illuminates when MAIN switch on ASCD steering switch is turned ON to indicate that ASCD system is ready for operation.

SET indicator illuminates when following conditions are met.

- · CRUISE indicator is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET indicator remains lit during ASCD control.

Refer to EC-524 for the ASCD function.

# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference value.

MONITOR ITEM	CONE	DITION	SPECIFICATION
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at 1st time → 2nd	$ON \rightarrow OFF$
OFTLAND	MAIN switch: ON	ASCD: Operating	ON
SET LAMP	<ul> <li>Vehicle: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Not operating	OFF

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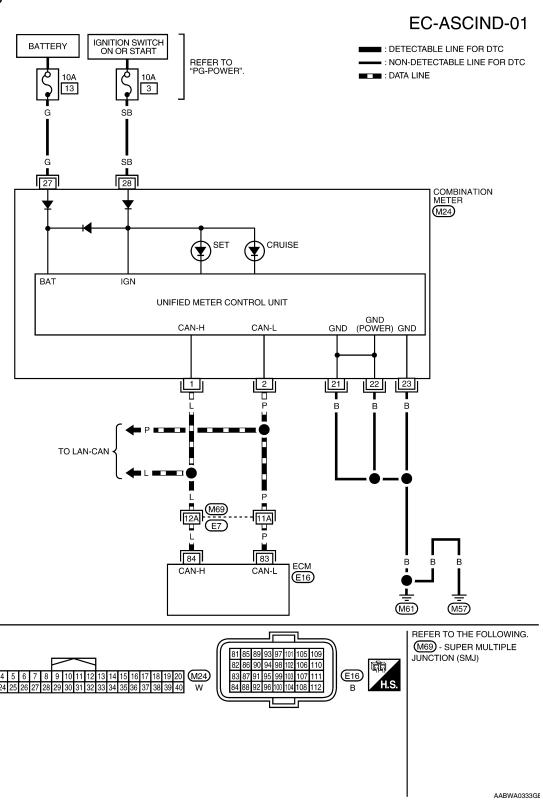
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Wiring Diagram

INFOID:0000000004537519



# Diagnosis Procedure

INFOID:0000000004537520

# 1. CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

# **ASCD INDICATOR**

< SERVICE INFOMATION >

[MR TYPE 1]

ASCD INDICATOR	CONE	DITION	SPECIFICATION	_
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at 1st time → 2nd	$ON \rightarrow OFF$	
	MAIN switch: ON	ASCD: Operating	ON	
SET LAMP	<ul> <li>Vehicle: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Not operating	OFF	
OK or NG				_
OK >> INSPECTION	END			
NG >> GO TO 2.				
CHECK DTC				
Check that DTC U1000 or	U1001 is not displayed.			
<u>es or No</u>				
Yes >> Perform troub No >> GO TO 3.	le diagnoses for DTC U1000	, U1001, refer to <u>EC-633</u> .		
3.CHECK COMBINATION	N METED ODEDATION			
Does combination meter o <u>′es or No</u>	perate normally?			
Yes >> GO TO 4.				
	nation meter circuit. Refer to	<u>DI-3</u> .		
$oldsymbol{1}.$ CHECK INTERMITTEN	IT INCIDENT			
Refer to EC-626.				_
>> INSPECTION	END			

# **ELECTRICAL LOAD SIGNAL**

# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537521

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd position.	ON
LOAD SIGNAL	rigilition switch. On	Rear window defogger switch is OFF and lighting switch is OFF.	OFF
HEATER FAN SW	Ignition switch: ON	Heater fan: Operating.	ON
TILATER FAIN SW	Ignition switch: ON	Heater fan: Not operating.	OFF

# Diagnosis Procedure

INFOID:0000000004537522

# 1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCITION-I

- 1. Turn ignition switch ON.
- 2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-III under the following conditions.

Condition	LOAD SIGNAL
Lighting switch: ON at 2nd position	ON
Lighting 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" in "DATA MONITOR" mode with CONSULT-III under the following conditions.

Condition	LOAD SIGNAL
Rear window defogger switch: ON	ON
Rear window defogger switch: OFF	OFF

#### OK or NG

OK >> GO TO 3.

NG >> GO TO 5.

# 3.check heater fan signal circuit overall function

Check "HEATER FAN SW" in "DATA MONITOR" mode with CONSULT-III under the following conditions.

Condition	LOAD SIGNAL
Heater fan control switch: ON	ON
Heater fan control switch: OFF	OFF

# OK or NG

OK >> INSPECTION END.

NG >> GO TO 6.

# 4. CHECK HEADLAMP SYSTEM

Refer to LT-4 or LT-25.

#### >> INSPECTION END

# 5. CHECK REAR WINDOW DEFOGGER SYSTEM

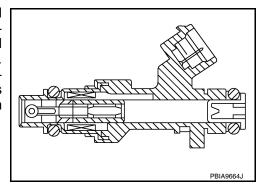
ELECTRICAL LOAD SIGNAL		
< SERVICE INFOMATION >	[MR TYPE 1]	
Refer to GW-51.	А	
>> INSPECTION END	, , , , , , , , , , , , , , , , , , ,	
6.CHECK HEATER FAN CONTROL SYSTEM	EC	
Refer to MTC-22.		
>> INSPECTION END	C	
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INFOID:0000000004537523

# **FUEL INJECTOR**

# **Component Description**

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

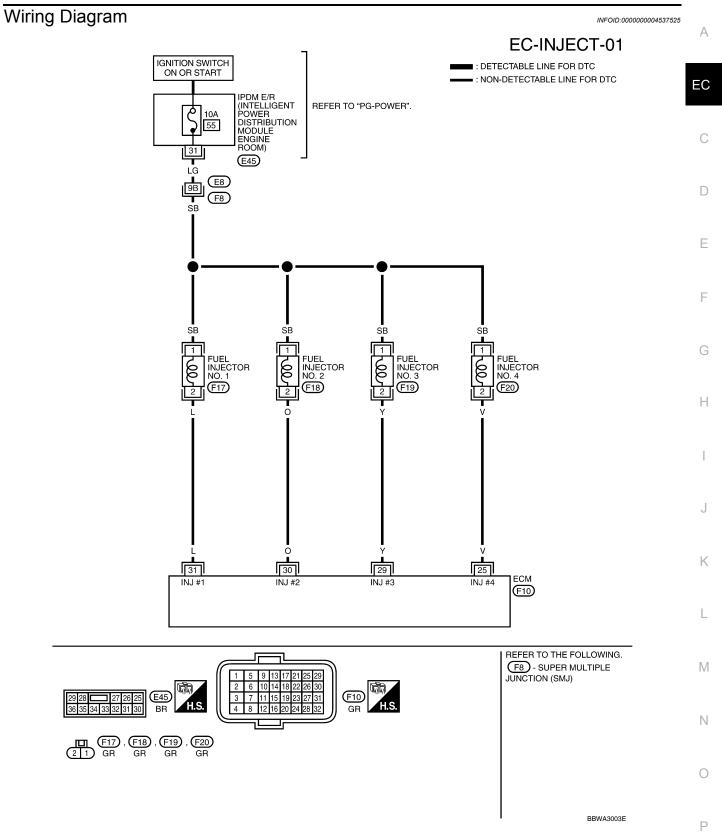


# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004537524

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	See <u>EC-618</u> .		
	Engine: After warming up	Idle	2.0 - 3.0 msec
INJ PULSE-B1	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,000 rpm	1.9 - 2.9 msec



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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25 29	V	Fuel injector No. 4 Fuel injector No. 3	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	BATTERY VOLTAGE (11 - 14V)
30 31	O L	Fuel injector No. 2 Fuel injector No. 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  >>> 10.0 V/Div 50 ms/Div T  PBIA4943J

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004537526

# 1.INSPECTION START

Turn ignition switch to START.

#### Is any cylinder ignited?

#### Yes or No

Yes >> GO TO 2. No >> GO TO 3.

# 2.CHECK OVERALL FUNCTION

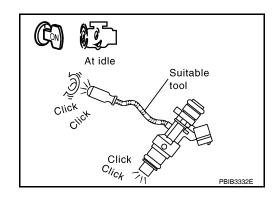
#### With CONSULT-III

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

# Without CONSULT-III

- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

Clicking noise should be heard.



#### OK or NG

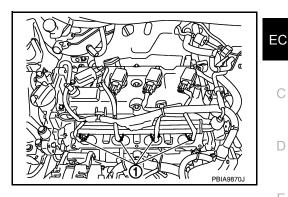
OK >> INSPECTION END

NG >> GO TO 3.

[MR TYPE 1] < SERVICE INFOMATION >

# 3. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect fuel injector (1) harness connector.
- Turn ignition switch ON.

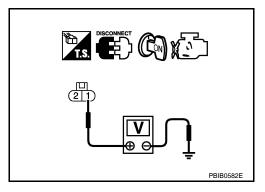


Check voltage between fuel injector terminal 1 and ground with CONSULT-III or tester.

## Voltage: Battery voltage

#### OK or NG

OK >> GO TO 5. NG >> GO TO 4.



# 4. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- IPDM E/R harness connector E45
- 10A 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between fuel injector terminal 2 and ECM terminals 25, 29, 30, 31. 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-990, "Component Inspection".

## OK or NG

OK >> GO TO 7.

NG >> Replace fuel injector.

# .CHECK INTERMITTENT INCIDENT

Refer to EC-626.

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## >> INSPECTION END

# **Component Inspection**

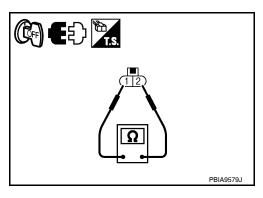
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# **FUEL INJECTOR**

- 1. Disconnect fuel injector harness connector.
- 2. Check resistance between terminals as shown in the figure.

Resistance:  $11.1 - 14.5\Omega$  [at  $10 - 60^{\circ}$ C ( $50 - 140^{\circ}$ F)]

3. If NG, replace fuel injector.



# Removal and Installation

INFOID:0000000004537528

FUEL INJECTOR Refer to EM-156.

# **FUEL PUMP**

Description INFOID:0000000004537529

#### 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*		

<sup>\*:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

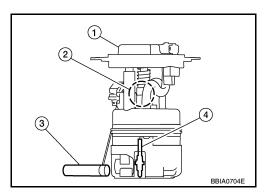
The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump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

Condition	Fuel pump operation	
Ignition switch is turned to ON	Operates for 1 second	
Engine running and cranking	Operates	
Engine: 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 level sensor (3)
- Fuel tank temperature sensor (4)



## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	<ul><li>For 1 second after turning ignition switch ON</li><li>Engine running or cranking</li></ul>	ON
	Except above conditions	OFF

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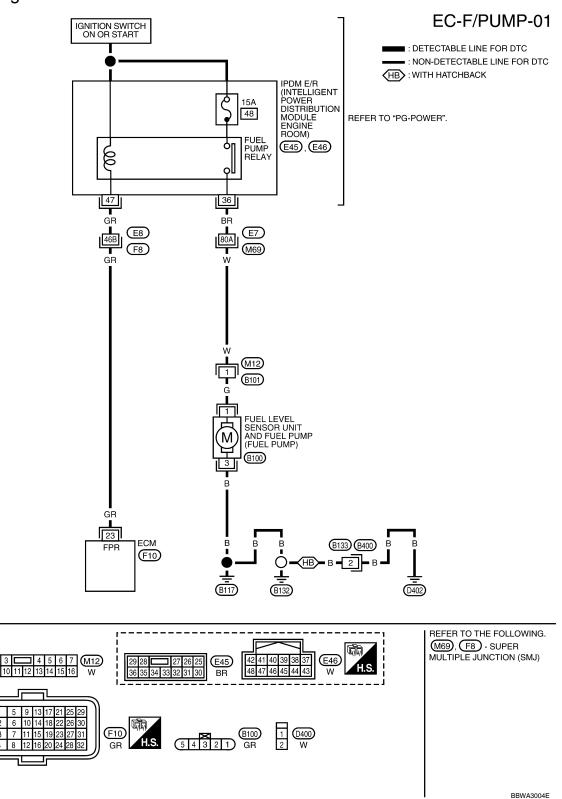
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# Wiring Diagram

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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

#### [MR TYPE 1]

#### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23 GR	Fuel nump relev	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0V	
23	GIX	Fuel pump relay	[Ignition switch: ON]  • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

INFOID:0000000004537532

# 1. CHECK OVERALL FUNCTION

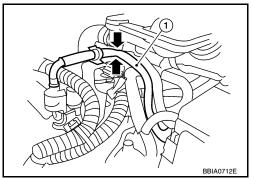
- Turn ignition switch ON.
- Pinch fuel feed hose (1) with two fingers.
- Illustration shows the view with intake air duct removed.

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.



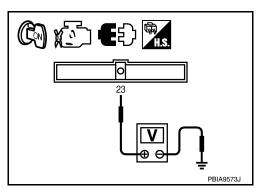
# 2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- Check voltage between ECM terminal 23 and ground with CON-SULT-III or tester.

# Voltage: Battery voltage

## OK or NG

OK >> GO TO 5. NG >> GO TO 3.



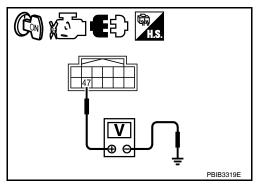
# 3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector E46.
- Turn ignition switch ON. 3.
- 4. Check voltage between IPDM E/R terminal 47 and ground with CONSULT-III or tester.

## Voltage: Battery voltage

## OK or NG

OK >> GO TO 4. NG >> GO TO 11.



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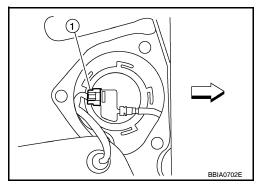
# 4. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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-III

- 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 inspection hole cover removed.
- 4. Turn ignition switch ON.

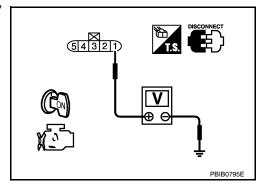


5. Check voltage between "fuel level sensor unit and fuel pump" terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage should exist for 1 second after ignition switch is turned ON.

#### OK or NG

OK >> GO TO 9. NG >> GO TO 6.



# 6. CHECK 15A FUSE

- 1. Turn ignition switch OFF.
- 2. Disconnect 15A fuse.
- 3. Check 15A fuse.

# OK or NG

OK >> GO TO 7.

NG >> Replace fuse.

# 7.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

- 1. Disconnect IPDM E/R harness connector E45.
- 2. Check harness continuity between IPDM E/R terminal 36 and "fuel level sensor unit and fuel pump" 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 11.

NG >> GO TO 8.

# 8. DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness connectors M69, E7
- · Harness connectors M12, B101

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- Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 9. CHECK FUEL PUMP GROUND CIRCUIT

Check harness continuity between "fuel level sensor unit and fuel pump" terminal 3 and ground. Refer to Wiring Diagram.

# Continuity should exist.

Also check harness for short to power.

#### OK or NG

OK >> GO TO 10.

NG >> Repair or replace harness or connectors.

# 10. CHECK FUEL PUMP

Refer to EC-995, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> Replace fuel pump.

# 11. CHECK INTERMITTENT INCIDENT

# Refer to EC-626.

## 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.

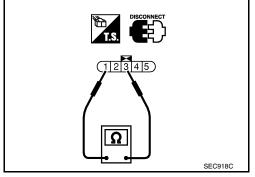
# Component Inspection

#### **FUEL PUMP**

- 1. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- Check resistance between "fuel level sensor unit and fuel pump" terminals 1 and 3.

## Resistance: Approximately 0.2 - 5.0 $\Omega$ [at 25°C (77°F)]

If NG, replace "fuel level sensor unit and fuel pump".



## Removal and Installation

**FUEL PUMP** 

Refer to FL-5.

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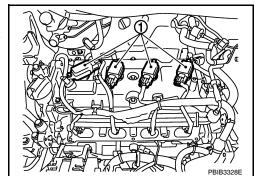
# **IGNITION SIGNAL**

# **Component Description**

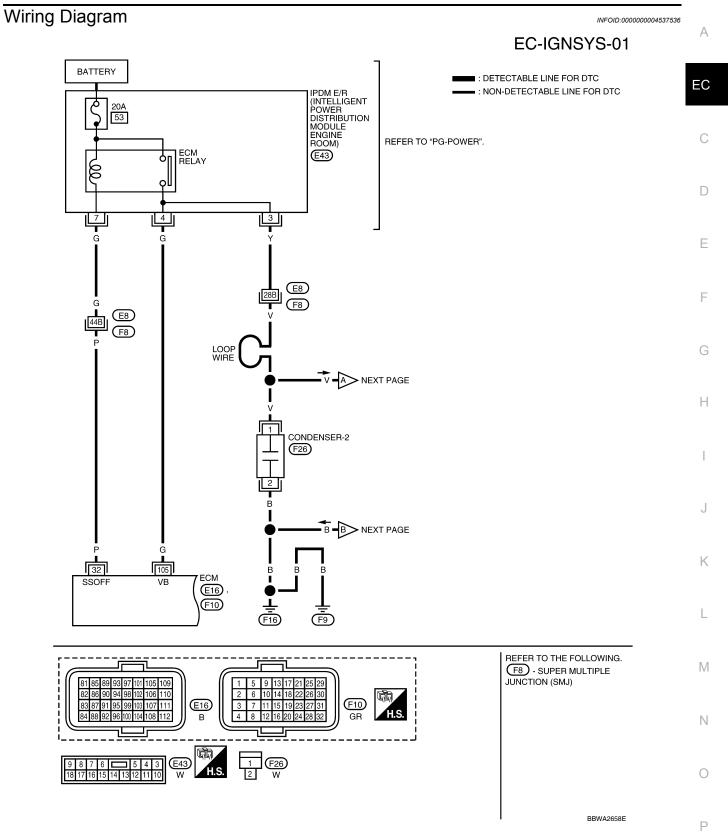
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# **IGNITION COIL & POWER TRANSISTOR**

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 (1) primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.







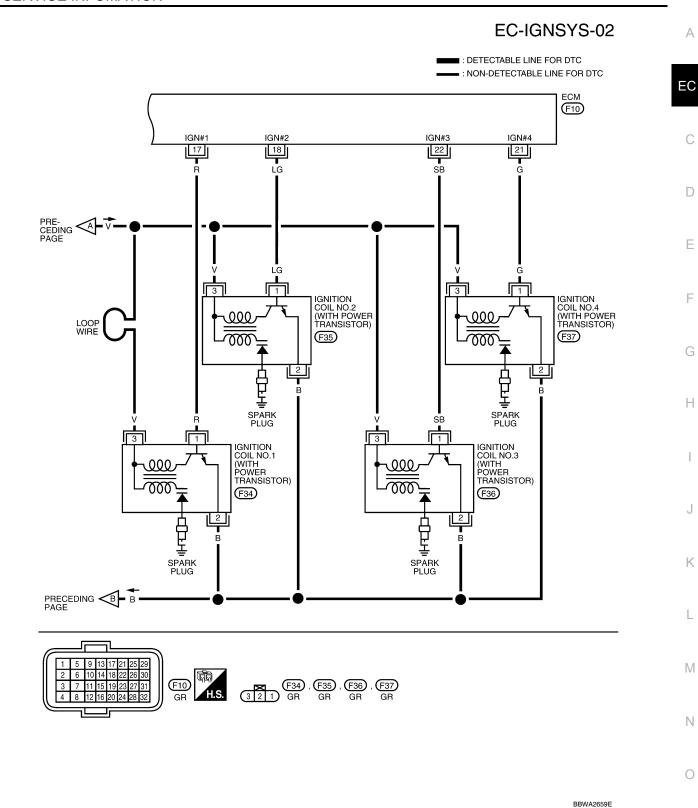
Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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

# < SERVICE INFOMATION >

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32 P	ECM relay	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V	
		(Self shut-off)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

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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.

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17 18 21 22	R LG G SB	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 4 Ignition signal No. 3	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	0 - 0.3V
			[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	0.2 - 0.5V  2.0 V/Div 50 ms/Div T  PBIA9266J

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

# Diagnosis Procedure

INFOID:0000000004537537

# 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

- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- Make sure that each circuit produces a momentary engine speed drop.

## OK or NG

OK >> INSPECTION END

NG >> GO TO 10.

# 3.check overall function

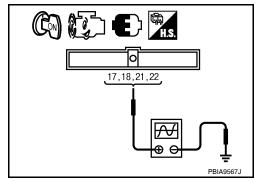
## Without CONSULT-III

- 1. Let engine idle.
- Read the voltage signal between ECM terminals 17, 18, 21, 22 and ground with an oscilloscope.
- Verify that the oscilloscope screen shows the signal wave as shown below.

#### NOTE:

The pulse cycle changes depending on rpm at idle.





PBIA9265J

## < SERVICE INFOMATION >

OK >> INSPECTION END

NG >> GO TO 10.

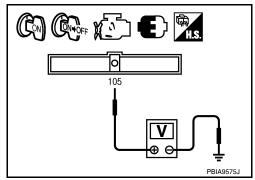
# 4.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- 2. Check voltage between ECM terminal 105 and ground with CONSULT-III or tester.

# Voltage: Battery voltage

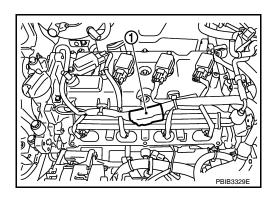
## OK or NG

OK >> GO TO 5. NG >> Go to <u>EC-627</u>.



# 5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect condenser-2 (1) harness connector.
- Turn ignition switch ON.

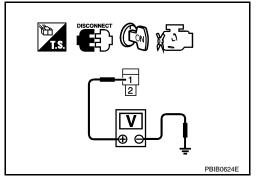


Check voltage between condenser-2 terminal 1 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

# OK or NG

OK >> GO TO 8. NG >> GO TO 6.



# 6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector E43. 2.
- Check harness continuity between IPDM E/R terminal 3 and condenser-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 <u>EC-627</u>.

NG >> GO TO 7.

# .DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E8, F8

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- · Harness for open or short between IPDM E/R and condenser-2
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# $8.\mathsf{CHECK}$ CONDENSER-2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Check harness continuity between condenser-2 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-2

### Refer to EC-1003, "Component Inspection"

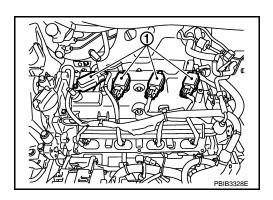
# OK or NG

OK >> GO TO 10.

NG >> Replace condenser-2.

# 10. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect ignition coil (1) harness connector.
- 4. Turn ignition switch ON.

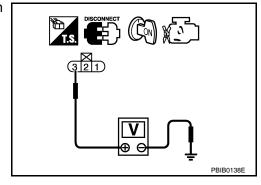


Check voltage between ignition coil terminal 3 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 12. NG >> GO TO 11.



# 11. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connector F8
- Harness for open or short between ignition coil and harness connector F8
  - >> Repair or replace harness or connectors.

# 12. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

< SERVICE INFOMATION > [MR TYPE 1]

Check harness continuity between ignition coil terminal 2 and ground. Refer to Wiring Diagram.

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## Continuity should exist.

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.

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# 13.check ignition coil output signal circuit for open and short

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminals 17, 18, 21, 22 and ignition coil terminal 1. Refer to Wiring Diagram.

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# **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.

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# 14. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1003, "Component Inspection".

#### OK or NG

OK >> GO TO 15.

NG >> Replace ignition coil with power transistor.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-626.

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004537538

#### IGNITION COIL WITH POWER TRANSISTOR

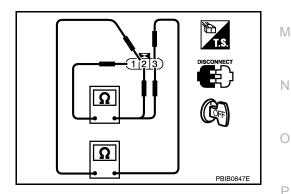
#### **CAUTION:**

Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- Disconnect ignition coil harness connector.
- 3. Check resistance between ignition coil terminals as follows.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]	
1 and 2	Except 0 or ∞	
1 and 3	Except 0	
2 and 3		

- 4. If NG, replace ignition coil with power transistor. If OK, go to next step.
- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.



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**EC-1003** 

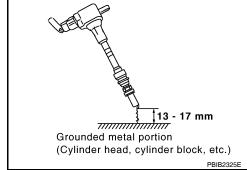
#### < SERVICE INFOMATION >

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.

- : Vehicle front
- 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.
- Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



## Spark should be generated.

#### **CAUTION:**

- Do not approach to the spark plug and the ignition coil within 50cm. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm is taken. NOTE:

When the gap is less than 13 mm, the spark might be generated even if the coil is malfunctioning.

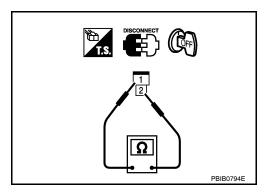
17. If NG, replace ignition coil with power transistor.

#### **CONDENSER-2**

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser-2 harness connector.
- 3. Check resistance between condenser-2 terminals 1 and 2.

#### Resistance: Above 1 M $\Omega$ [at 25°C (77°F)]

4. If NG, replace condenser-2.



Removal and Installation

INFOID:0000000004537539

IGNITION COIL WITH POWER TRANSISTOR Refer to EM-153.

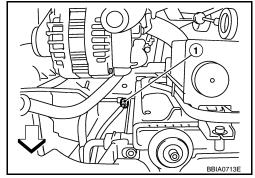
INFOID:0000000004537540

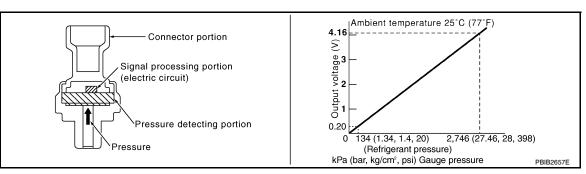
# REFRIGERANT PRESSURE SENSOR

# **Component Description**

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.

• : Vehicle front





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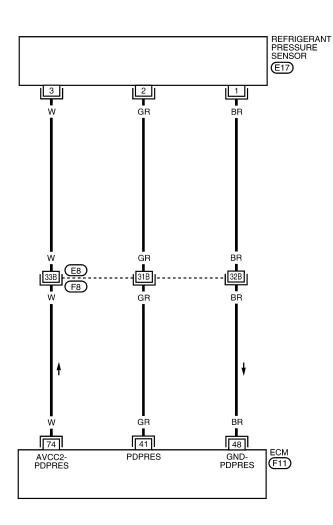
0

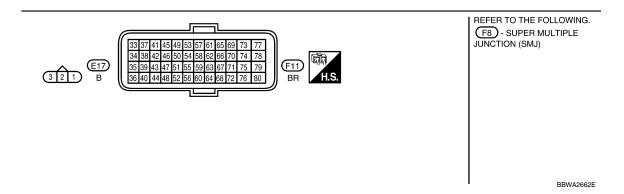
Wiring Diagram

INFOID:0000000004537541

# EC-RP/SEN-01

: DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC





Specification data are reference values and are measured between each terminal and ground.

# **CAUTION:**

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

## REFRIGERANT PRESSURE SENSOR

< SERVICE INFOMATION >

[MR TYPE 1]

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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
41	GR	Refrigerant pressure sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan switch: ON (Compressor operates)</li> </ul>	1.0 - 4.0V	
48	BR	Sensor ground (Refrigerant pressure sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	_
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V	_

# Diagnosis Procedure

INFOID:0000000004537542

# 1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

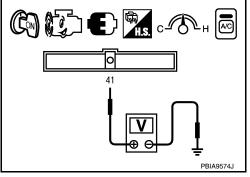
- Start engine and warm it up to normal operating temperature.
- Turn A/C switch and blower fan switch ON. 2.
- Check voltage between ECM terminal 41 and ground with CON-SULT-III or tester.

Voltage: 1.0 - 4.0V

# OK or NG

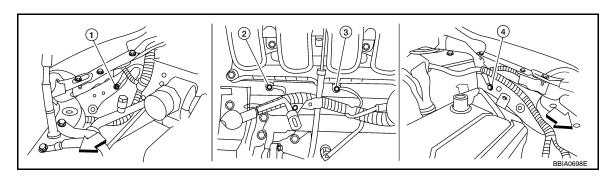
OK >> INSPECTION END

NG >> GO TO 2.



# 2. CHECK GROUND CONNECTIONS

- Turn A/C switch and blower fan switch OFF.
- Stop engine and turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to EC-632, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

# OK or NG

OK >> GO TO 3.

NG >> Repair or replace ground connections.

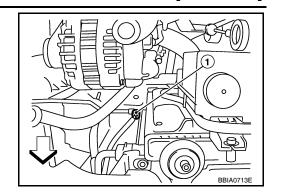
3.check refrigerant pressure sensor power supply circuit

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# [MR TYPE 1]

- < SERVICE INFOMATION >
- Disconnect refrigerant pressure sensor (1) harness connector.
- : Vehicle front
- 2. Turn ignition switch ON.

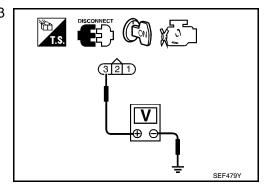


3. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-III or tester.

## **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 5. NG >> GO TO 4.



# 4. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- · Harness for open or short between refrigerant pressure sensor and ECM
  - >> 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.
- Check harness continuity between refrigerant pressure sensor terminal 1 and ECM terminal 48.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 E8, F8
- Harness for open or short between refrigerant pressure sensor and ECM
  - >> 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

Check harness continuity between refrigerant pressure sensor terminal 2 and ECM terminal 41.
 Refer to Wiring Diagram.

#### Continuity should exist.

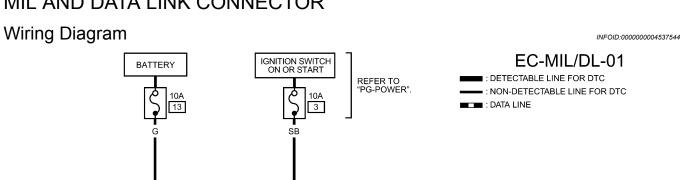
2. Also check harness for short to ground and short to power.

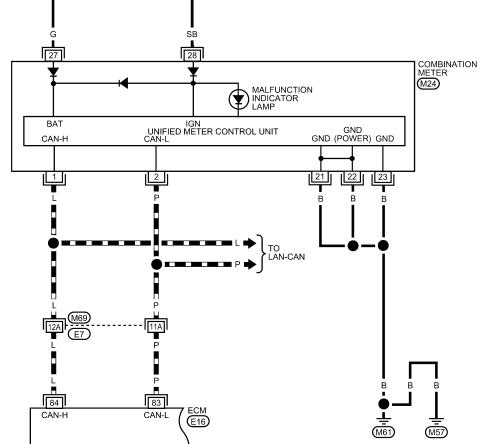
#### OK or NG

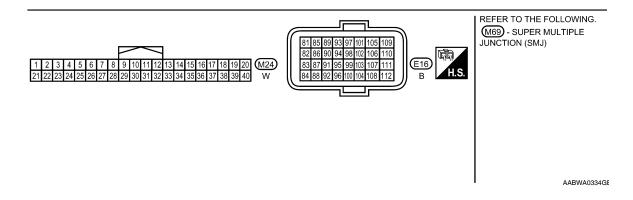
### REFRIGERANT PRESSURE SENSOR

REFRIGERANT PRESSURE SENSOR		
< SERVICE INFOMATION >	[MR TYPE 1]	
OK >> GO TO 9. NG >> GO TO 8.		۸
8. DETECT MALFUNCTIONING PART		А
Check the following.		F0
<ul> <li>Harness connectors E8, F8</li> <li>Harness for open or short between refrigerant pressure sensor and ECM</li> </ul>		EC
riamess for open of short between reingerant pressure senser and Lewi		
>> Repair open circuit or short to ground or short to power in harness or connectors.		С
9.CHECK INTERMITTENT INCIDENT		
Refer to EC-626.  OK or NG		D
OK >> Replace refrigerant pressure sensor.		_
NG >> Repair or replace.		Е
Removal and Installation	INFOID:0000000004537543	_
REFRIGERANT PRESSURE SENSOR		F
Refer to MTC-83, "Removal and Installation of Refrigerant Pressure Sensor".		
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### MIL AND DATA LINK CONNECTOR





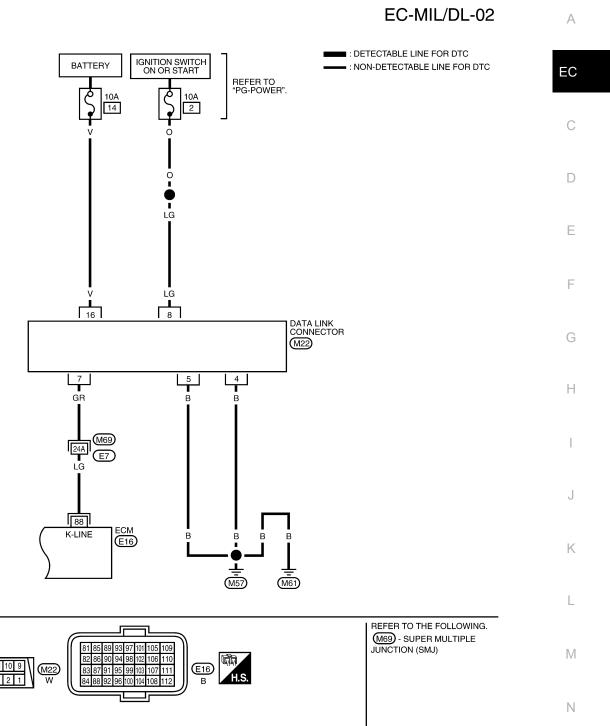


### [MR TYPE 1]

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BBWA2998E



EC-1011

## SERVICE DATA AND SPECIFICATIONS (SDS)

Fuel Pressure

Fuel pressure at idle	Approximately 350 kPa (3.57 kg/cm <sup>2</sup> , 51 psi)

## Idle Speed and Ignition Timing

INFOID:0000000004537546

	A/T	No load* (in P or N position)	
Target idle speed	CVT	No load* (In P or N position)	$700\pm50~\mathrm{rpm}$
	M/T	No load* (in Neutral position)	
	A/T	In P or N position	
Air conditioner: ON	CVT	In P or N position	850 rpm or more
	M/T	In Neutral position	
	A/T	In P or N position	
Ignition timing	CVT	In P or N position	13 ± 5° BTDC
	M/T	In Neutral position	

<sup>\*:</sup> 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:0000000004537547

	Calculated load value% (Using CONSULT-III or GST)	
At idle	10 - 35	
At 2,500 rpm	10 - 35	

### Mass Air Flow Sensor

INFOID:0000000004537548

Supply voltage	Battery voltage (11 - 14V)	
Output voltage at idle	1.0 - 1.3*V	
Mass air flow (Using CONSULT-III or GST)	1.0 - 4.0 g·m/sec at idle* 2.0 - 10.0 g·m/sec at 2,500 rpm*	

<sup>\*:</sup> Engine is warmed up to normal operating temperature and running under no load.

## Intake Air Temperature Sensor

INFOID:0000000004537549

Temperature °C (°F)	Resistance kΩ	
25 (77)	1.800 - 2.200	

## Engine Coolant Temperature Sensor

INFOID:0000000004537550

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

# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE INFOMATION >	[MR TYPE 1]	
Air Fuel Ratio (A/F) Sensor 1 Heater	INFOID:000000004537551	А
Resistance [at 25°C (77°F)]	1.8 - 2.44Ω	
Heated Oxygen sensor 2 Heater	INFOID:000000004537552	EC
Resistance [at 25°C (77°F)]	3.4 - 4.4Ω	С
Crankshaft Position Sensor (POS)	INFOID:000000004537553	
Refer to EC-780, "Component Inspection".		D
Camshaft Position Sensor (PHASE)	INFOID:000000004537554	
Refer to EC-785, "Component Inspection".		Е
Throttle Control Motor	INFOID:000000004537555	_
Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω	F
Fuel Injector	INFOID:000000004537556	G
Resistance [at 10 - 60°C (50 - 140°F)]	11.4 - 14.5Ω	Н
Fuel Pump	INFOID:000000004537557	
Resistance [at 25°C (77°F)]	Approximately 0.2 - 5.0Ω	

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# **SERVICE INFOMATION**

## **APPLICATION NOTICE**

## How to Check Vehicle Type

INFOID:0000000004538071

Check the vehicle serial number to confirm the service information in EC section.

Vehicle serial number	Service information
Up to serial 386333	MR TYPE 1
From serial 386334	MR TYPE 2

### **INDEX FOR DTC**

U0101-U1001 INFOID:0000000004499897

DTC	C*1	Itomo	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
U0101	0101* <sup>4</sup>	LOST COMM (TCM)	EC-1145
U0140	0140* <sup>4</sup>	LOST COMM (BCM)	EC-1147
U1001	1001* <sup>4</sup>	CAN COMM CIRCUIT	EC-1149

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0011-P0075 INFOID:0000000004806544

DT	DTC*1		
CONSULT-III GST* <sup>2</sup>	ECM*3	Items (CONSULT-III screen terms)	Reference
P0011	0011	INT/V TIM CONT-B1	EC-1151
P0031	0031	A/F SEN1 HTR (B1)	EC-1155
P0032	0032	A/F SEN1 HTR (B1)	EC-1155
P0037	0037	HO2S2 HTR (B1)	EC-1160
P0038	0038	HO2S2 HTR (B1)	EC-1160
P0075	0075	INT/V TIM V/CIR-B1	EC-1165

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0101-P0128 INFOID:0000000004806556

DTO	C*1	Harris	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P0101	0101	MAF SEN/CIRCUIT-B1	EC-1170
P0102	0102	MAF SEN/CIRCUIT-B1	EC-1178
P0103	0103	MAF SEN/CIRCUIT-B1	EC-1178
P0112	0112	IAT SEN/CIRCUIT-B1	EC-1185
P0113	0113	IAT SEN/CIRCUIT-B1	EC-1185
P0116	0116	ECT SEN/CIRC	EC-1189
P0117	0117	ECT SEN/CIRC	EC-1189
P0118	0118	ECT SEN/CIRC	EC-1189
P0122	0122	TP SEN 2/CIRC-B1	EC-1197
P0123	0123	TP SEN 2/CIRC-B1	EC-1197
P0125	0125	ECT SENSOR	EC-1202

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<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*4:</sup> The troubleshooting for this DTC needs CONSULT-III.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

DTC*1		Items	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	(CONSULT-III screen terms)	Reference
P0127	0127	IAT SENSOR-B1	EC-1205
P0128	0128	THERMSTAT FNCTN	EC-1208

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0130-P0183

INFOID:0000000004806554

DTC	C*1	Home	
CONSULT-III GST* <sup>2</sup>	ECM*3	ltems (CONSULT-III screen terms)	Reference
P0130	0130	A/F SENSOR1 (B1)	EC-1210
P0131	0131	A/F SENSOR1 (B1)	EC-1216
P0132	0132	A/F SENSOR1 (B1)	EC-1222
P0133	0133	A/F SENSOR1 (B1)	EC-1228
P0137	0137	HO2S2 (B1)	EC-1235
P0138	0138	HO2S2 (B1)	EC-1242
P0139	0139	HO2S2 (B1)	EC-1251
P0171	0171	FUEL SYS-LEAN-B1	EC-1258
P0172	0172	FUEL SYS-RICH-B1	EC-1264
P0181	0181	FTT SENSOR	EC-1270
P0182	0182	FTT SEN/CIRCUIT	EC-1274
P0183	0183	FTT SEN/CIRCUIT	EC-1274

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0222-P0420

INFOID:0000000004806555

DTC	C*1	ltama	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P0222	0222	TP SEN 1/CIRC-B1	EC-1278
P0223	0223	TP SEN 1/CIRC-B1	EC-1278
P0300	0300	MULTI CYL MISFIRE	EC-1283
P0301	0301	CYL 1 MISFIRE	EC-1283
P0302	0302	CYL 2 MISFIRE	EC-1283
P0303	0303	CYL 3 MISFIRE	EC-1283
P0304	0304	CYL 4 MISFIRE	EC-1283
P0327	0327	KNOCK SEN/CIRC-B1	EC-1289
P0328	0328	KNOCK SEN/CIRC-B1	EC-1289
P0335	0335	CKP SEN/CIRCUIT	EC-1293
P0340	0340	CMP SEN/CIRC-B1	EC-1299
P0420	0420	TW CATALYST SYS-B1	EC-1305

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

[MR TYPE 2]

- \*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-P0463

DTC*	1	W	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P0441	0441	EVAP PURG FLOW/MON	EC-1310
P0442	0442	EVAP SMALL LEAK	EC-1315
P0443	0443	PURG VOLUME CONT/V	EC-1322
P0444	0444	PURG VOLUME CONT/V	EC-1330
P0445	0445	PURG VOLUME CONT/V	EC-1330
P0447	0447	VENT CONTROL VALVE	EC-1336
P0448	0448	VENT CONTROL VALVE	EC-1342
P0451	0451	EVAP SYS PRES SEN	EC-1348
P0452	0452	EVAP SYS PRES SEN	EC-1351
P0453	0453	EVAP SYS PRES SEN	EC-1358
P0455	0455	EVAP GROSS LEAK	EC-1366
P0456	0456	EVAP VERY SML LEAK	EC-1373
P0460	0460	FUEL LEV SEN SLOSH	EC-1381
P0461	0461	FUEL LEVEL SENSOR	EC-1383
P0462	0462	FUEL LEVL SEN/CIRC	EC-1385
P0463	0463	FUEL LEVL SEN/CIRC	EC-1385

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0500-P0643

DTC*1			
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P0500	0500	VEH SPEED SEN/CIRC	EC-1387
P0506	0506	ISC SYSTEM	EC-1389
P0507	0507	ISC SYSTEM	EC-1391
P0605	0605	ECM	EC-1393
P0607	0607	ECM	EC-1395
P0643	0643	SENSOR POWER/CIRC	EC-1396

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

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<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

P0705-P0734

DTC*1			
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P0705	0705	PNP SW/CIRC	<u>AT-91</u> (A/T) <u>CVT-244</u> (CVT)
P0710	0710	ATF TEMP SEN/CIRC*4	<u>AT-96</u> (A/T) <u>CVT-249</u> (CVT)
P0715	0715	INPUT SPD SEN/CIRC	<u>CVT-254</u>
P0720	0720	VEH SPD SEN/CIR AT	<u>AT-101</u> (A/T) <u>CVT-258</u> (CVT)
P0725	0725	ENGINE SPEED SIG	<u>AT-106</u>
P0731	0731	A/T 1ST GR FNCTN*4	<u>AT-110</u>
P0732	0732	A/T 2ND GR FNCTN*4	<u>AT-113</u>
P0733	0733	A/T 3RD GR FNCTN*4	<u>AT-116</u>
P0734	0734	A/T 4TH GR FNCTN* <sup>4</sup>	<u>AT-119</u>

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P0740-P0840

DTC*1		ltomo	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P0740	0740	TCC SOLENOID/CIRC	AT-124 (A/T) CVT-266 (CVT)
P0744	0744	A/T TCC S/V FNCTN	<u>AT-129</u> (A/T) <u>CVT-271</u> (CVT)
P0745	0745	L/PRESS SOL/CIRC	AT-134 (A/T) CVT-273 (CVT)
P0746	0746	PRS CNT SOL/A FCTN	<u>CVT-278</u>
P0750	0750	SFT SOL A/CIRC	<u>AT-139</u>
P0755	0755	SFT SOL B/CIRC	<u>AT-144</u>
P0776	0776	PRS CNT SOL/B FCTN	<u>CVT-280</u>
P0778	0778	PRS CNT SOL/B CIRC	<u>CVT-282</u>
P0840	0840	TR PRS SENS/A CIRC	<u>CVT-287</u>

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*3:</sup> When erasing this DTC, always use CONSULT-III or GST.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

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DTC*1		ltama	
CONSULT-III GST* <sup>2</sup>	ECM*3	Items (CONSULT-III screen terms)	Reference
P0850	0850	P-N POS SW/CIRCUIT	EC-1401
P1148	1148	CLOSED LOOP-B1	EC-1407
P1217	1217	ENG OVER TEMP	EC-1408
P1225	1225	CTP LEARNING-B1	EC-1417
P1226	1226	CTP LEARNING-B1	EC-1419
P1421	1421	COLD START CONTROL	EC-1421
P1564	1564	ASCD SW	EC-1423
P1572	1572	ASCD BRAKE SW	EC-1429
P1574	1574	ASCD VHL SPD SEN	EC-1438

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P1610-P1615

DTC*1		Harra	
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P1610	1610	LOCK MODE	BL-259
P1611	1611	ID DISCORD,IMMU-ECM	<u>BL-259</u>
P1612	1612	CHAIN OF ECM-IMMU	BL-259
P1614	1614	CHAIN OF IMMU-KEY	BL-259
P1615	1615	DIFFERENCE OF KEY	<u>BL-259</u>

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

P1715-P1805

DTC	C*1	Items (CONSULT-III screen terms)	Reference
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>		
P1715	1715	IN PULY SPEED	EC-1440 (A/T) EC-1441 (CVT)
P1740	1740	LU-SLCT SOL/CIRC	<u>CVT-306</u>
P1760	1760	O/R CLTCH SOL/CIRC	<u>AT-149</u>
P1777	1777	STEP MOTR CIRC	<u>CVT-311</u>
P1778	1778	STEP MOTR FNC	<u>CVT-315</u>
P1805	1805	BRAKE SW/CIRCUIT	EC-1443

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

<sup>\*2:</sup> This number is prescribed by SAE J2012.

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

P2100-P2A00

DTC	C*1		
CONSULT-III GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT-III screen terms)	Reference
P2100	2100	ETC MOT PWR-B1	EC-1447
P2101	2101	ETC FNCTN/CIRC-B1	EC-1451
P2103	2103	ETC MOT PWR	EC-1447
P2118	2118	ETC MOT-B1	EC-1457
P2119	2119	ETC ACTR-B1	EC-1462
P2122	2122	APP SEN 1/CIRC	EC-1464
P2123	2123	APP SEN 1/CIRC	EC-1464
P2127	2127	APP SEN 2/CIRC	EC-1469
P2128	2128	APP SEN 2/CIRC	EC-1469
P2135	2135	TP SENSOR-B1	EC-1476
P2138	2138	APP SENSOR	EC-1481
P2A00	2A00	A/F SENSOR1 (B1)	EC-1488

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

<sup>\*2:</sup> This number is prescribed by SAE J2012.

<sup>\*3:</sup> 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"

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 SYS-TEM" and "SEAT BELTS" of this Service Manual.

- 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.

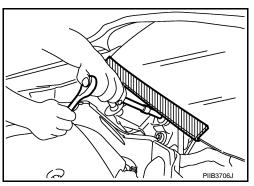
PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

#### **WARNING:**

- · When working near the Airbag Diagnosis Sensor Unit or other Airbag 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

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, CVT

The ECM has an on board diagnostic system. It will light up 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 battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.
- Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-64.
- 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 light up due to the short circuit.

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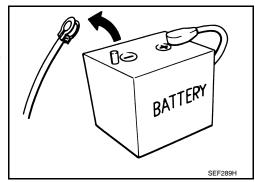
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- Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube
  may cause the MIL to light up due to the malfunction of the fuel injection system, etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

Precaution INFOID:000000004499902

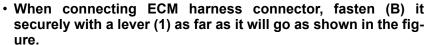
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage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



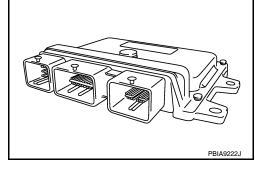
- · Do not disassemble ECM.
- If battery cable is disconnected, the memory will return to the initial ECM values.

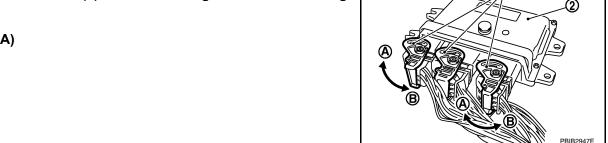
The ECM will now start to self-control at its initial values. Engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

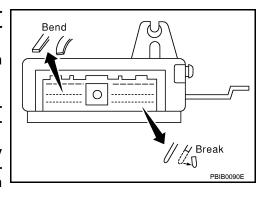


- ECM (2)
- Loosen (A)

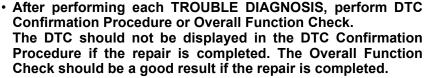


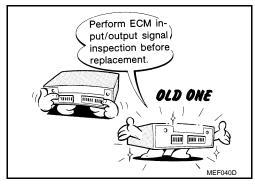


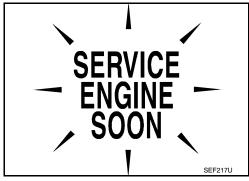
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).
  - Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
   A poor connection can cause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



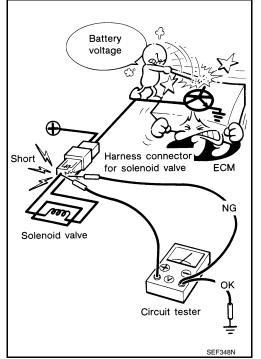
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-1109, "ECM Terminal and Reference Value".
- Handle mass air flow sensor carefully to avoid damage.
- · Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).







- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  - Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



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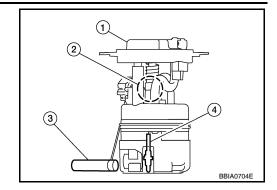
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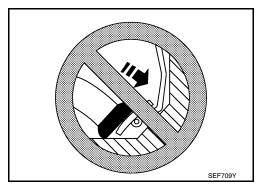
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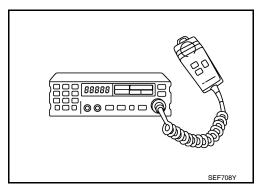
- · Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.
- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel level sensor (3)
- Fuel tank temperature sensor (4)



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



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



## **PREPARATION**

## Special Service Tool

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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	С
(J-44321)		Checking fuel pressure	
Fuel pressure gauge Kit			D
	LEC642		Е
(J-44321-6) Fuel pressure adapter		Connecting fuel pressure gauge to quick connector type fuel lines.	F
			G
	LBIA0376E		
KV10118400 Fuel tube adapter		Measuring fuel pressure	Н
r del tabe deapter			I
	PBIB3043E		J

### **Commercial Service Tool**

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Tool number (Kent-Moore No.) Tool name		Description	L
Leak detector i.e.: (J-41416)	S-NT703	Locating the EVAP leak	M
EVAP service port adapter i.e.: (J-41413-OBD)		Applying positive pressure through EVAP service port	0
(* 655)			Ρ
	S-NT704		

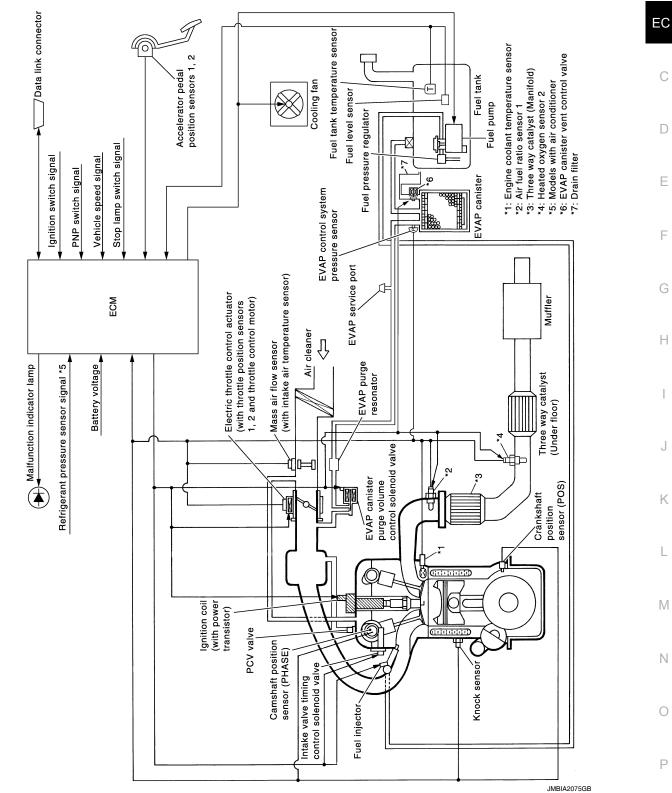
SERVICE INFOMATION	JN >	[10111 111 2 2
Tool number (Kent-Moore No.) Tool name		Description
Fuel filler cap adapter i.e.: (MLR-8382)		Checking fuel tank vacuum relief valve opening pressure
Socket wrench	19 mm (0.75 in) More than 32 mm (1.26 in)	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	Mating surface shave cylinder	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with antiseize 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 <sup>TM</sup> 133AR or equivalent meeting MIL specifica- tion MIL-A-907)	S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

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### **ENGINE CONTROL SYSTEM**

Schematic



Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position	-	
Accelerator pedal position sensor	Accelerator pedal position	Fuel injection & mixture ratio Fuel injector	
Park/neutral position (PNP) switch	Gear position		Fuel injector
Battery	Battery voltage*3	control	<b>,</b>
Knock sensor	Engine knocking condition		
EPS control unit	Power steering operation*2		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
Air conditioner switch	Air conditioner operation*2		
ABS actuator and electric unit (control unit)	Val. 1 1 + 2		
Combination meter	Vehicle speed* <sup>2</sup>		

<sup>\*1:</sup> This sensor is not used to control the engine system under normal conditions.

#### SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

#### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

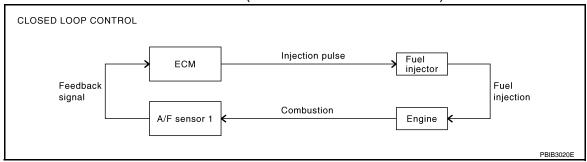
### <Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D (A/T and CVT models)
- · High-load, high-speed operation

#### <Fuel decrease>

- During deceleration
- · During high engine speed operation

### MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



<sup>\*2:</sup> This signal is sent to the ECM through CAN communication line.

<sup>\*3:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

#### < SERVICE INFOMATION >

The mixture ratio feedback system provides the best air/fuel mixture ratio for drivability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses air fuel ratio (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 air fuel ratio (A/F) sensor 1, refer to EC-1210. 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 air fuel ratio (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 air fuel ratio (A/F) sensor 1 or its circuit
- Insufficient activation of air fuel ratio (A/F) sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D (A/T and CVT models)
- When starting the engine

### MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from air fuel ratio (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.

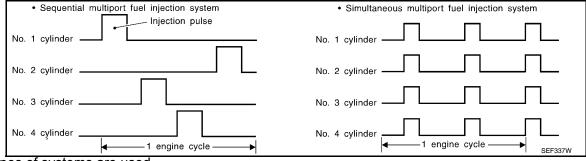
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"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 air fuel ratio (A/F) sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

#### FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The four fuel injectors will then receive the signals two times for each engine cycle.

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### < SERVICE INFOMATION >

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:0000000004499907

### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed* <sup>2</sup>		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position	Ignition timing control	Power transistor
Battery	Battery voltage*2	oom.or	
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
ABS actuator and electric unit (control unit)	Vehicle anad*1		
Combination meter	Vehicle speed*1		

<sup>\*1:</sup> This signal is sent to the ECM through CAN communication line.

### SYSTEM DESCRIPTION

Firing order: 1 - 3 - 4 - 2

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor (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:0000000004499908

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	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		Fuel injector
ABS actuator and electric unit (control unit)	Vehicle exced*		
Combination meter	Vehicle speed*		

<sup>\*2:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

### **ENGINE CONTROL SYSTEM**

### < SERVICE INFOMATION >

[MR TYPE 2]

### SYSTEM DESCRIPTION

If the engine speed is above 2,400 rpm under no load [for example, the shift lever position is P or N (A/T, CVT), Neutral (M/T) 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 <u>EC-1027</u>, "Multiport Fuel Injection (MFI) System".

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<sup>\*:</sup> This signal is sent to the ECM through CAN communication line.

[MR TYPE 2]

### AIR CONDITIONING CUT CONTROL

### Input/Output Signal Chart

INFOID:0000000004499909

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner ON signal*1		
Accelerator pedal position sensor	Accelerator pedal position		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed* <sup>2</sup>		
Engine coolant temperature sensor	Engine coolant temperature	Engine coolant temperature  Air conditioner	
Battery	Battery voltage*2	cut control	Air conditioner relay
Refrigerant pressure sensor	Refrigerant pressure		
EPS control unit	Power steering operation*1		
ABS actuator and electric unit (control unit)			
Combination meter	Vehicle speed*1		

<sup>\*1:</sup> This signal is sent to the ECM through CAN communication line.

### System Description

INFOID:0000000004499910

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.

<sup>\*2:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

### **AUTOMATIC SPEED CONTROL DEVICE (ASCD)**

[MR TYPE 2] < SERVICE INFOMATION >

## AUTOMATIC SPEED CONTROL DEVICE (ASCD)

## System Description

INFOID:0000000004499911

### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
ASCD brake switch	Brake pedal operation			
Stop lamp switch	Brake pedal operation			
ASCD clutch switch (M/T models)	Clutch pedal operation			
ASCD steering switch	ASCD steering switch operation	ASCD vehicle speed control	Electric throttle control actuator	
Park/neutral position (PNP) switch	Gear position			
ABS actuator and electric unit (control unit)	Vehicle speed*			
Combination meter				
TCM	Powertrain revolution*			

<sup>\*:</sup> 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 indicator and SET indicator in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.

#### NOTE:

Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws.

#### SET OPERATION

Press MAIN switch. (The CRUISE indicator in combination meter illuminates.)

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET/COAST switch. (Then SET indicator in combination meter illuminates.)

### **ACCELERATE OPERATION**

If the RESUME/ACCELERATE switch is depressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system. And then ASCD will keep the new set speed.

#### CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- More than two switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to the neutral position (M/T models)
- Selector lever is changed to N, P, R position (A/T and CVT models)
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE lamp may blink slowly.
  - When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by pressing SET/COAST switch or RESUME/ ACCELERATE switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET lamp will blink quickly.

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

#### COAST OPERATION

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### **AUTOMATIC SPEED CONTROL DEVICE (ASCD)**

#### < SERVICE INFOMATION >

[MR TYPE 2]

When the SET/COAST switch is depressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will keep the new set speed.

#### RESUME OPERATION

When the RESUME/ACCELERATE switch is depressed after cancel operation other than depressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- · Brake pedal is released.
- Clutch pedal is released (M/T models)
- Selector lever is in other than P and N positions (A/T and CVT models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

### Component Description

INFOID:0000000004499912

ASCD STEERING SWITCH

Refer to EC-1423.

ASCD BRAKE SWITCH

Refer to <u>EC-1429</u> and <u>EC-1495</u>.

ASCD CLUTCH SWITCH

Refer to <u>EC-1429</u> and <u>EC-1495</u>.

STOP LAMP SWITCH

Refer to <u>EC-1429</u>, <u>EC-1443</u> and <u>EC-1495</u>.

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to <u>EC-1447</u>, <u>EC-1451</u>, <u>EC-1457</u> and <u>EC-1462</u>.

ASCD INDICATOR

Refer to EC-1503.

### **CAN COMMUNICATION**

[MR TYPE 2] < SERVICE INFOMATION >

## CAN COMMUNICATION

## **System Description**

INFOID:0000000004499913

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-26, "CAN Communication Signal Chart", about CAN communication for detail.

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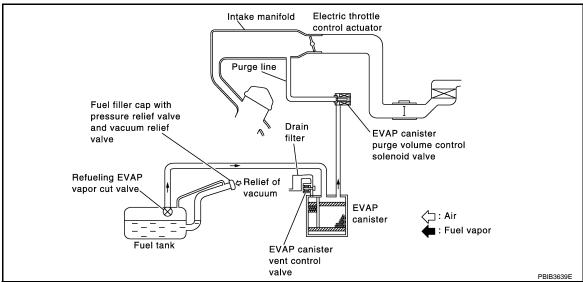
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### **EVAPORATIVE EMISSION SYSTEM**

Description INFOID:000000004499914

#### 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**

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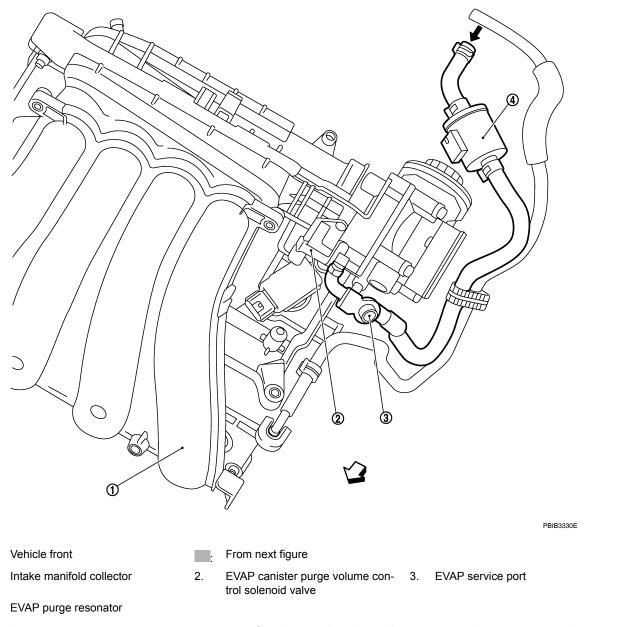
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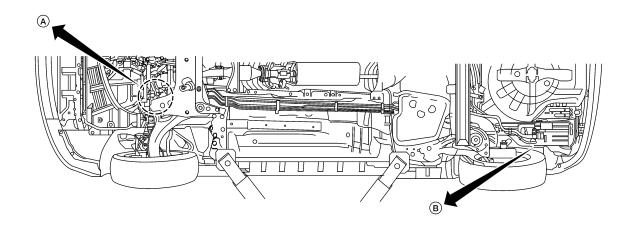
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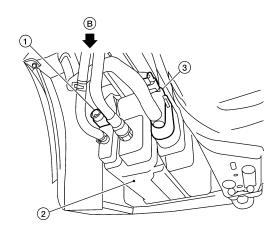
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NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

EC-1037





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(A): To previous figure

1. EVAP control system pressure sensor 2. EVAP canister

3. EVAP canister vent control valve

NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

## Component Inspection

INFOID:0000000004499915

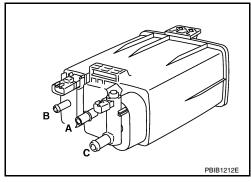
**EVAP CANISTER** 

### **EVAPORATIVE EMISSION SYSTEM**

#### < SERVICE INFOMATION >

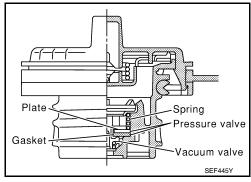
Check EVAP canister as follows:

- 1. Block port **B**.
- 2. Blow air into port Aand check that it flows freely out of port C.
- 3. Release blocked port **B**.
- 4. Apply vacuum pressure to port Band 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.



Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa

(0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 - 2.90 psi)

-6.0 to -3.4 kPa Vacuum:

 $(-0.061 \text{ to } -0.035 \text{ kg/cm}^2, -0.87 \text{ to } -0.48 \text{ psi})$ 

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 come on.



Refer to EC-1329, "Component Inspection".

FUEL TANK TEMPERATURE SENSOR

Refer to EC-1273, "Component Inspection".

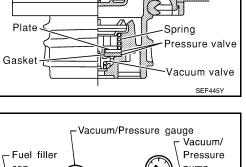
EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1340, "Component Inspection".

EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1350, "Component Inspection".

**EVAP SERVICE PORT** 



numn cap One-way  $oldsymbol{oldsymbol{\mathcal{L}}}$  Fuel filler cap adapter

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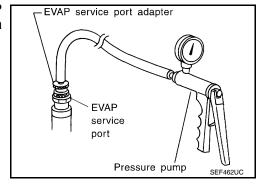
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#### [MR TYPE 2]

### < SERVICE INFOMATION >

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 leak.

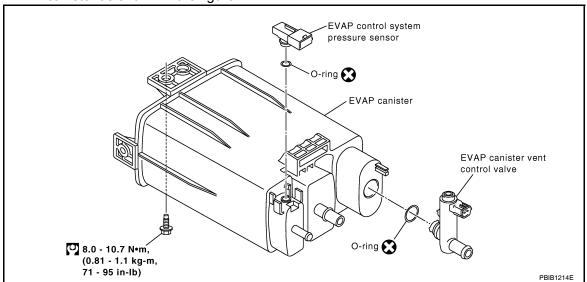


### Removal and Installation

INFOID:0000000004499916

### **EVAP CANISTER**

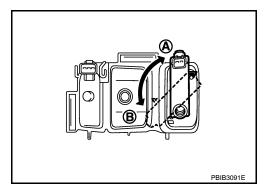
Tighten EVAP canister as shown in the figure.



### 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 Fuel Vapor Leakage

INFOID:0000000004499917

#### **CAUTION:**

- · Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in EVAP system.
   NOTE:
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

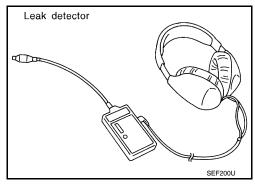
#### WITH CONSULT-III

- 1. Attach the EVAP service port adapter securely to the EVAP service port.
- 2. Also attach the pressure pump and hose to the EVAP service port adapter.

### **EVAPORATIVE EMISSION SYSTEM**

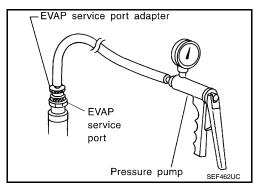
< SERVICE INFOMATION > [MR TYPE 2]

- 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 and hose with pressure pump.
- 8. Locate the leak using a leak detector. Refer to <u>EC-1036</u>. "Description".

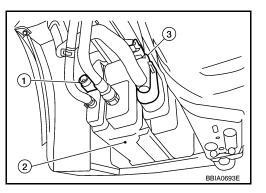


### WITHOUT CONSULT-III

- Attach the EVAP service port adapter securely to the EVAP service port.
- Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



- Apply battery voltage to the terminal of EVAP canister vent control valve (3) to make a closed EVAP system.
  - EVAP control system pressure sensor (1)
  - EVAP canister (2)



- 4. 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<sup>2</sup>, 0.2 to 0.4 psi).
- 5. Remove EVAP service port adapter and hose with pressure pump.
- Locate the leak using a leak detector. Refer to <u>EC-1036</u>, "<u>Description</u>".

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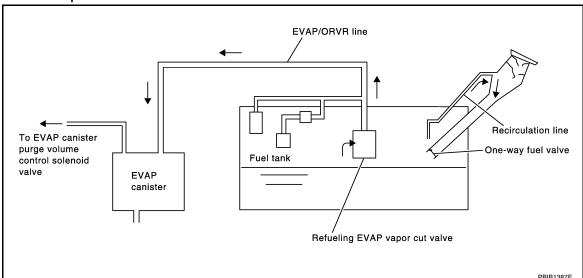
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< SERVICE INFOMATION > [MR TYPE 2]

## ON BOARD REFUELING VAPOR RECOVERY (ORVR)

### System Description



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.
- · Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to furnish the workshop with a CO2 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-1086, "Fuel Pressure Check".
- Disconnect negative battery cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose and clamps excessively to avoid damaging hoses.
- · After installation, run engine and check for fuel leaks at connection.
- Do not 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:0000000004499919

INFOID:0000000004499918

#### 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.
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 1.9 kg (4.2 lb).

#### OK or NG

OK >> GO TO 2. NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

### ON BOARD REFUELING VAPOR RECOVERY (ORVR)

## < SERVICE INFOMATION >

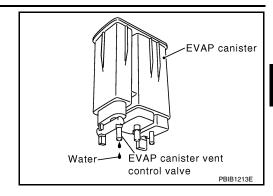
[MR TYPE 2]

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.

No >> GO TO 6.



3.REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. CHECK DRAIN FILTER

Refer to EC-1045, "Component Inspection".

OK or NG

OK >> GO TO 5.

NG >> Replace drain filter.

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-1045, "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

- 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 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 2.

NG >> GO TO 3.

2.CHECK IF EVAP CANISTER SATURATED WITH WATER

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### ON BOARD REFUELING VAPOR RECOVERY (ORVR)

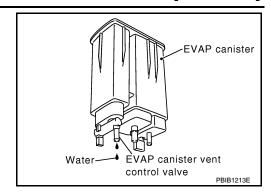
### < SERVICE INFOMATION >

[MR TYPE 2]

Does water drain from the EVAP canister?

### 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. CHECK DRAIN FILTER

Refer to EC-1045, "Component Inspection".

### OK or NG

OK >> GO TO 5.

NG >> Replace drain filter.

### 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 VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling EVAP vapor cut valve for clogging, kink, looseness and improper connection.

#### OK or NG

OK >> GO TO 7.

NG >> Repair or replace hoses and tubes.

### .CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

#### OK or NG

OK >> GO TO 8.

NG >> Replace filler neck tube.

### 8. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1045, "Component Inspection".

### OK or NG

OK >> GO TO 9.

NG >> Replace refueling EVAP vapor cut valve with fuel tank.

### 9. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

#### OK or NG

OK >> GO TO 10.

NG >> Replace fuel filler tube.

## 10. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

### OK or NG

OK >> GO TO 11.

## ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< SERVICE INFOMATION > [MR TYPE 2]

NG >> Repair or replace one-way fuel valve with fuel tank.

# 11. CHECK ONE-WAY FUEL VALVE-II

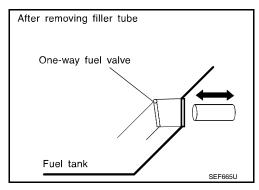
- 1. Make sure that fuel is drained from the tank.
- Remove fuel filler tube and hose.
- Check one-way fuel valve for operation as follows.When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

#### OK or NG

OK >> INSPECTION END

NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



INFOID:0000000004499920

## Component Inspection

### REFUELING EVAP VAPOR CUT VALVE

#### With CONSULT-III

- 1. Remove fuel tank. Refer to FL-9.
- 2. Drain fuel from the tank as follows:
- 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.
- Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- 4. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- a. Connect vacuum pump to hose end.
- b. Remove fuel gauge retainer with fuel gauge unit.

#### Always replace O-ring with new one.

- c. Put fuel tank upside down.
- d. Apply vacuum pressure to hose end [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.

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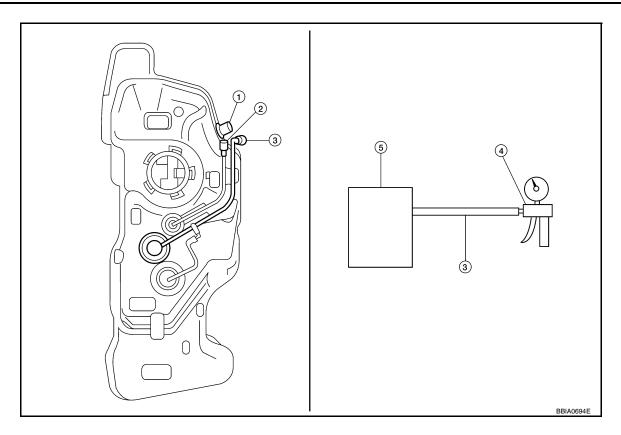
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1. Filler tube

- 2. Recirculation line
- 3. EVAP/ORVR line

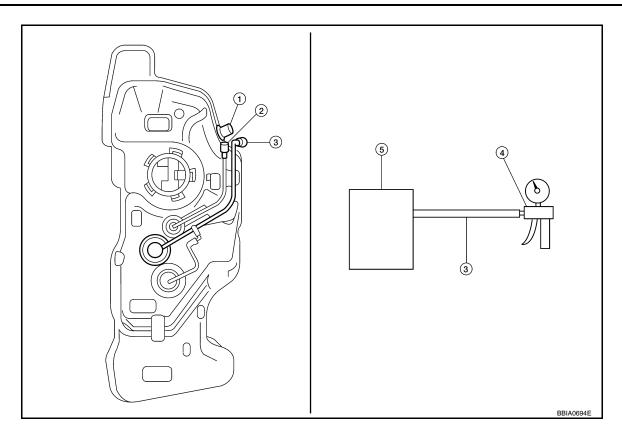
- 4. Vacuum/pressure handy pump
- 5. Fuel tank

#### Without CONSULT-III

- 1. Remove fuel tank. Refer to FL-9.
- 2. Drain fuel from the tank as follows:
- a. Remove fuel gauge retainer.
- b. Drain fuel from the tank using a handy pump into a fuel container.
- Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- 4. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- a. Connect vacuum pump to hose end.
- b. Remove fuel gauge retainer with fuel gauge unit.

### Always replace O-ring with new one.

- c. Put fuel tank upside down.
- d. Apply vacuum pressure to hose end [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.

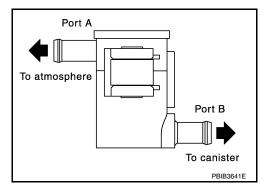


- 1. Filler tube
- 4. Vacuum/pressure handy pump
- 2. Recirculation line
- 5. Fuel tank

EVAP/ORVR line

### **DRAIN FILTER**

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.
- 7. If NG, replace drain filter.



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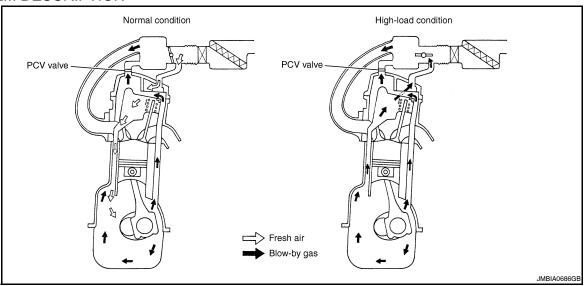
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## POSITIVE CRANKCASE VENTILATION

Description INFOID:000000004499921

#### SYSTEM DESCRIPTION

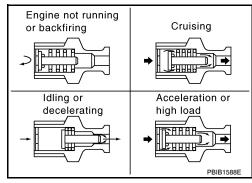


This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

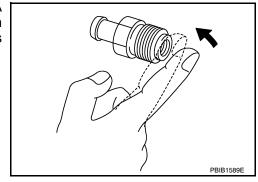


## Component Inspection

INFOID:0000000004499922

## 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.



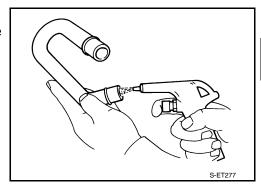
## **POSITIVE CRANKCASE VENTILATION**

< SERVICE INFOMATION >

[MR TYPE 2]

## PCV VALVE VENTILATION HOSE

- 1. Check hoses and hose connections for leaks.
- 2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



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## **NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM-NATS)**

< SERVICE INFOMATION > [MR TYPE 2]

## NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM-NATS)

Description INFOID:0000000004499923

 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 <u>EC-1015</u>, "<u>U0101-U1001</u>".

- 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-1083, "Procedure After Replacing ECM".

Introduction INFOID:000000004499924

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.

						x: Applicable	—: Not applicable
	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	SRT status	Test value
CONSULT-III	×	×	×	×	×	×	_
GST	×	×	×	_	×	X	×
ECM	×	×*	_	_	_	×	_

<sup>\*:</sup> 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 lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode.

(Refer to EC-1094, "Fail-Safe Chart".)

## 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 light up at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

x: Applicable —: Not applicable

		MIL				DTC		1st trip DTC	
Items	1st	t trip	2nc	2nd trip		0.5 4 45.5	1 of trip	2nd trip	
Noo	Blinking	Lighting up	Blinking	Lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	display- ing	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	_	_	_	_	_	×	_	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	_	_	×	_	_	×	_	_	
One trip detection diagnoses (Refer to <u>EC-1052</u> , "Emission-related Diagnostic Information".)	_	×	_	-	×	-		_	
Except above		_	_	×	_	×	×	_	

When there is an open circuit on MIL circuit, the ECM cannot warn the driver by MIL lighting up when there is malfunction on engine control system.

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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

## **Emission-related Diagnostic Information**

INFOID:0000000004499926

#### EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

x: Applicable —: Not applicable

					x. Applicable	—. Not applicable
	DTC	·*1				
Items (CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM*3	SRT code	Trip	MIL lighting up	Reference
LOST COMM (TCM)	U0101	0101*4	_	1	×	EC-1145
LOST COMM (BCM)	U0140	0140*4	_	1	×	EC-1147
CAN COMM CIRCUIT	U1001	1001* <sup>4</sup>	_	2	_	EC-1149
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	0000	_	_	Flashing* <sup>5</sup>	EC-1069
INT/V TIM CONT-B1	P0011	0011	_	2	×	EC-1151
A/F SEN1 HTR (B1)	P0031	0031	_	2	×	EC-1155
A/F SEN1 HTR (B1)	P0032	0032	_	2	×	EC-1155
HO2S2 HTR (B1)	P0037	0037	_	2	×	EC-1160
HO2S2 HTR (B1)	P0038	0038	_	2	×	EC-1160
INT/V TIM V/CIR-B1	P0075	0075	_	2	×	EC-1165
MAF SEN/CIRCUIT-B1	P0101	0101	_	2	×	EC-1170
MAF SEN/CIRCUIT-B1	P0102	0102	_	1	×	EC-1178
MAF SEN/CIRCUIT-B1	P0103	0103	_	1	×	EC-1178
IAT SEN/CIRCUIT-B1	P0112	0112	_	2	×	EC-1185
IAT SEN/CIRCUIT-B1	P0113	0113	_	2	×	EC-1185
ECT SEN/CIRC	P0116	0116	_	2	×	EC-1189
ECT SEN/CIRC	P0117	0117	_	1	×	EC-1192
ECT SEN/CIRC	P0118	0118	_	1	×	EC-1192
TP SEN 2/CIRC-B1	P0122	0122	_	1	×	EC-1197
TP SEN 2/CIRC-B1	P0123	0123	_	1	×	EC-1197
ECT SENSOR	P0125	0125	_	2	×	EC-1202
IAT SENSOR-B1	P0127	0127	_	2	×	EC-1205
THERMSTAT FNCTN	P0128	0128	_	2	×	EC-1208
A/F SENSOR1 (B1)	P0130	0130	_	2	×	EC-1210
A/F SENSOR1 (B1)	P0131	0131	_	2	×	EC-1216
A/F SENSOR1 (B1)	P0132	0132	_	2	×	EC-1222
A/F SENSOR1 (B1)	P0133	0133	×	2	×	EC-1228
HO2S2 (B1)	P0137	0137	×	2	×	EC-1235
HO2S2 (B1)	P0138	0138	×	2	×	EC-1242
HO2S2 (B1)	P0139	0139	×	2	×	EC-1251
FUEL SYS-LEAN-B1	P0171	0171	_	2	×	EC-1258

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[MR TYPE 2]

Items	DTO	)* <sup>1</sup>					А
(CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM*3	SRT code	Trip	MIL lighting up	Reference	
FUEL SYS-RICH-B1	P0172	0172	_	2	×	EC-1264	EC
FTT SENSOR	P0181	0181	_	2	×	EC-1270	
FTT SEN/CIRCUIT	P0182	0182	_	2	×	EC-1274	
FTT SEN/CIRCUIT	P0183	0183	_	2	×	EC-1274	C
TP SEN 1/CIRC-B1	P0222	0222	_	1	×	EC-1278	
TP SEN 1/CIRC-B1	P0223	0223	_	1	×	EC-1278	
MULTI CYL MISFIRE	P0300	0300	_	2	×	EC-1283	
CYL 1 MISFIRE	P0301	0301	_	2	×	EC-1283	
CYL 2 MISFIRE	P0302	0302	_	2	×	EC-1283	Е
CYL 3 MISFIRE	P0303	0303	_	2	×	EC-1283	
CYL 4 MISFIRE	P0304	0304	_	2	×	EC-1283	F
KNOCK SEN/CIRC-B1	P0327	0327	_	2	_	EC-1289	
KNOCK SEN/CIRC-B1	P0328	0328	_	2	_	EC-1289	
CKP SEN/CIRCUIT	P0335	0335	_	2	×	EC-1293	(
CMP SEN/CIRC-B1	P0340	0340	_	2	×	EC-1299	
TW CATALYST SYS-B1	P0420	0420	×	2	×	EC-1305	
EVAP PURG FLOW/MON	P0441	0441	×	2	×	EC-1310	-
EVAP SMALL LEAK	P0442	0442	×	2	×	EC-1315	
PURG VOLUME CONT/V	P0443	0443	_	2	×	EC-1322	
PURG VOLUME CONT/V	P0444	0444	_	2	×	EC-1330	
PURG VOLUME CONT/V	P0445	0445	_	2	×	EC-1330	
VENT CONTROL VALVE	P0447	0447	_	2	×	EC-1336	U
VENT CONTROL VALVE	P0448	0448	_	2	×	EC-1342	
EVAP SYS PRES SEN	P0451	0451	_	2	×	EC-1348	k
EVAP SYS PRES SEN	P0452	0452	_	2	×	EC-1351	
EVAP SYS PRES SEN	P0453	0453	_	2	×	EC-1358	
EVAP GROSS LEAK	P0455	0455	_	2	×	EC-1366	L
EVAP VERY SML LEAK	P0456	0456	×* <sup>6</sup>	2	×	EC-1373	
FUEL LEV SEN SLOSH	P0460	0460	_	2	×	EC-1381	1
FUEL LEVEL SENSOR	P0461	0461	_	2	×	EC-1383	
FUEL LEVL SEN/CIRC	P0462	0462	_	2	×	EC-1385	
FUEL LEVL SEN/CIRC	P0463	0463	_	2	×	EC-1385	1
VEH SPEED SEN/CIRC*7	P0500	0500	_	2	×	EC-1387	
ISC SYSTEM	P0506	0506	_	2	×	EC-1389	
ISC SYSTEM	P0507	0507	_	2	×	EC-1391	
ECM	P0605	0605	_	1 or 2	— or ×	EC-1393	
ECM	P0607	0607	_	1 (CVT) 1 (A/T) 2 (M/T)	× (CVT) × (A/T) — (M/T)	EC-1393	F
SENSOR POWER/CIRC	P0643	0643	_	1	×	EC-1396	
PNP SW/CIRC	P0705	0705	_	2	×	AT-91 (A/T) CVT-244 (CVT)	

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Homo	DTC	· <sup>1</sup>				
Items (CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM*3	SRT code	Trip	MIL lighting up	Reference
ATF TEMP SEN/CIRC*8	P0710	0710	_	2 (A/T) 1 (CVT)	×	AT-96 (A/T) CVT-249 (CVT)
INPUT SPD SEN/CIRC	P0715	0715	_	2	×	CVT-254
VEH SPD SEN/CIR AT* <sup>7</sup>	P0720	0720	_	2	×	AT-101 (A/T) CVT-258 (CVT)
ENGINE SPEED SIG	P0725	0725	_	2	× (A/T) — (CVT)	AT-106 (A/T) CVT-263 (CVT)
A/T 1ST GR FNCTN*8	P0731	0731	_	2	×	<u>AT-110</u>
A/T 2ND GR FNCTN*8	P0732	0732	_	2	×	<u>AT-113</u>
A/T 3RD GR FNCTN*8	P0733	0733	_	2	X	<u>AT-116</u>
A/T 4TH GR FNCTN*8	P0734	0734	_	2	×	AT-119
TCC SOLENOID/CIRC	P0740	0740	_	2	×	AT-124 (A/T) CVT-266 (CVT)
A/T TCC S/V FNCTN	P0744	0744	_	2	×	AT-129 (A/T) CVT-271 (CVT)
L/PRESS SOL/CIRC	P0745	0745	_	2	×	AT-134 (A/T) CVT-273 (CVT)
PRS CNT SOL/A FCTN	P0746	0746	_	1	×	CVT-278
SFT SOL A/CIRC	P0750	0750	_	1	×	AT-139
SFT SOL B/CIRC	P0755	0755	_	1	×	<u>AT-144</u>
PRS CNT SOL/B FCTN	P0776	0776	_	2	×	CVT-280
PRS CNT SOL/B CIRC	P0778	0778	_	2	×	CVT-282
TR PRS SENS/A CIRC	P0840	0840	_	2	×	CVT-287
P-N POS SW/CIRCUIT	P0850	0850	_	2	×	EC-1401
CLOSED LOOP-B1	P1148	1148	_	1	×	EC-1407
ENG OVER TEMP	P1217	1217	_	1	×	EC-1408
CTP LEARNING-B1	P1225	1225	_	2	_	EC-1417
CTP LEARNING-B1	P1226	1226	_	2	_	EC-1419
COLD START CONTROL	P1421	1421	_	2	×	EC-1421
ASCD SW	P1564	1564	_	1	_	EC-1423
ASCD BRAKE SW	P1572	1572	_	1	_	EC-1429
ASCD VHL SPD SEN	P1574	1574	_	1	_	EC-1438
LOCK MODE	P1610	1610	_	2	_	BL-259
ID DISCORD,IMMU-ECM	P1611	1611	_	2	_	BL-259
CHAIN OF ECM-IMMU	P1612	1612	_	2	_	BL-259
CHAIN OF IMMU-KEY	P1614	1614	_	2	_	BL-259
DIFFERENCE OF KEY	P1615	1615	_	2	_	<u>BL-259</u>
IN PULY SPEED	P1715	1715	_	2	_	EC-1440 (A/T) EC-1441 (CVT)
LU-SLCT SOL/CIRC	P1740	1740	_	2	×	CVT-306
O/R CLTCH SOL/CIRC	P1760	1760	_	2	×	<u>AT-149</u>
STEP MOTR CIRC	P1777	1777	_	1	×	CVT-311
STEP MOTR FNC	P1778	1778	_	2	×	<u>CVT-315</u>
BRAKE SW/CIRCUIT	P1805	1805	_	2	_	EC-1443

[MR TYPE 2]

Items	DTC	<b>*</b> 1					
(CONSULT-III screen terms)	CONSULT-III GST* <sup>2</sup>	ECM*3	SRT code	Trip	MIL lighting up	Reference	
ETC MOT PWR-B1	P2100	2100	_	1	×	EC-1447	
ETC FNCTN/CIRC-B1	P2101	2101	_	1	×	EC-1451	
ETC MOT PWR	P2103	2103	_	1	×	EC-1447	
ETC MOT-B1	P2118	2118	_	1	×	EC-1457	
ETC ACTR-B1	P2119	2119	_	1	×	EC-1462	
APP SEN 1/CIRC	P2122	2122	_	1	×	EC-1464	
APP SEN 1/CIRC	P2123	2123	_	1	×	EC-1464	
APP SEN 2/CIRC	P2127	2127	_	1	×	EC-1469	
APP SEN 2/CIRC	P2128	2128	_	1	×	EC-1469	
TP SENSOR-B1	P2135	2135	_	1	×	EC-1476	
APP SENSOR	P2138	2138	_	1	×	EC-1481	
A/F SENSOR1 (B1)	P2A00	2A00	_	2	×	EC-1488	

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

#### 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 stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

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 INFOR-MATION 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-1089, "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

### **WITH GST**

CONSULT-III or GST (Generic Scan Tool) Examples: P0340, P0850, P1148, etc. These DTCs are prescribed by SAE J2012.

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<sup>\*2:</sup> This number is prescribed by SAE J2012.

<sup>\*3:</sup> In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

<sup>\*4:</sup> The troubleshooting for this DTC needs CONSULT-III.

<sup>\*5:</sup> When the ECM in the mode of displaying SRT status, MIL may flash. For the details, refer to "How to Display SRT Status".

<sup>\*6:</sup> SRT code will not be set if the self-diagnostic result is NG.

<sup>\*7:</sup> When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

<sup>\*8:</sup> When erasing this DTC, always use CONSULT-III or GST.

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#### < SERVICE INFOMATION >

(CONSULT-III also displays the malfunctioning component or system.)

#### 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.

DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-III. Time data indicates how many times the vehicle was driven after the last detection of a DTC.

If the DTC is being detected currently, the time data will be [0].

If a 1st trip DTC is stored in the ECM, the time data will be [1t].

### 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 <u>EC-1116</u>, "CONSULT-III Function (ENGINE)".

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 - P0304 Fuel Injection System Function — DTC: P0171, P0172		
2		Except the above items (Includes A/T or CVT 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 "EMISSION-RELATED DIAGNOS-TIC INFORMATION ITEMS".

### 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.

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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 indica- tion)	Perfor- mance Priority*	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
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
		Heated oxygen sensor 2	P0137
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139

<sup>\*:</sup> 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.

				Example		
Self-diagno	Self-diagnosis result		← ON → O		ion cycle OFF $\leftarrow$ ON $\rightarrow$	OFF ← ON →
All OK	Case 1	P0400	OK (1)	<del> (1)</del>	OK (2)	—(2)
		P0402	OK (1)	<del> (1)</del>	— (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.

<sup>-:</sup> Self-diagnosis is not carried out.

< SERVICE INFOMATION > [MR TYPE 2]

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT".  $\rightarrow$  Case 1 above

When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT".  $\rightarrow$  Case 3 above

The table above shows that the minimum number of cycles for setting SRT as "INCMP" is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate "INCMP".

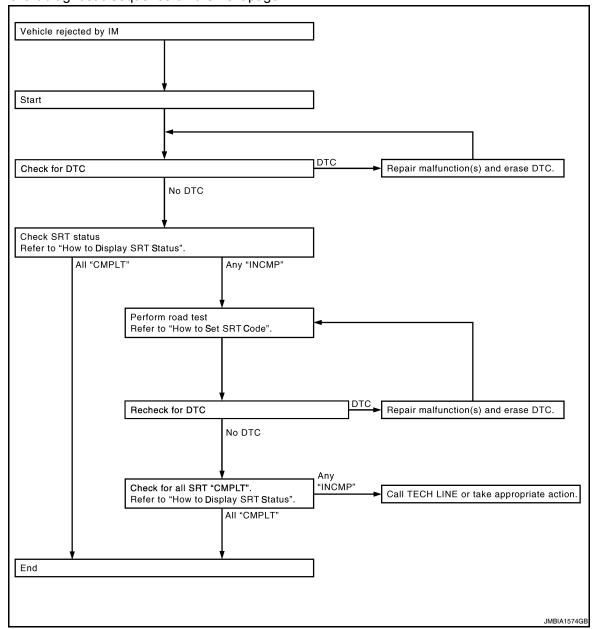
#### NOTE:

SRT can be set as "CMPLT" together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates "CMPLT".

SRT Service Procedure

< SERVICE INFOMATION > [MR TYPE 2]

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence on the next page.



How to Display SRT Status

#### WITH CONSULT-III

Selecting "SRT STATUS" in "DTC & SRT ONFIRMATION" mode with CONSULT-III.

For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-III screen; for items whose SRT codes are not set, "INCMP" is displayed.

#### 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 can not be displayed while only SRT status can be.

- Turn ignition switch ON and wait 20 seconds.
- 2. SRT status is indicated as shown below.
  - When all SRT codes are set, MIL lights up continuously.

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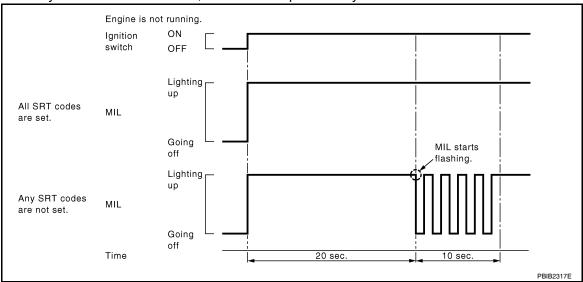
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· When any SRT codes are not set, MIL will flash periodically for 10 seconds.



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.

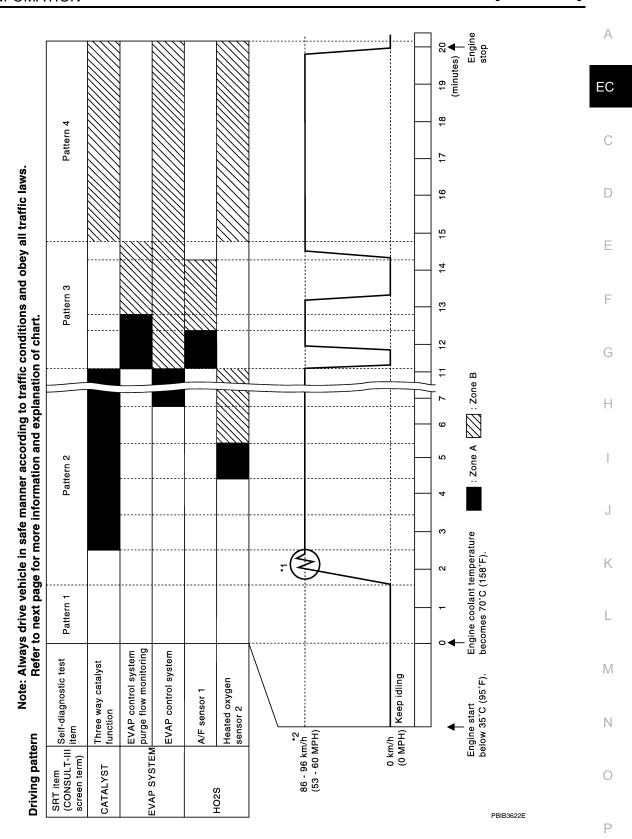
#### WITH CONSULT-III

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 on the next page. The driving pattern should be performed one or more times to set all SRT codes.

**Driving Pattern** 



• The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time, required for the diagnosis under normal conditions\*, is the shortest.

Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

<sup>\*:</sup> Normal conditions refer to the following:

#### < SERVICE INFOMATION >

- Sea level
- Flat road
- Ambient air temperature: 20 30°C (68 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
   Under different conditions [For example: ambient air temperature other than 20 30°C (68 86°F)], diagnosis may also be performed.

#### Pattern 1:

- The engine is started at the engine coolant temperature of -10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 38 and ground is 3.0 4.3V).
- The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 38 and ground is lower than 1.4V).
- The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 43 and ground is less than 4.1V).

#### Pattern 2:

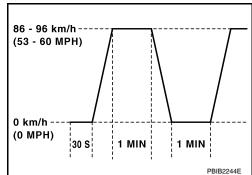
• When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

#### Pattern 3:

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during decelerating 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 steadystate driving.
- If the accelerator pedal is moved, the test must be conducted all over 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 and CVT Models**

Set the selector lever in the D position (CVT), D position with the overdrive switch turned ON (A/T).

#### Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:	For quick acceleration in low altitude areas	For high attitude areas [over 1,219m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	km/h (MPH)	km/h (MPH)
1st to 2nd	13 (8)	24 (15)	24 (15)
2nd to 3rd	27 (17)	40 (25)	40 (25)
3rd to 4th	40 (25)	53 (33)	65 (40)
4th to 5th	58 (36)	71 (44)	73 (45)
5th to 6th	82 (51)	82 (51)	82 (51)

#### Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.

Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits and drive according to the road conditions to ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

[MR TYPE 2]

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Gear	km/h (MPH)
1st	50 (30)
2nd	90 (55)
3rd	_
4th	
5th	_
6th	_

## 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. (eq., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

Item	OBD-	Self-diagnostic test item	DTC	li	e and Test mit display)	Description	
item	MID	Sell-diagnostic test item	DIC	TID	Unitand Scaling ID	Beschpton	
			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	
	01H	Air fuel ratio (A/F) sensor 1 (Bank 1)	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
HO2S			P0130	8BH	0BH	Difference in sensor output voltage	
			P0133	8CH	83H	Response gain at the limited frequency	
		Heated oxygen sensor 2 (Bank 1)  Heated oxygen sensor 3 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle	
	02H		P0137	08H	0CH	Maximum sensor output voltage for test cycle	
			P0138	80H	0CH	Sensor output voltage	
			P0139	81H	0CH	Difference in sensor output voltage	
			P0143	07H	0CH	Minimum sensor output voltage for test cycle	
	03H		P0144	08H	0CH	Maximum sensor output voltage for test cycle	
			P0146	80H	0CH	Sensor output voltage	
			P0145	81H	0CH	Difference in sensor output voltage	

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Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unit and Scaling ID	Description
			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
		Air fuel ratio (A/E) concer 1	P0150	86H	0BH	Maximum sensor output voltage for test cycle
	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	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
HO2S			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
		Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
	07H		P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
			P0420	80H	01H	O2 storage index
	0411	Three way catalyst function (Bank1)	P0420	82H	01H	Switching time lag engine exhaust index value
	21H		P2423	83H	0CH	Difference in 3rd O2 sensor output voltage
CATA-			P2423	84H	84H	O2 storage index in HC trap catalyst
LYST			P0430	80H	01H	O2 storage index
	2211	Three way catalyst function	P0430	82H	01H	Switching time lag engine exhaust index value
	22H	(Bank2)	P2424	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2424	84H	84H	O2 storage index in HC trap catalyst

[MR TYPE 2]

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Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			P0400	80H	96H	Low Flow Faults: EGR temp change rate (short term)
			P0400	81H	96H	Low Flow Faults: EGR temp change rate (long term)
EGR SYSTEM	31H	EGR function	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
			P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
	35H	VA/T Manitor (Ponk1)	P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
	งจก	VVT Monitor (Bank1)	P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
VVT			P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
SYSTEM	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)
	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down
	3ВН	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)
EVAP SYSTEM	2011	EVAP control system leak	P0456	80H	05H	Leak area index (for more than 0.02 inch)
O I O I LIVI	3CH	(Very small leak)	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
	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
O2 SEN-	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of Heater electric cur- rent to voltage
SOR HEATER	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 cur- rent to voltage

## < SERVICE INFOMATION >

[MR TYPE 2]

Item	OBD-	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
item	MID		ыс	TID	Unit and Scaling ID	Boodiplion
		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
	71H		P2445	82H	01H	Secondary Air Injection System Pump Stuck Off
SEC- OND- ARY AIR			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
	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
FUEL	ОПП		P0171 or P0172	81H	24H	The number of lambda control clamped
SYSTEM	82H	Fuel injection system function	P0174 or P0175	80H	2FH	Long term fuel trim
	ŏ∠Ħ	(Bank 2)	P0174 or P0175	81H	24H	The number of lambda control clamped

< SERVICE INFOMATION > [MR TYPE 2]

	OBD-			li	e and Test mit display)	
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			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
MICEIDE	A 411	Markinka Codinadan Minfina	P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder
MISFIRE	A1H	Multiple Cylinder Misfires	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

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Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
	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
	АЗН	No. 2 Cylinder Misfire	P0302	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles
			P0302	0CH	24H	Misfire counts for last/current driving cycles
	A4H	No. 3 Cylinder Misfire	P0303	0ВН	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
MOEIDE			P0304	0CH	24H	Misfire counts for last/current driving cycles
MISFIRE	А6Н	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
	А8Н	No. 7 Cylinder Misfire	P0307	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0307	0CH	24H	Misfire counts for last/current driving cycles
	А9Н	No. 8 Cylinder Misfire	P0308	0ВН	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 or CVT related items (see EC-1015), skip step 1.
- 1. Erase DTC in TCM.
- Select "ENGINE" with CONSULT-III.
- Select "SELF-DIAG RESULTS".

< SERVICE INFOMATION > [MR TYPE 2]

4. Touch "ERASE". (The DTC in the 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.

Select Service \$04 with GST.

### 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 lost within 24 hours.
- The following data are cleared when the ECM memory is erased.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

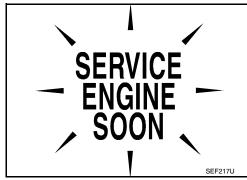
## Malfunction Indicator Lamp (MIL)

INFOID:0000000004499927

#### DESCRIPTION

The MIL is located on the instrument panel.

- The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, refer to DI-20 or see EC-1532.
- When the engine is started, the MIL should go off.
  If the MIL remains on, the on board diagnostic system has
  detected an engine system malfunction.



#### ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following three functions.

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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	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected.  The following malfunctions will light up 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 MIL lighting up 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 Flashing Without DTC

When any SRT codes are not set, MIL may flash without DTC. For the details, refer to <u>EC-1052</u>, "Emission-related Diagnostic Information".

#### HOW TO SWITCH DIAGNOSTIC TEST MODE

#### NOTE:

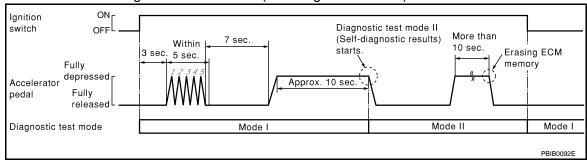
- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF.

How to Set Diagnostic Test Mode II (Self-diagnostic Results)

- Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 2. Repeat the following procedure quickly five times within 5 seconds.
- a. Fully depress the accelerator pedal.
- b. Fully release the accelerator pedal.
- 3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
- 4. Fully release the accelerator pedal.

< SERVICE INFOMATION > [MR TYPE 2]

ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

- Set ECM in Diagnostic Test Mode II (Self-diagnostic results).
   Refer to "How to Set Diagnostic Test Mode II (Self-diagnostic Results)".
- 2. Fully depress the accelerator pedal and keep it for more than 10 seconds.

  The emission-related diagnostic information has been erased from the backup memory in the ECM.
- 3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

#### DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-20 or EC-1532.

### DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MIL	Condition
ON	When the malfunction is detected.
OFF	No malfunction

These DTC numbers are 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-

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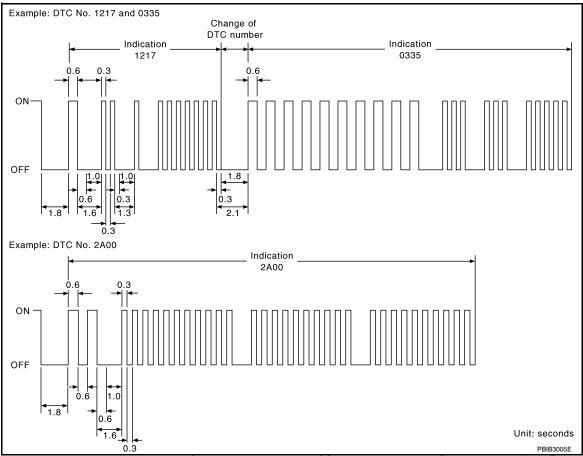
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tified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The "A" is indicated by the number of eleven flash. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle. The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle. A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

A change from one trouble code to another occurs at an interval of 1.8-second OFF.

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See EC-1015)

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back-up memory in the ECM by depressing accelerator pedal.

Refer to "How to Erase Diagnostic Test Mode II (Self-diagnostic Results)".

- If the battery is disconnected, the DTC will be lost from the backup memory within 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

## **OBD System Operation Chart**

INFOID:0000000004499928

### 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. For details, refer to <u>EC-1051</u>, "Two Trip Detection Logic".
- The MIL will go off after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern).

### < SERVICE INFOMATION >

[MR TYPE 2]

C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CON-SULT-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 (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns B and C under "Fuel Injection System" and "Misfire", see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"".

For details about patterns A and B under "Other", see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUAL-ITY DETERIORATION>", "FUEL INJECTION SYSTEM"".

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

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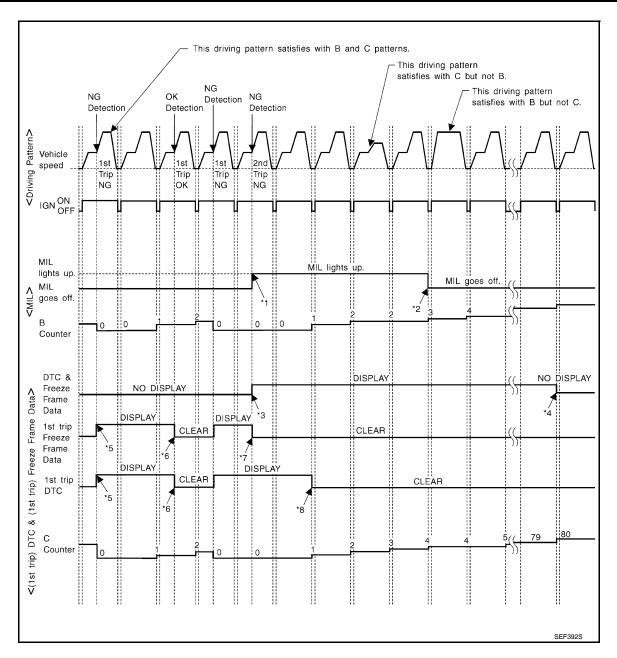
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<sup>\*1:</sup> Clear timing is at the moment OK is detected.

<sup>\*2:</sup> Clear timing is when the same malfunction is detected in the 2nd trip.



- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*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.)
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*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.
- \*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the 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.

EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORA-TION>", "FUEL INJECTION SYSTEM"

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

[MR TYPE 2] < SERVICE INFOMATION >

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 go off when the B counter reaches 3. (\*2 in "OBD SYSTEM OPERATION CHART")

### <Driving Pattern C>

Driving pattern C means the vehicle operation as follows:

The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data)  $\pm 375$  rpm

Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]

Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

#### Example:

If the stored freeze frame data is as follows:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

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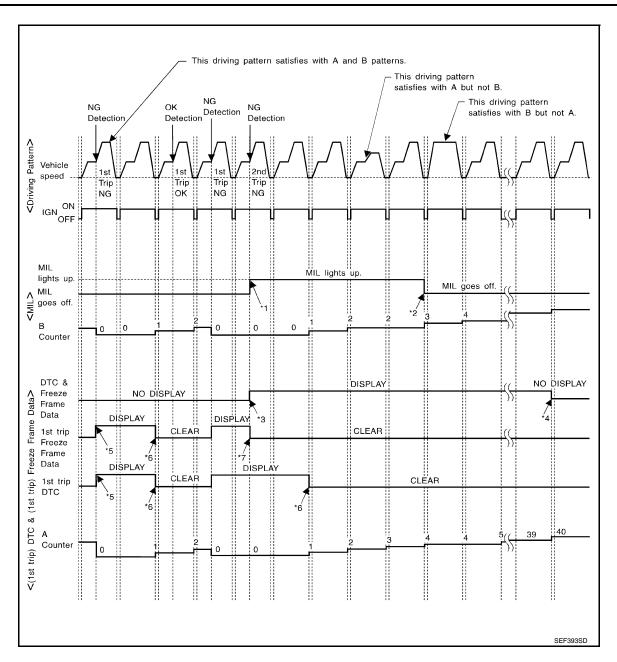
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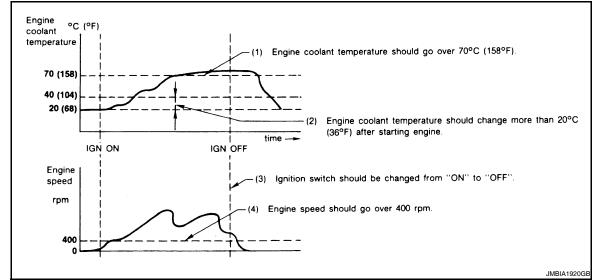


- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*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.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the 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.

EXPLANATION FOR DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) (4).
- The A counter will be counted up when (1) (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

#### <Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (\*2 in "OBD SYSTEM OPERATION CHART").

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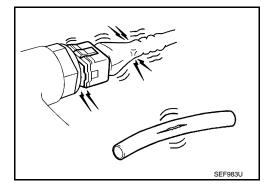
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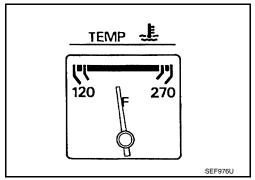
## BASIC SERVICE PROCEDURE

Basic Inspection

# 1.INSPECTION START

- 1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
- 2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket
- 3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
- Start engine and warm it up until engine coolant temperature indicator points the middle of gauge. Ensure engine stays below 1,000 rpm.

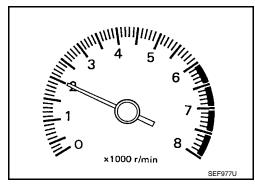




- 5. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 6. Make sure that no DTC is displayed with CONSULT-III or GST.

#### OK or NG

OK >> GO TO 3. NG >> GO TO 2.



# 2. REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3.

# 3. CHECK TARGET IDLE SPEED

### With CONSULT-III

1. Run engine at about 2,000 rpm for about 2 minutes under no load.

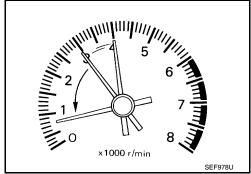
### **BASIC SERVICE PROCEDURE**

### < SERVICE INFOMATION > [MR TYPE 2]

2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.

3. Read idle speed in "DATA MONITOR" mode with CONSULT-III. Refer to EC-1082, "Idle Speed and Ignition Timing Check".

M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)



### Without CONSULT-III

- 1. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
- Check idle speed. Refer to <u>EC-1082</u>, "Idle Speed and Ignition Timing Check".

M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)

### OK or NG

OK >> GO TO 10. NG >> GO TO 4.

## f 4 . PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform <u>EC-1084</u>, "Accelerator Pedal Released Position Learning".

>> GO TO 5.

# 5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1084, "Throttle Valve Closed Position Learning".

>> GO TO 6.

## 6.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1084, "Idle Air Volume Learning".

#### Is Idle Air Volume Learning carried out successfully?

#### Yes or No

Yes >> GO TO 7.

No >> 1. Follow the instruction of Idle Air Volume Learning.

GO TO 4.

## 7.CHECK TARGET IDLE SPEED AGAIN

#### With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Read idle speed in "DATA MONITOR" mode with CONSULT-III. Refer to <u>EC-1082</u>, "Idle Speed and Ignition Timing Check".

M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  rpm (in P or N position)

### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Check idle speed. Refer to <u>EC-1082</u>, "Idle Speed and Ignition Timing Check".

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M/T:  $700 \pm 50$  rpm (in Neutral position) A/T:  $700 \pm 50$  rpm (in P or N position) CVT:  $700 \pm 50$  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 crankshaft position sensor (POS) and circuit.

Refer to EC-1293.

Check camshaft position sensor (PHASE) and circuit.
 Refer to <u>EC-1299</u>.

#### OK or NG

OK >> GO TO 9.

NG >> 1. Repair or replace.

2. GO TO 4.

## 9. CHECK ECM FUNCTION

- 1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
- 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "ECM Re-communicating Function".

>> GO TO 4.

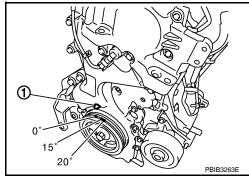
# 10. CHECK IGNITION TIMING

- 1. Run engine at idle.
- Check ignition timing with a timing light. Refer to <u>EC-1082</u>, "Idle Speed and Ignition Timing Check".
- Timing indicator (1)

M/T: 13  $\pm$  5° BTDC (in Neutral position) A/T: 13  $\pm$  5° BTDC (in P or N position) CVT: 13  $\pm$  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.
- Perform <u>EC-1084</u>, "Accelerator Pedal Released Position Learning".

>> GO TO 12.

# 12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1084, "Throttle Valve Closed Position Learning".

>> GO TO 13.

# 13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1084, "Idle Air Volume Learning".

Is Idle Air Volume Learning carried out successfully?

Yes or No

#### **BASIC SERVICE PROCEDURE**

[MR TYPE 2] < SERVICE INFOMATION >

Yes >> GO TO 14.

No >> 1. Follow the instruction of Idle Air Volume Learning.

GO TO 4.

# 14. CHECK TARGET IDLE SPEED AGAIN

#### With CONSULT-III

Start engine and warm it up to normal operating temperature.

Read idle speed in "DATA MONITOR" mode with CONSULT-III. Refer to EC-1082, "Idle Speed and Ignition Timing Check".

M/T: 700  $\pm$  50 rpm (in Neutral position)

A/T:  $700 \pm 50$  rpm (in P or N position)

CVT:  $700 \pm 50$  rpm (in P or N position)

#### Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.

Check idle speed. Refer to <u>EC-1082</u>, "Idle <u>Speed and Ignition Timing Check"</u>.

M/T: 700  $\pm$  50 rpm (in Neutral position)

A/T: 700  $\pm$  50 rpm (in P or N position)

CVT:  $700 \pm 50$  rpm (in P or N position)

#### OK or NG

OK >> GO TO 15. NG >> GO TO 17.

# 15. CHECK IGNITION TIMING AGAIN

Run engine at idle.

2. Check ignition timing with a timing light. Refer to EC-1082, "Idle Speed and Ignition Timing Check".

Timing indicator (1)

M/T:  $13 \pm 5^{\circ}$  BTDC (in Neutral position) A/T:  $13 \pm 5^{\circ}$  BTDC (in P or N position) CVT:  $13 \pm 5^{\circ}$  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-161, "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 crankshaft position sensor (POS) and circuit. Refer to EC-1293.

 Check camshaft position sensor (PHASE) and circuit. Refer to EC-1299.

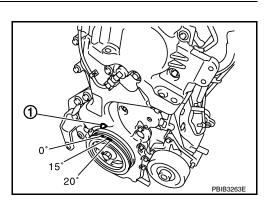
#### OK or NG

OK >> GO TO 18.

NG >> 1. Repair or replace.

GO TO 4.

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- 1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
- 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "ECM Re-communicating Function".

>> GO TO 4.

## 19. INSPECTION END

Did you replace ECM, referring this Basic Inspection procedure?

#### Yes or No

Yes >> 1. Perform EC-1084, "VIN Registration".

2. INSPECTION END

No >> INSPECTION END

## Idle Speed and Ignition Timing Check

INFOID:0000000004499930

#### **IDLE SPEED**

#### With CONSULT-III

Check idle speed in "DATA MONITOR" mode with CONSULT-III.

#### With GST

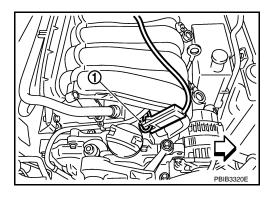
Check idle speed in Service \$01 with GST.

#### **IGNITION TIMING**

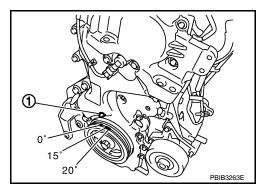
Any of following two methods may be used.

#### Method A

- 1. Attach timing light to loop wire (1) as shown.
  - : Vehicle front



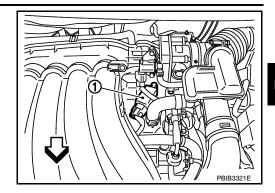
- 2. Check ignition timing.
  - Timing indicator (1)



#### Method B

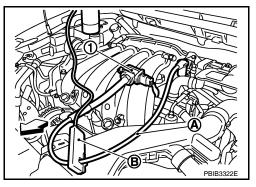
1. Remove No. 4 ignition coil (1).

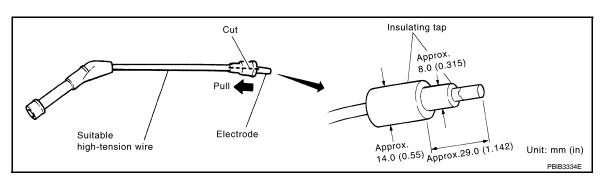
• : Vehicle front



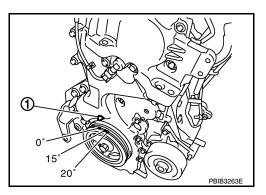
2. Connect No. 4 ignition coil (1) and No. 4 spark plug with suitable high-tension wire (A) as shown, and attach timing light clamp (B) to this wire.

• : Vehicle front





- Check ignition timing.
  - Timing indicator (1)



## Procedure After Replacing ECM

When replacing ECM, the following procedure must be performed.

- 1. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>".
- 2. Perform EC-1084, "VIN Registration".
- 3. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 4. Perform EC-1084, "Throttle Valve Closed Position Learning".

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INFOID:0000000004499931

#### [MR TYPE 2]

#### < SERVICE INFOMATION >

5. Perform EC-1084, "Idle Air Volume Learning".

## VIN Registration

INFOID:0000000004499932

#### DESCRIPTION

VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced. **NOTE:** 

Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

#### **OPERATION PROCEDURE**

#### With CONSULT-III

- 1. Check the VIN of the vehicle and note it. Refer to GI-43, "Model Variation".
- Turn ignition switch ON and engine stopped.
- 3. Select "VIN REGISTRATION" in "WORK SUPPORT" mode.
- 4. Follow the instruction of CONSULT-III display.

### Accelerator Pedal Released Position Learning

INFOID:0000000004499933

#### DESCRIPTION

Accelerator Pedal Released Position Learning is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

#### **OPERATION PROCEDURE**

- 1. Make sure that accelerator pedal is fully released.
- 2. Turn ignition switch ON and wait at least 2 seconds.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON and wait at least 2 seconds.
- 5. Turn ignition switch OFF and wait at least 10 seconds.

### Throttle Valve Closed Position Learning

INFOID:0000000004499934

#### DESCRIPTION

Throttle Valve Closed Position Learning is an operation 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.

#### **OPERATION PROCEDURE**

- Make sure that accelerator pedal is fully released.
- 2. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

#### Idle Air Volume Learning

INFOID:0000000004499935

#### **DESCRIPTION**

Idle Air Volume Learning is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

#### **PREPARATION**

Before performing Idle Air Volume Learning, make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- · Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 95°C (158 203°F)
- · Park/neutral position (PNP) switch: ON
- · Electric load switch: OFF

#### **BASIC SERVICE PROCEDURE**

[MR TYPE 2] < SERVICE INFOMATION >

[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
- Models with CONSULT-III (A/T and CVT models)
- Drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" or "CVT" system indicates less than 0.9V.
- Models without CONSULT-III (A/T and CVT models) and M/T models
- · Drive vehicle for 10 minutes.

#### OPERATION PROCEDURE

#### With CONSULT-III

- Perform EC-1084, "Accelerator Pedal Released Position Learning".
- Perform <u>EC-1084</u>, "Throttle Valve Closed Position Learning".
- Start engine and warm it up to normal operating temperature.
- Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
- Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 6. Touch "START" and wait 20 seconds.
- Make sure 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 the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

Refer to EC-1078, "Basic Inspection".

ITEM	SPECIFICATION
Idle speed	M/T: $700 \pm 50$ rpm (in Neutral position) A/T: $700 \pm 50$ rpm (in P or N position) CVT: $700 \pm 50$ rpm (in P or N position)
Ignition timing	M/T: $13 \pm 5^{\circ}$ BTDC (in Neutral position) A/T: $13 \pm 5^{\circ}$ BTDC (in P or N position) CVT: $13 \pm 5^{\circ}$ 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.
- Perform <u>EC-1084</u>, "Accelerator <u>Pedal Released Position Learning"</u>.
- 2. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 3. Start engine and warm it up to normal operating temperature.
- 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.
- 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.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
- Fully release the accelerator pedal within 3 seconds after the MIL turned ON.
- Start engine and let it idle.

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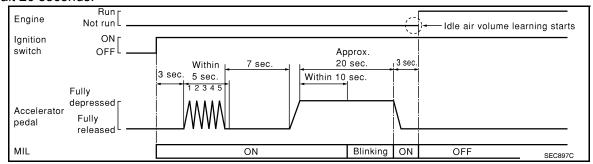
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11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications. Refer to EC-1078, "Basic Inspection".

ITEM	SPECIFICATION
Idle speed	M/T: $700 \pm 50$ rpm (in Neutral position) A/T: $700 \pm 50$ rpm (in P or N position) CVT: $700 \pm 50$ rpm (in P or N position)
Ignition timing	M/T: $13 \pm 5^{\circ}$ BTDC (in Neutral position) A/T: $13 \pm 5^{\circ}$ BTDC (in P or N position) CVT: $13 \pm 5^{\circ}$ BTDC (in P or N position)

13. If idle speed and ignition timing are not within the specification, 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 follows:

- 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 <u>EC-1130</u>.
- 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 all over again:
- Engine stalls.
- Erroneous idle.

#### Fuel Pressure Check

INFOID:0000000004499936

#### **FUEL PRESSURE RELEASE**

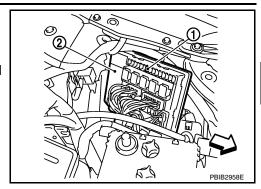
- With CONSULT-III
- 1. Turn ignition switch ON.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-III.
- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- Without CONSULT-III

#### **BASIC SERVICE PROCEDURE**

< SERVICE INFOMATION > [MR TYPE 2]

1. Remove fuel pump fuse (1) located in IPDM E/R (2).

- : Vehicle front
- 2. Start engine.
- After engine stalls, crank it two or three times to release all fuel pressure.
- 4. Turn ignition switch OFF.
- 5. Reinstall fuel pump fuse after servicing fuel system.



# FUEL PRESSURE CHECK

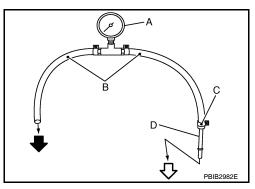
#### **CAUTION:**

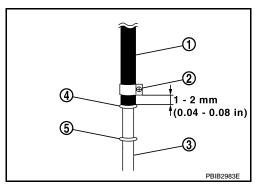
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger. NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because C11 models do not have fuel return system.
- The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.
- Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains seal ability with O-rings inside.
- Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.
- 1. Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
- 2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
  - : To quick connector
  - To fuel tube (engine side)
  - · C: Clamp
  - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
  - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
  - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
  - Use Pressure Gauge to check fuel pressure.
- 3. Remove fuel hose. Refer to EM-156, "Removal and Installation".
  - Do not twist or kink fuel hose because it is plastic hose.
- 4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
  - No.2 spool (5)
  - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
  - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
  - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
  - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
  - When reconnecting fuel line, always use new clamps.
  - Use a torque driver to tighten clamps.
  - Install hose clamp to the position within 1 2 mm (0.04 0.08 in).

## Tightening torque: 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

Make sure that clamp screw does not contact adjacent parts.





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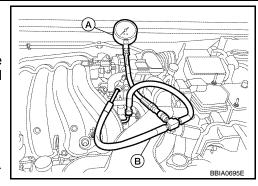
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- 5. Connect fuel tube adapter to quick connector.
  - · A: Fuel pressure gauge
  - B: Fuel hose for fuel pressure check
- After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
- 7. Turn ignition switch ON and check for fuel leakage.
- Start engine and check for fuel leakage.
- 9. Read the indication of fuel pressure gauge.
  - Do not perform fuel pressure check with system operating.
     Fuel pressure gauge may indicate false readings.
  - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.



## At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 51 psi)

- 10. If result is unsatisfactory, go to next step.
- 11. Check the following.
  - Fuel hoses and fuel tubes for clogging
  - · Fuel filter for clogging
  - Fuel pump
  - · Fuel pressure regulator for clogging

If OK, replace fuel pressure regulator.

If NG, repair or replace.

- 12. Check the following.
  - · Fuel hoses and fuel tubes for clogging
  - · Fuel filter for clogging
  - Fuel pump
  - · Fuel pressure regulator for clogging

If OK, replace fuel pressure regulator.

If NG, repair or replace.

 Before disconnecting Fuel Pressure Gauge and Fuel Pressure Adapter J-44321-6, release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".

### TROUBLE DIAGNOSIS

## **Trouble Diagnosis Introduction**

#### INFOID:0000000004499937

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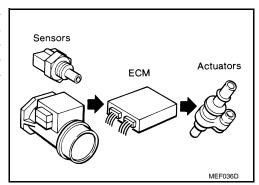
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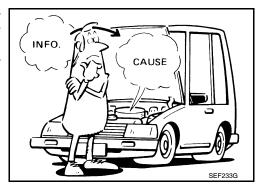
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#### INTRODUCTION

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 leaks, fouled spark plugs, or other malfunctions with the engine.



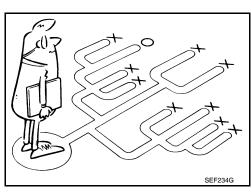
It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



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 on "WORK FLOW".

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a drivability 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 drivability malfunctions on an electronically controlled engine vehicle.



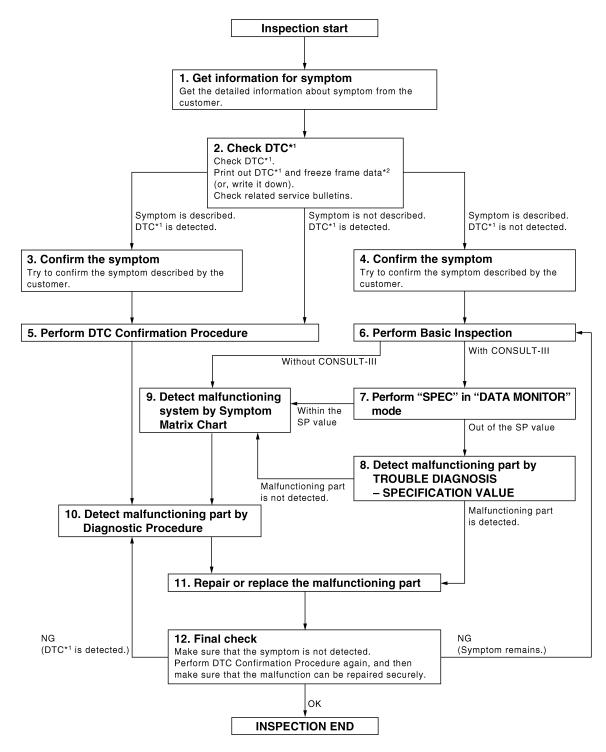
**WORK FLOW** 

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Overall Sequence



\*1: Include 1st trip DTC.

\*2: Include 1st trip freeze frame data.

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#### **Detailed Flow**

### 1.GET INFORMATION FOR SYMPTOM

Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "DIAGNOSTIC WORKSHEET".

IMR TYPE 2 < SERVICE INFOMATION >

# $\overline{2}$ .CHECK DTC $^{*1}$

Check DTC\*1. 1.

Perform the following procedure if DTC\*<sup>1</sup> is displayed.

Record DTC\*1 and freeze frame data\*2. (Print them out with CONSULT-III or GST.)

Erase DTC\*1. (Refer to EC-1052, "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-1095, "Symptom Matrix Chart".)

Check related service bulletins for information.

#### Is any symptom described and any DTC 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 WORK SHEET is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

### f 4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

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.

## ${f 5}$ PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC Confirmation Procedure for the displayed DTC\*1, and then make sure that DTC\*1 is detected again.

If two or more DTCs\*1 are detected, refer to EC-1093, "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<sup>1</sup> by DTC Confirmation Procedure.

Is DTC\*1 detected?

Yes >> GO TO 10.

>> Check according to EC-1138.

#### $\mathbf{6}$ Perform basic inspection

Perform EC-1078, "Basic Inspection".

With CONSULT-III>>GO TO 7. Without CONSULT-III>>GO TO 9.

#### / .PERFORM SPEC IN DATA MONITOR (SPEC) MODE

#### With CONSULT-III

Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL", and "A/F ALPHA-B1" are within the SP value using CONSULT-III "SPEC" in "DATA MONITOR" mode, Refer to EC-1130, "Inspection Procedure".

#### Are they within the SP value?

Yes >> GO TO 9. EC

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No >> GO TO 8.

## 8.DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to EC-1130, "Diagnosis Procedure".

#### Is malfunctioning part detected?

Yes >> GO TO 11. No >> GO TO 9.

## 9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM MATRIX CHART

Detect malfunctioning system according to <u>EC-1095</u>, "Symptom Matrix Chart" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

>> GO TO 10.

## 10. DETECT MALFUNCTIONING PART BY 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-25, "How to Perform Efficient Diagnosis for an Electrical Incident".

#### Is malfunctioning part detected?

Yes >> GO TO 11.

No

>> Monitor input data from related sensors or check voltage of related ECM terminals using CON-SULT-III. Refer to <a href="EC-1109">EC-1109</a>. "ECM Terminal and Reference Value", <a href="EC-1126">EC-1126</a>. "CONSULT-III Reference Value in Data Monitor Mode".

## 11. REPAIR OR REPLACE THE MALFUNCTIONING PART

- 1. Repair or replace the malfunctioning part.
- Reconnect parts or connectors disconnected during Diagnostic Procedure again after repair and replacement.
- 3. Check DTC. If DTC is displayed, erase it, refer to EC-1052. "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 make sure that the malfunction have been repaired securely.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

#### 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, make sure to erase unnecessary DTC\*1 in ECM and TCM (Transmission Control Module). (Refer to <u>EC-1052</u>, "<u>Emission-related Diagnostic Information</u>" and <u>AT-39</u>, "<u>OBD-II Diagnostic Trouble Code (DTC)</u>", <u>CVT-209</u>, "<u>OBD-II Diagnostic Trouble Code (DTC)</u>".)
  - 2. If the completion of SRT is needed, drive vehicle under the specific driving pattern. Refer to <a href="EC-1052">EC-1052</a>, "Emission-related Diagnostic Information".
  - 3. INSPECTION END
- \*1: Include 1st trip DTC.
- \*2: Include 1st trip freeze frame data.

#### DIAGNOSTIC WORKSHEET

Description

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#### < SERVICE INFOMATION >

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 as shown in the following "Worksheet Sample" 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 na	me 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.										
	☐ Startability	☐ Impossible to start ☐ No combus ☐ Partial combustion affected by tl ☐ Partial combustion NOT affected ☐ Possible but hard to start ☐ Other	hrottle position d by throttle position										
Symptoms	□ Idling	☐ No fast idle ☐ Unstable ☐ H☐ Others [	High idle										
eyp.ce	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock☐ Intake backfire ☐ Exhaust backfi☐ Others [											
	☐ Engine stall	g elerating ing											
Incident occu	urrence	☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night [											
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes											
Weather con-	ditions	☐ Not affected											
	Weather	☐ Fine ☐ Raining ☐ Snowing	Others [										
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐	Cold ☐ Humid °F										
		☐ Cold ☐ During warm-up ☐	After warm-up										
Engine condi	itions	Engine speed 0 2,000	4,000 6,000 8,000 rpm										
Road condition	ons	☐ In town ☐ In suburbs ☐ Hig	ghway 🔲 Off road (up/down)										
Driving condi	itions	☐ While accelerating ☐ While cruis	☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising										
		Vehicle speed											
Malfunction in	ndicator lamp	☐ Turned on ☐ Not turned on											

## **DTC Inspection Priority Chart**

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

INFOID:0000000004499938

MTBL0017

Priority	Detected items (DTC)
1	<ul> <li>U0101 U0140 U1001 CAN communication line</li> <li>P0101 P0102 P0103 Mass air flow sensor</li> <li>P0112 P0113 P0127 Intake air temperature sensor</li> <li>P0116 P0117 P0118 P0125 Engine coolant temperature sensor</li> <li>P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor</li> <li>P0128 Thermostat function</li> <li>P0181 P0182 P0183 Fuel tank temperature sensor</li> <li>P0327 P0328 Knock sensor</li> <li>P0335 Crankshaft position sensor (POS)</li> <li>P0340 Camshaft position sensor (PHASE)</li> <li>P0460 P0461 P0462 P0463 Fuel level sensor</li> <li>P0500 Vehicle speed sensor</li> <li>P0605 P0607 ECM</li> <li>P0643 Sensor power supply</li> <li>P0705 P0850 Park/neutral position (PNP) switch</li> <li>P1610 - P1615 NATS</li> <li>P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor</li> </ul>
2	<ul> <li>P0031 P0032 Air fuel ratio (A/F) sensor 1 heater</li> <li>P0037 P0038 Heated oxygen sensor 2 heater</li> <li>P0075 Intake valve timing control solenoid valve</li> <li>P0130 P0131 P0132 P0133 P2A00 Air fuel ratio (A/F) sensor 1</li> <li>P0137 P0138 P0139 Heated oxygen sensor 2</li> <li>P0441 EVAP control system purge flow monitoring</li> <li>P0443 P0444 P0445 EVAP canister purge volume control solenoid valve</li> <li>P0447 P0448 EVAP canister vent control valve</li> <li>P0451 P0452 P0453 EVAP control system pressure sensor</li> <li>P1217 Engine over temperature (OVERHEAT)</li> <li>P1805 Brake switch</li> <li>P2100 P2103 Throttle control motor relay</li> <li>P2101 Electric throttle control function</li> <li>P2118 Throttle control motor</li> </ul>
3	<ul> <li>P0011 Intake valve timing control</li> <li>P0171 P0172 Fuel injection system function</li> <li>P0300 - P0304 Misfire</li> <li>P0420 Three way catalyst function</li> <li>P0442 P0456 EVAP control system (SMALL LEAK, VERY SMALL LEAK)</li> <li>P0455 EVAP control system (GROSS LEAK)</li> <li>P0506 P0507 Idle speed control system</li> <li>P0710 P0715 P0720 P0725 P0731 P0732 P0733 P0734 P0740 P0744 P0745 P0746 P0750 P0755 P0776 P0778 P0840 P0845 P1705 P1740 P1760 P1777 P1778 A/T or CVT related sensors, solenoid valves and switches</li> <li>P148 Closed loop control</li> <li>P1421 Cold start control</li> <li>P1564 ASCD steering switch</li> <li>P1572 ASCD brake switch</li> <li>P1574 ASCD vehicle speed sensor</li> <li>P1715 Turbine revolution sensor (A/T), Primary speed sensor (CVT)</li> <li>P2119 Electric throttle control actuator</li> </ul>

Fail-Safe Chart

When the DTC listed below is detected, the ECM enters fail-safe mode and the MIL lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC No.	Detected items	Engine operating condition in fail-sa	afe mode						
P0117 P0118	Engine coolant temperature sensor circuit	tion.	determined by ECM based on the following condi- colant 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 sarting.	80°C (176°F)						
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)						
		When the fail-safe system for engining fan operates while engine is run	e coolant temperature sensor is activated, the cool- ning.						
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	in order for the idle position to be w	le control actuator in regulating the throttle opening ithin +10 degrees. ed of the throttle valve to be slower than the normal						
P0643	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at fixed opening (approx. 5 degrees) by the return spring.							
P2100 P2103	Throttle control relay	ECM stops the electric throttle contributed opening (approx. 5 degrees) by	rol actuator control, throttle valve is maintained at a by the return spring.						
P2101	Electric throttle control function	ECM stops the electric throttle contributed opening (approx. 5 degrees) by	rol actuator control, throttle valve is maintained at a by the return spring.						
P2118	Throttle control motor	ECM stops the electric throttle contributed opening (approx. 5 degrees) by	rol actuator control, throttle valve is maintained at a by the return spring.						
P2119	Electric throttle control actuator	spring malfunction:)	tuator by regulating the throttle opening around the not rise more than 2,000 rpm.						
			in fail-safe mode is not in specified range:) ontrol actuator by regulating the throttle opening to						
		the engine stalls.	ve is stuck open:) down gradually by fuel cut. After the vehicle stops, /T, CVT), Neutral (M/T) position, and engine speed						
P2122 P2123 P2127 P2128	Accelerator pedal position sensor	in order for the idle position to be w	le control actuator in regulating the throttle opening ithin +10 degrees. ed of the throttle valve to be slower than the normal						

<sup>•</sup> When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting up MIL when there is malfunction on engine control system.

So, the acceleration will be poor.

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

## Symptom Matrix Chart

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							S	YMPT	OM						
		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)	Reference
	y symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	E0.4540
Fuel	Fuel pump circuit	1	1	2	3	2	4	2	2			3		2	EC-1513
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-1086
	Fuel injector circuit	1	1	2	3	2	4	2	2	4		2			EC-1508
Air	Evaporative emission system  Positive crankcase ventilation sys-	3	3	4	4	4	4	4	4	4		4			EC-1036
All	tem	3	3	4	4	4	4	4	4	4		4	1		EC-1048
	Incorrect idle speed adjustment						1	1	1	1		1			EC-1078
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-1451, EC-1462
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-1078
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1518
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			EC-1139
Mass air	flow sensor circuit				2										EC-1170, EC-1178
Engine o	coolant temperature sensor circuit	1					3			3					EC-1189, EC-1192, EC-1202
Air fuel r	ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-1210, EC-1216, EC-1222, EC-1228, EC-1488
Throttle	position sensor circuit						2			2					EC-1197, EC-1278, EC-1417, EC-1419, EC-1476
Accelerator pedal position sensor circuit				3	2	1									EC-1396, EC-1464, EC-1469, EC-1481
Knock s	Knock sensor circuit			2								3			EC-1289
Cranksh	aft position sensor (POS) circuit	2	2												EC-1293
Camsha	ft position sensor (PHASE) circuit	3	2												EC-1299
Vehicle s	speed signal circuit		2	3		3						3			EC-1387
ECM		2	2	3	3	3	3	3	3	3	3	3			EC-1393

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						S\	/MPT	ОМ						
	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)	Reference
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-1165
Park/neutral position (PNP) switch circuit			3		3		3	3			3			EC-1401
Refrigerant pressure sensor circuit		2				3			3		4			EC-1527
Electrical load signal circuit							3							EC-1506
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	MTC-22
ABS actuator and electric unit (control unit)			4											BRC-8

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next table)

## SYSTEM — ENGINE MECHANICAL & OTHER

							S	MPT	OM						
		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)	Reference
Warranty	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	
Fuel	Fuel tank	5													<u>FL-9</u>
	Fuel piping	3		5	5	5		5	5			5			EM-156
	Vapor lock		5												_
	Valve deposit														_
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_

							S'	/MPT	MC						
		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)	Reference
Warranty s	ymptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Air	Air duct														EM-139
	Air cleaner													·	EM-139
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			EM-139
	Electric throttle control actuator	5			5		5			5				·	EM-141
	Air leakage from intake manifold/ Collector/Gasket														EM-141
Cranking	Battery	1	1	1		1		1	1					1	<u>SC-7</u>
	Generator circuit	Ċ	•	•					•						<u>SC-22</u>
	Starter circuit	3													<u>SC-16</u>
	Signal plate	6										1			EM-200
	Park/neutral position (PNP) switch	4													MT-54, AT-95, CVT-252
Engine	Cylinder head	_	-	_	_	_		_				_			<b></b>
	Cylinder head gasket	- 5	5	5	5	5		5	5		4	5	3		<u>EM-186</u>
	Cylinder block														
	Piston	1											4		
	Piston ring	6	6	6	6	6		6	6			6			EM-200
	Connecting rod	1	U	U	U	U		U	U			U			LIVI-ZUU
	Bearing														
	Crankshaft														
Valve	Timing chain														EM-161
mecha- nism	Camshaft														EM-170
	Intake valve timing control	5	5	5	5	5		5	5			5			EM-161
	Intake valve												3		EM-189
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			<u>EM-144,</u> <u>EX-9</u>
1 62	Three way catalyst														EM 417
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			EM-147, LU-19
	Oil level (Low)/Filthy oil														<u>LU-16</u>

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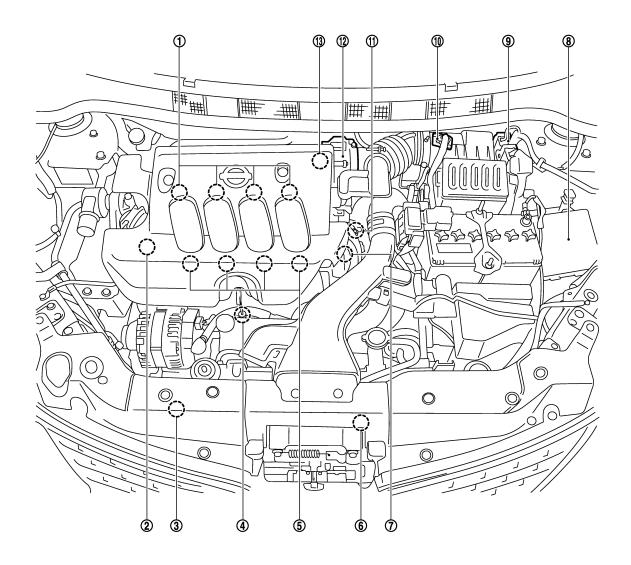
							S١	/MPT	OM							۸
		<u> </u>				NO					HIGH					Α
		(EXCP. HA)		SPOT		ACCELERATION						NO	z	(GE)		EC
		START/RESTART (EX		HESITATION/SURGING/FLAT SI	SPARK KNOCK/DETONATION	POOR ACCE	H H	TING		SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE	CONSUMPTION	CONSUMPTION	NDER CHARGE)	Reference	С
			STALL	ON/SURG	NOCK/DE	POWER/POOR	=/LOW ID	OLE/HUN	BRATION	RETURN	ATS/WATE	VE FUEL	OIL	DEAD (U		D
		HARD/NO	ENGINE	HESITATI	SPARK KI	LACK OF	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NC	OVERHE/	EXCESSIVE FUEL	EXCESSIVE	BATTERY DEAD (UNDER		Е
Warranty	symptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА		
Cooling	Radiator/Hose/Radiator filler cap														CO-38	F
	Thermostat									5					<u>CO-45</u>	
	Water control valve														<u>CO-47</u>	G
	Water pump	5	5	5	5	5		5	5		4	5			<u>CO-43</u>	
	Water gallery										-				<u>CO-34</u>	
	Cooling fan														<u>CO-42</u>	Н
	Coolant level (Low)/Contaminat- ed coolant									5					<u>CO-35</u>	
NVIS (NIS NATS)	SSAN Vehicle Immobilizer System-	1	1												BL-257	I

<sup>1 - 6:</sup> The numbers refer to the order of inspection.

EC-1099

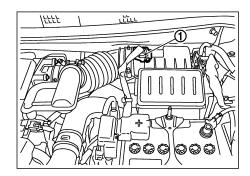
## **Engine Control Component Parts Location**

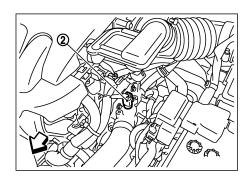
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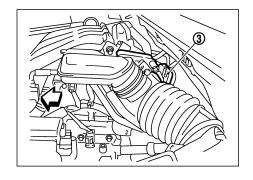


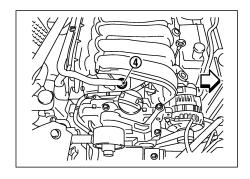
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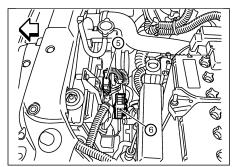
- Ignition coil (with power transistor) and spark plug
- 4. Knock sensor
- 7. Camshaft position sensor (PHASE)
- 10. Mass air flow sensor (with intake air temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- 2. Intake valve timing control solenoid valve
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Refrigerant pressure sensor
- 6. Cooling fan motor
- 9. ECM
- Electric throttle control actuator (with built-in throttle position sensor, throttle control motor)

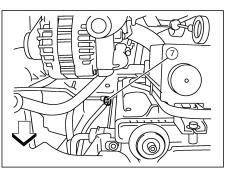












BBIA0724E

#### : Vehicle front

- Mass air flow sensor
   (with intake air temperature sensor)
- 4. PCV valve
- 7. Refrigerant pressure sensor
- 2. Engine coolant temperature sensor
- 5. Cooling fan motor

- Electric throttle control actuator (with built in throttle position sensor, throttle control motor)
- 6. Resistor

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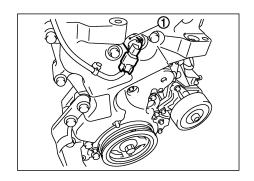
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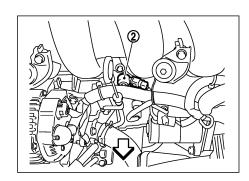
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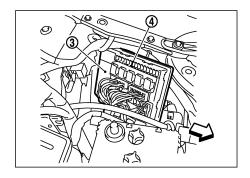
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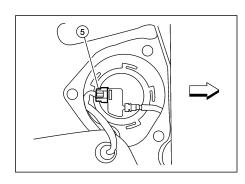
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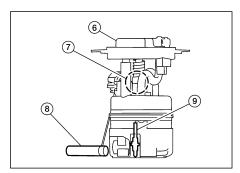
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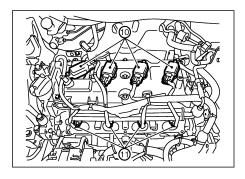








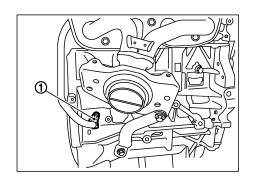


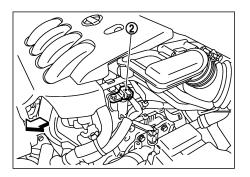


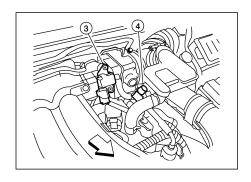
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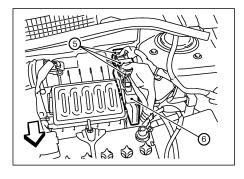
- : Vehicle front
- Intake valve timing control solenoid valve
- 4. Fuel pump fuse (15A)
- 7. Fuel pressure regulator
- 10. Ignition coil (with power transistor) and spark plug
- 2. Knock sensor
- harness connector (view with inspection hole cover removed)
- 8. Fuel level sensor
- Fuel injector

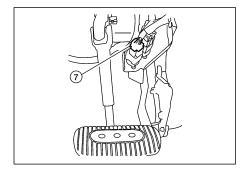
- 3. IPDM E/R
- Fuel level sensor unit and fuel pump 6. Fuel level sensor unit and fuel pump
  - 9. Fuel tank temperature sensor

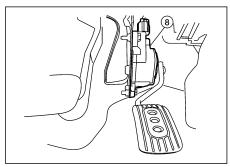












BBIA0727E

Vehicle front

1. Crankshaft position sensor (POS)

- 4. EVAP service port
- 7. Stop lamp switch
- 2. Camshaft position sensor (PHASE) 3.
- 5. ECM harness connector
- 8. Accelerator pedal position sensor
- EVAP canister purge volume control solenoid valve
- 6. ECM

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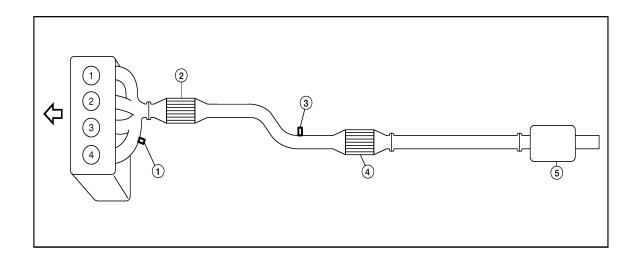
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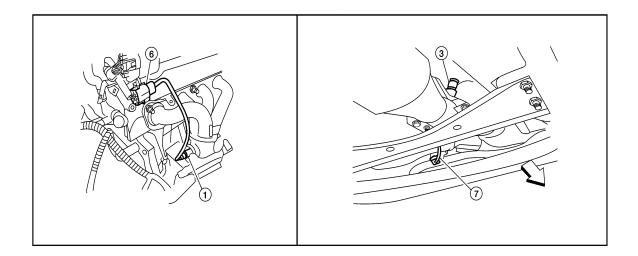
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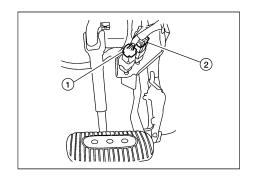


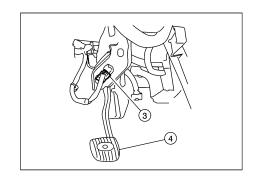


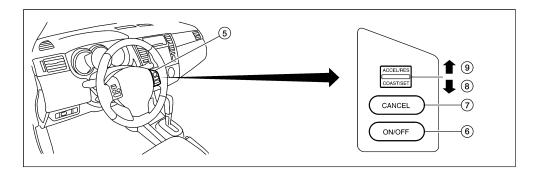
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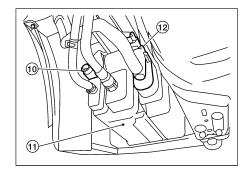
- : Vehicle front
- 1. Air fuel ratio (A/F) sensor 1
- 4. Three way catalyst (Under floor)
- 7. Heated oxygen sensor 2 harness connector
- 2. Three way catalyst (Manifold)
- 5. Muffler

- 3. Heated oxygen sensor 2
- 6. Air fuel ratio (A/F) sensor 1 harness connector









BBIA0728E

Stop lamp switch 1.

Clutch pedal 4.

CANCEL switch

10. EVAP control system pressure sen- 11. EVAP canister

ASCD brake switch 2.

5. ASCD steering switch

8. SET/COAST switch

ASCD clutch switch 3.

6. MAIN switch

RESUME/ACCELERATOR switch

12. EVAP canister vent control valve

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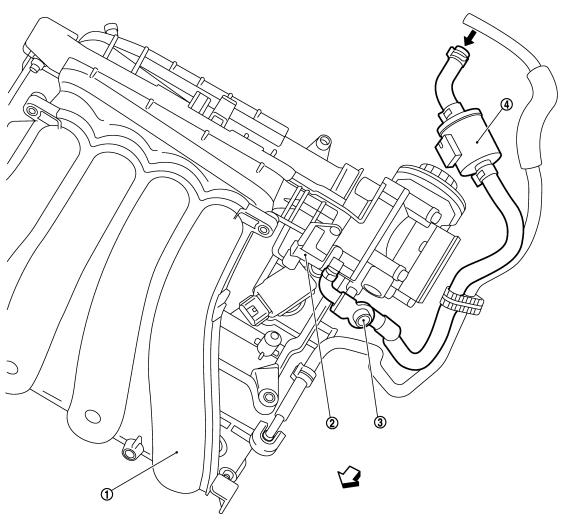
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Vacuum Hose Drawing

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PBIB3330E

: Vehicle front

1. Intake manifold

: From EVAP canister

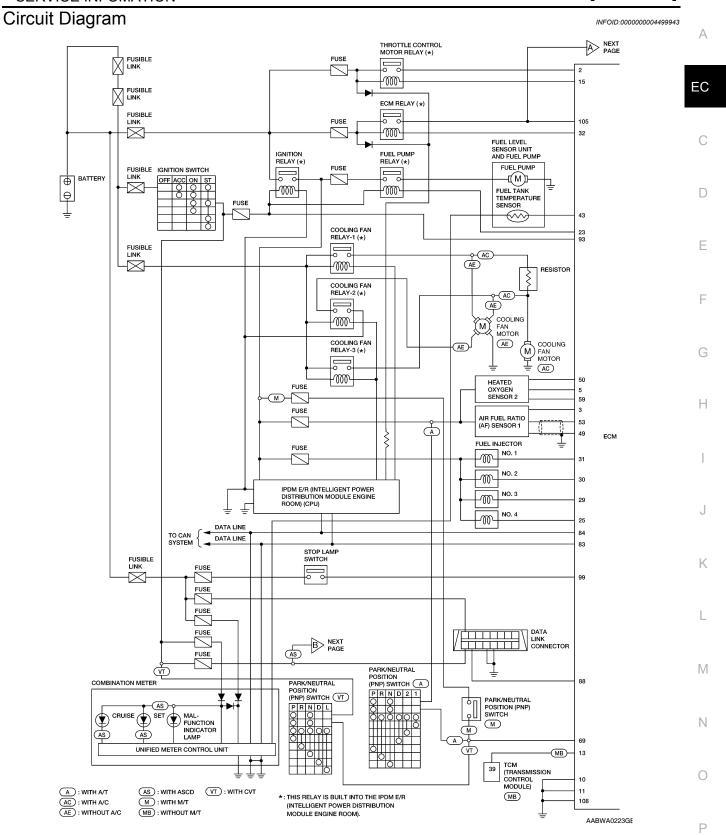
EVAP canister purge volume control 3. EVAP service port solenoid valve

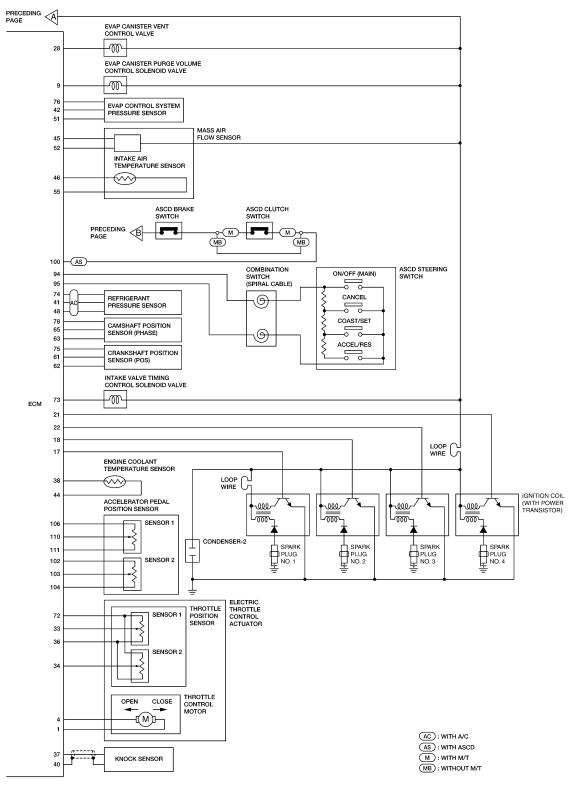
4. EVAP purge resonator

#### NOTE:

Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

Refer to EC-1027, "Schematic" for Vacuum Control System.





## **ECM Harness Connector Terminal Layout**

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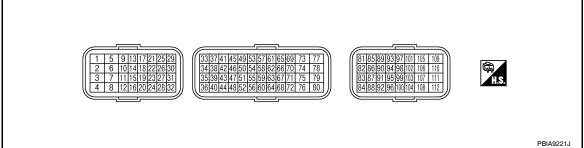
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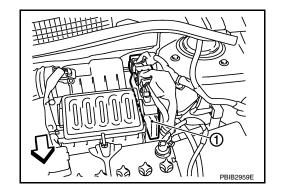


### ECM Terminal and Reference Value

INFOID:0000000004499945

#### **PREPARATION**

- 1. ECM (1) is located in the engine room left side near battery.
  - : Vehicle front



#### **ECM INSPECTION TABLE**

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

					K
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	L
1	L	Throttle control motor (Open)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully depressed	Approximately 3.2V  SV/Div 1ms/Div T  PBIA8150J	M
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	0
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V	Р

-02:00	102 1111	OWATION >		
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	Р	Throttle control motor (Close)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully released	Approximately 1.8V  >>> 5V/Div 1ms/Div T  PBIA8149J
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  >>> 10.0V/Div 50ms/Div T  PBIAB148J
			[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
9 1		P EVAP canister purge volume control solenoid valve  [Engine is running]	<ul><li>Idle speed</li><li>Accelerator pedal: Not depressed even</li></ul>	BATTERY VOLTAGE  (11 - 14V)  >> 10.0V/Div 50 ms/Div  PBIB0050E
			Engine speed: About 2,000 rpm (More than	Approximately 10V
10 11	B B	ECM ground	[Engine is running] • Idle speed	Body ground
13	L	Tachometer signal	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	3 - 5V ⇒ 2.0V/Div 50ms/Div   PBIA8164J
			<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm.</li></ul>	3 - 5V  ⇒ 2.0V/Div 50ms/Div  PBIA8165J

C Voltage)
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50 ms/01v T PBIA9265J
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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	LG	Throttle position sensor 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36V
33	LG		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75V
34	0		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	Less than 4.75V
34	0	Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36V
36	Y	Sensor ground (Throttle position sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
37	W	Knock sensor	[Engine is running]  • Idle speed	Approximately 2.5V
38	Р	Engine coolant temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
40	_	Sensor ground (Knock sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
41	GR	Refrigerant pressure sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan switch: ON (Compressor operates.)</li> </ul>	1.0 - 4.0V
42	٧	EVAP control system pressure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V
43	Р	Fuel tank temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature
44	В	Sensor ground (Engine coolant temperature sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
45	G	Mass air flow sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0.8 - 1.1V
43	J	ividas dil ilow serisor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.7V
46	V	Intake air temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
48	BR	Sensor ground (Refrigerant pressure sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
49	W	A/F sensor 1	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	Approximately 1.8V Output voltage varies with air fuel ratio.

## **TROUBLE DIAGNOSIS**

< SERVICE INFOMATION >

[MR TYPE 2]

TERMI-					
NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	Α
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V	EC C
51	0	Sensor ground (EVAP control system pressure sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	D
52	LG	Sensor ground (Mass air flow sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	Е
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V	
55	0	Sensor ground (Intake air temperature sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	F
59	0	Sensor ground (Heated oxygen sensor 2)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V	G
	61 W Crankshaft position sensor (POS)		[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle.	Approximately 4.0V	H
61			[Engine is running] • Engine speed: 2,000 rpm	Approximately 4.0V	K
62	R	Sensor ground [Crankshaft position sensor (POS)]	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	M
63	BR	Sensor ground [Camshaft position sensor (PHASE)]	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V	N

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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	G	Camshaft position sensor (PHASE)	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	1.0 - 2.0V
•			[Engine is running] • Engine speed: 2,000 rpm.	1.0 - 2.0V  → 10 ms/Div T  PBIB2987E
		Park/neutral position (PNP)	[Ignition switch: ON] • Shift lever: P or N (A/T, CVT), Neutral (M/T)	BATTERY VOLTAGE (11 - 14V)
69	L	switch	[Ignition switch: ON] • Except above	Approximately 0V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V
			[Engine is running]  • Warm-up condition  • Idle speed	BATTERY VOLTAGE (11 - 14V)
73	P	Intake valve timing control solenoid valve	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>When revving engine up to 2,000 rpm quickly</li> </ul>	7 - 10V
74	w	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pressure sensor power supply	[Ignition switch: ON]	Approximately 5V
78	0	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5V
83	Р	CAN communication line	_	_
84	L	CAN communication line	_	_
88	LG	DATA link connector	_	_
			[Ignition switch: OFF]	0V
93	0	Ignition switch	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)		
		[Ignition switch: ON] • ASCD steering switch: OFF	Approximately 4V			
			[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0V		
94	R	ASCD steering switch	[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1V		
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3V		
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 2V		
95	В	Sensor ground (ASCD steering switch)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V		
99	R	Stan Jama quitab	[Ignition switch: OFF] • Brake pedal: Fully released	Approximately 0V		
99	K	Stop lamp switch	[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)		
100	G		[Ignition switch: ON]  • Brake pedal: Slightly depressed (A/T, CVT)  • Brake pedal and/or clutch pedal: Slightly depressed (M/T)	Approximately 0V		
100 G	ASCD brake switch	[Ignition switch: ON]  • Brake pedal: Fully released (A/T, CVT)  • Brake pedal and clutch pedal: Fully released (M/T)	BATTTERY VOLTAGE (11 - 14V)			
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5V		
102	103 GR		103 GP	Accelerator pedal position	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103		sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V		
104	Y	Sensor ground (Accelerator pedal position sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V		
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)		
106	Р	Sensor power supply (Accelerator pedal position sensor 1)	[Ignition switch: ON]	Approximately 5V		
108	В	ECM ground	[Engine is running] Idle speed	Body ground		
110 G	G	Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V		
	G		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V		
111	R	Sensor ground (Accelerator pedal position sensor 1)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V		

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## CONSULT-III Function (ENGINE)

INFOID:0000000004499946

#### **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 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 their vehicle condition requires periodic maintenance.		
DTC & SRT Confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.		
ECU Identification	ECM part number can be read.		

<sup>\*:</sup> 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

	tto			DIAGNOSTIC TEST MODE						
					AGNOSTIC SULT	DATA		DTC & SRT CONFIRMATION		
	ltem		SUP- FREEZE M	MONI- TOR	ACTIVE TEST	SRT STATUS	DTC WORK SUP- PORT			
		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		×		×				
TS		Throttle position sensor		×	×	×				
PAR		Fuel tank temperature sensor		×		×	×			
NENT		EVAP control system pressure sensor		×		×				
ΠPO		Intake air temperature sensor		×	×	×				
ő	INPUT	Knock sensor		×						
7	Ξ	Refrigerant pressure sensor				×				
ENGINE CONTROL COMPONENT PARTS		Closed throttle position switch (Accelerator pedal position sensor signal)				×				
S S		Air conditioner switch				×				
Ш		Park/neutral position (PNP) switch		×		×				
		Stop lamp switch		×		×				
		Battery voltage				×				
		Load signal				×				
		Fuel level sensor		×		×				
		ASCD steering switch		×		×				
		ASCD brake switch		×		×				
		ASCD clutch switch		×		×				
		Power steering operation signal				×				

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			DIAGNOSTIC TEST MODE						
	_			SELF DIAGNOSTIC RESULT		DATA		DTC & SRT CONFIRMATION	
Item			SUP- PORT	DTC*1	FREEZE FRAME DATA* <sup>2</sup>	MONI- TOR	ACTIVE TEST	SRT STATUS	DTC WORK SUP- PORT
		Fuel injector				×	×		
	ООТРОТ	Power transistor (Ignition timing)				×	×		
RTS		Throttle control motor relay		×		×			
PA		Throttle control motor		×					
ENGINE CONTROL COMPONENT PARTS		EVAP canister purge volume control solenoid valve		×		×	×		×
MPC		Air conditioner relay				×			
00		Fuel pump relay	×			×	×		
3OL		Cooling fan relay		×		×	×		
IL		Air fuel ratio (A/F) sensor 1 heater		×		×		×* <sup>3</sup>	
S E		Heated oxygen sensor 2 heater		×		×		×*3	
<u>5</u>		EVAP canister vent control valve	×	×		×	×		
Ä		Intake valve timing control solenoid valve		×		×	×		
		Calculated load value			×	×			

### X: Applicable

## **WORK SUPPORT MODE**

### Work Item

WORK ITEM	CONDITION	USAGE	
FUEL PRESSURE RELEASE	FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line	
IDLE AIR VOL LEARN	THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume	
SELF-LEARNING CONT	THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT.	When clearing the coefficient of self-learning control value	

<sup>\*1:</sup> This item includes 1st trip DTCs.

<sup>\*2:</sup> 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 <a href="EC-1052">EC-1052</a>, "Emission-related Diagnostic Information".

<sup>\*3:</sup> Always "COMPLT" is displayed.

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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.  • 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, CONSULTIII 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 vapor leak point of EVAP system
TARGET IDLE RPM ADJ*	IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	IDLE CONDITION	When adjusting target ignition timing
VIN REGISTRATION	IN THIS MODE, VIN IS REGISTERED IN ECM.	When registering VIN in ECM

<sup>\*:</sup> 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-1052, "Emission-related Diagnostic Information".

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description		
DIAG TROUBLE CODE [PXXXX]	<ul> <li>The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to <u>EC-1015</u>)</li> </ul>		
FUEL SYS-B1	<ul> <li>"Fuel injection system status" at the moment a malfunction is detected is displayed.</li> <li>One mode in the following is displayed.         Mode2: Open loop due to detected system malfunction         Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment)         Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control         Mode5: Open loop - has not yet satisfied condition to go to closed loop     </li> </ul>		
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 [%]	<ul> <li>"Long-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.</li> </ul>		
S-FUEL TRM-B1 [%]	<ul> <li>"Short-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.</li> </ul>		
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.		

## **TROUBLE DIAGNOSIS**

## < SERVICE INFOMATION >

Freeze frame data item*	Description
FUEL SYS-B2	
L-FUEL TRM-B2 [%]	
S-FUEL TRM-B2 [%]	These items are displayed but are not applicable to this model.
INT MANI PRES [kPa]	
COMBUST CONDITION	

<sup>\*:</sup> 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 signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	<ul> <li>Accuracy becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul>
MAS A/F SE-B1 [V]	The signal voltage of the mass air flow sensor is displayed.	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>When engine is running, specification range is indicated in "SPEC".</li> </ul>
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.	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>This data also includes the data for the air/fuel ratio learning control.</li> <li>When engine is running, specification range is indicated in "SPEC".</li> </ul>
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 A/F sensor 1 is displayed.	
HO2S2 (B1) [V]	The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR (B1) [RICH/LEAN]	Display of heated oxygen sensor 2 signal:     RICH: means the amount of oxygen after three way catalyst is relatively small.     LEAN: means the amount of oxygen after three way catalyst is relatively large.	When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]  ACCEL SEN 2 [V]	The accelerator pedal position sensor signal voltage is displayed.	ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 1-B1 [V] TP SEN 2-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.

## < SERVICE INFOMATION >

Monitored item [Unit]	Description	Remarks
FUEL T/TMP SE [°C] or [°F]	The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE [°C] or [°F]	The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES [V]	The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE [V]	The signal voltage of the fuel level sensor is displayed.	
START SIGNAL [ON/OFF]	<ul> <li>Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.</li> </ul>	After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	<ul> <li>Indicates idle position [ON/OFF] computed by the ECM ac- cording to the accelerator pedal position sensor signal.</li> </ul>	
AIR COND SIG [ON/OFF]	<ul> <li>Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.</li> </ul>	
P/N POSI SW [ON/OFF]	<ul> <li>Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.</li> </ul>	
PW/ST SIGNAL [ON/OFF]	[ON/OFF] condition of the power steering system (determined by the signal sent from EPS control unit) is indicated.	
LOAD SIGNAL [ON/OFF]	<ul> <li>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.</li> </ul>	
IGNITION SW [ON/OFF]	Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	<ul> <li>Indicates [ON/OFF] condition from the stop lamp switch signal.</li> </ul>	
INJ PULSE-B1 [msec]	<ul> <li>Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.</li> </ul>	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 airflow.	
MASS AIRFLOW [g·m/s]	Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V [%]	<ul> <li>Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
INT/V TIM (B1) [°CA]	Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]	<ul> <li>The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>The advance angle becomes larger as the value increases</li> </ul>	
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.	

## < SERVICE INFOMATION >

Monitored item [Unit]	Description	Remarks
VENT CONT/V [ON/OFF]	The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated.  ON: Closed  OFF: Open	
THRTL RELAY [ON/OFF]	Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]	Indicates the condition of the cooling fan (determined by ECM according to the input signals).  HI: High speed operation  LOW: Low speed operation  OFF: Stop	
HO2S2 HTR (B1) [ON/OFF]	Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
I/P PULLY SPD [rpm]	Indicates the engine speed computed from the turbine revolution 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]	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.	
A/F S1 HTR (B1) [%]	<ul> <li>Indicates A/F sensor 1 heater control value computed by ECM according to the input signals.</li> <li>The current flow to the heater becomes larger as the value increases.</li> </ul>	
AC PRESS SEN [V]	The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [MPH]	The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
SET VHCL SPD [km/h] or [MPH]	The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]	Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW [ON/OFF]	Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW [ON/OFF]	Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW [ON/OFF]	Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1 [ON/OFF]	Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2 [ON/OFF]	Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT [NON/CUT]	Indicates the vehicle cruise condition.     NON: Vehicle speed is maintained at the ASCD set speed.     CUT: Vehicle speed increased to excessively high 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 compared with the ASCD set speed, and ASCD operation is cut off.	
AT OD MONITOR [ON/OFF]	<ul> <li>Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.</li> </ul>	For M/T models always "OFF" is displayed

## **TROUBLE DIAGNOSIS**

< SERVICE INFOMATION >

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Monitored item [Unit]	Description	Remarks	
AT OD CANCEL [ON/OFF]	Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM.	For M/T models always "OFF" is displayed	
CRUISE LAMP [ON/OFF]	Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.		Ε
SET LAMP [ON/OFF]	Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.		
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.		

### 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 INJEC- TION	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
IGNITION TIM- ING	Engine: Return to the original trouble condition     Timing light: Set     Retard the ignition timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learning.
POWER BAL- ANCE	<ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>Cut off each fuel injector signal one at a time using CONSULT-III.</li> </ul>	Engine runs rough or dies.	Harness and connectors     Compression     Fuel injector     Power transistor     Spark plug     Ignition coil
COOLING FAN*	Ignition switch: ON     Turn the cooling fan "LOW", "HI" and "OFF" with CONSULT-III.	Cooling fan moves and stops.	Harness and connectors     Cooling fan relay     Cooling fan motor
ENG COOLANT TEMP	Engine: Return to the original trouble condition     Change the engine coolant temperature using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	Harness and connectors     Engine coolant temperature sensor     Fuel injector
FUEL PUMP RE- LAY	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	<ul> <li>Engine: After warming up, run engine at 1,500 rpm.</li> <li>Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.</li> </ul>	Engine speed changes according to the opening percent.	Harness and connectors     EVAP canister purge volume control solenoid valve
FUEL/T TEMP SEN	Change the fuel tank temperature	using CONSULT-III.	

### < SERVICE INFOMATION >

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
VENT CON- TROL/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     EVAP canister vent control valve
V/T ASSIGN AN- GLE	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

<sup>\*:</sup> 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-1052, "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
	PURG FLOW P0441	P0441	EC-1310
	EVP SML LEAK P0442/P1442*	P0442	EC-1315
EVAPORATIVE SYS- TEM	EVP SIVIL LEAK PU442/P1442	P0455	EC-1366
	EVP V/S LEAK P0456/P1456*	P0456	EC-1373
	PURG VOL CN/V P1444	P0443	EC-1322
A/F SEN1	A/F SEN1 (B1) P1276	P0130	EC-1210
AVF SENT	A/F SEN1 (B1) P1278/P1279	P0133	EC-1228
	HO2S2 (B1) P0139	P0139	EC-1251
HO2S2	HO2S2 (B1) P1146	P0138	EC-1242
	HO2S2 (B1) P1147	P0137	EC-1235

<sup>\*:</sup> DTC P1442 and P1456 does not apply to C11 models but appears in DTC Work Support Mode screens.

# Generic Scan Tool (GST) Function

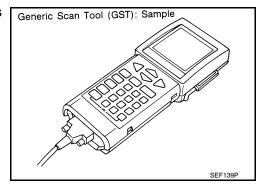
INFOID:0000000004499947

### **DESCRIPTION**

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained below.

ISO 15765-4 is used as the protocol.

The name GST or Generic Scan Tool is used in this service manual.



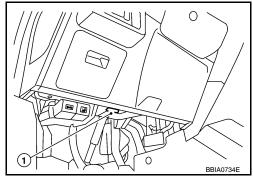
**FUNCTION** 

Diag	gnostic test mode	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-1116, "CONSULT-III Function (ENGINE)".
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.

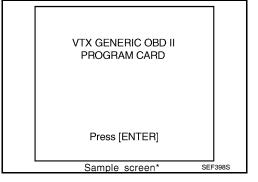
2. Connect GST to data link connector (1), which is located under LH dash panel.



3. Turn ignition switch ON.

Enter the program according to instruction on the screen or in the operation manual.

(\*: Regarding GST screens in this section, sample screens are shown.)



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Perform each diagnostic service according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.

**OBD II FUNCTIONS** 

F0: DATA LIST F1: FREEZE DATA

F2: DTCs

F3: SNAPSHOT

F4: CLEAR DIAG INFO

F5: O2 TEST RESULTS

F6: READINESS TESTS

F7: ON BOARD TESTS F8: EXPAND DIAG PROT

F9: UNIT CONVERSION

Sample screen\* SEF416S

### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004499948

#### 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	COI	NDITION	SPECIFICATION
ENG SPEED	Run engine and compare CONSL tion.	JLT-III value with the tachometer indica-	Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See <u>EC-1130</u> .		
B/FUEL SCHDL	See <u>EC-1130</u> .		
A/F ALPHA-B1	See <u>EC-1130</u> .		
COOLAN TEMP/S	Engine: After warming up		More than 70°C (158°F)
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V
HO2S2 (B1)	are met	rpm quickly after the following conditions	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	Engine: After warming up     Keeping the engine speed betwee     at idle for 1 minute under no load	en 3,500 and 4,000 rpm for 1 minute and	LEAN ←→ RICH
VHCL SPEED SE	Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication.
BATTERY VOLT	Ignition switch: ON (Engine stopp)	ed)	11 - 14V
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN I	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V
EVAP SYS PRES	Ignition switch: ON		Approx. 1.8 - 4.8V
TP SEN 1-B1	Ignition switch: ON     (Engine stopped)	Accelerator pedal: Fully released	More than 0.36V
TP SEN 2-B1*	Shift lever: D (A/T, CVT),     1st (M/T)	Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	Ignition switch: ON → START → ON		$OFF \to ON \to OFF$
CLED THE DOS	- Ignition quitable ON	Accelerator pedal: Fully released	ON
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Slightly depressed	OFF
	• Engine: Afterwarming up, idle the	Air conditioner switch: OFF	OFF
AIR COND SIG	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates.)	ON

MONITOR ITEM	CON	NDITION	SPECIFICATION	-
P/N POSI SW	Ignition switch: ON	Shift lever: P or N (A/T, CVT), Neutral (M/T)	ON	
		Shift lever: Except above	OFF	_
	Engine: After warming up, idle the	Steering wheel: Not being turned	OFF	-
PW/ST SIGNAL	engine	Steering wheel: Being turned	ON	
		Rear window defogger switch: ON and/or Lighting switch: 2nd	ON	<del></del>
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch and lighting switch: OFF	OFF	
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$		$ON \to OFF \to ON$	<del></del>
		Heater fan: Operating	ON	
HEATER FAN SW	Ignition switch: ON	Heater fan: Not operating	OFF	
		Brake pedal: Fully released	OFF	
BRAKE SW	Ignition switch: ON	Brake pedal: Slightly depressed	ON	
	Engine: After warming up	Idle	2.0 - 3.0 msec	
INJ PULSE-B1	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> </ul>	2,000 rpm	1.9 - 2.9 msec	
	No load     Engine: After warming up	Idle	8° - 18° BTDC	
IGN TIMING	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,000 rpm	25° - 45° BTDC	_
	Engine: After warming up	Idle	10% - 35%	
CAL/LD VALUE	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,500 rpm	10% - 35%	
	Engine: After warming up	Idle	1.0 - 4.0 g·m/s	
MASS AIRFLOW	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	2,500 rpm	2.0 - 10.0 g·m/s	
PURG VOL C/V	Engine: After warming up     Air conditioner switch: OFF     Shift lever: P or N (A/T, CVT),	Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%	
	Neutral (M/T)  No load	2,000 rpm	0 - 50%	
	Engine: After warming up	Idle	_5° - 5°CA	
INT/V TIM (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0° - 40°CA	
	Engine: After warming up	Idle	0% - 2%	
INT/V SOL (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0% - 90%	
		Air conditioner switch: OFF	OFF	
AIR COND RLY	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates)	ON	
FUEL PUMP RLY	For 1 second after turning ignition     Engine running or cranking		ON	
	Except above conditions		OFF	

## < SERVICE INFOMATION >

MONITOR ITEM	COI	NDITION	SPECIFICATION
VENT CONT/V	Ignition switch: ON		OFF
THRTL RELAY	Ignition switch: ON		ON
		Engine coolant temperature: 97°C (207°F) or less	OFF
COOLING FAN	<ul><li>Engine: After warming up, idle the engine</li><li>Air conditioner switch: OFF</li></ul>	Engine coolant temperature: Between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature: 100°C (212°F) or more	HIGH
HO2S2 HTR (B1)	Below 3,600 rpm after the followir     Engine: After warming up     Keeping the engine speed betwee     at idle for 1 minute under no load	ng conditions are met. en 3,500 and 4,000 rpm for 1 minute and	ON
	• Engine speed: Above 3,600 rpm		OFF
I/P PULLY SPD	Vehicle speed: More than 20 km/h	n (12 MPH)	Almost the same speed as the tachometer indication
VEHICLE SPEED	Turn drive wheels and compare C indication.	ONSULT-III value with the speedometer	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 mile)
A/F S1 HTR (B1)	Engine: After warming up, idle the engine (More than 140 seconds after starting engine.)		4 - 100%
AC PRESS SEN	Engine: Idle     Air conditioner switch: ON (Compressor operates)		1.0 - 4.0V
VHCL SPEED SE	Turn drive wheels and compare sp III value.	peedometer indication with the CONSULT-	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
IVIAIN SVV	Ignition switch: ON	MAIN switch: Released	OFF
CANCEL SW	Ignition switch: ON	CANCEL switch: Pressed	ON
CANCEL SW	• Ignition switch. ON	CANCEL switch: Released	OFF
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
RESUME/ACC SW	ignition switch. ON	RESUME/ACCELERATE switch: Released	OFF
SET SW	Ignition switch: ON	SET/COAST switch: Pressed	ON
OL I GVV	Ignition switch. On	SET/COAST switch: Released	OFF
BRAKE SW1	Ignition switch: ON	Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	ON
DIVARL SWI	- ignition switch. ON	Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	OFF
BRAKE SW2	Ignition switch: ON	Brake pedal: Fully released	OFF
DIVAIVE SWZ	- Igrillion Switch. ON	Brake pedal: Slightly depressed	ON
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time $\rightarrow$ at the 2nd time	$ON \rightarrow OFF$

## **TROUBLE DIAGNOSIS**

## < SERVICE INFOMATION >

[MR TYPE 2]

MONITOR ITEM	CON	NDITION	SPECIFICATION
	MAIN switch: ON	ACSD: Operating	ON
SET LAMP	Vehicle speed: Between 40 km/h     (25 MPH) and 144 km/h (89     MPH)	ASCD: Not operating	OFF

\*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

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## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description INFOID:0000000004499949

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" of "DATA MONI-TOR" mode of CONSULT-III during normal operation of the Engine Control System. When the value in "SPEC" of "DATA MONITOR" mode is within the SP value, the Engine Control System is confirmed OK. When the value in "SPEC" of "DATA MONITOR" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the 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 correc-
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

## Testing Condition

< SERVICE INFOMATION >

INFOID:0000000004499950

**IMR TYPE 21** 

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (1.003 1.064 kg/cm<sup>2</sup>, 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
- A/T and CVT models: After the engine is warmed up to normal operating temperature, drive vehicle until "FLUID TEMP SE" (A/T or CVT) fluid temperature sensor signal) indicates more than 60°C (140°F).
- M/T models: After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- · Engine speed: Idle

## Inspection Procedure

INFOID:0000000004499951

#### NOTE:

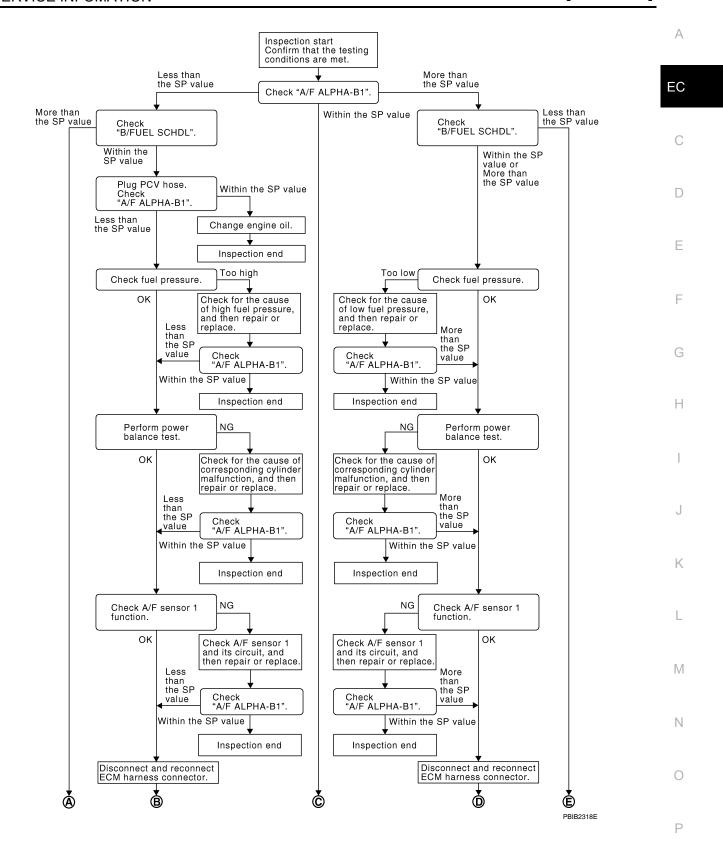
Perform "SPEC" of "DATA MONITOR" mode in maximum scale display.

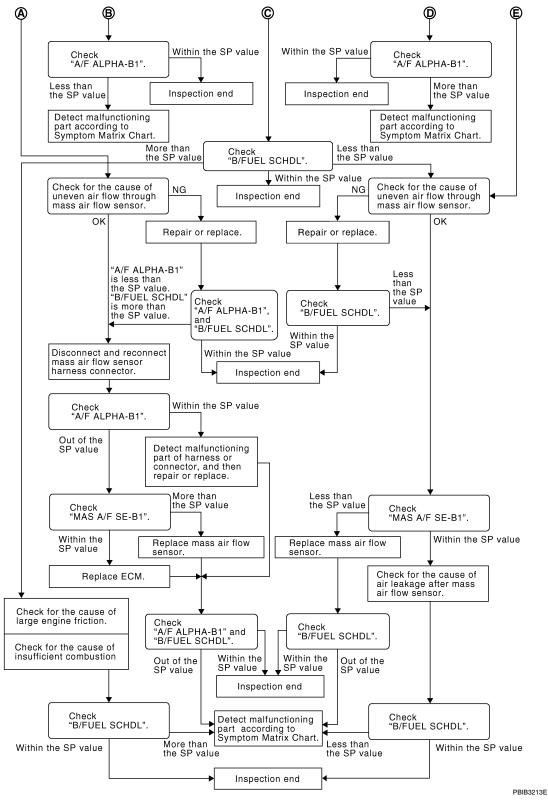
- Perform EC-1078, "Basic Inspection".
- Confirm that the testing conditions indicated above are met.
- Select "B/FUEL SCHDL", "A/F ALPHA-B1" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT-III.
- 4. Make sure that monitor items are within the SP value.
- If NG, go to EC-1130, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004499952

**OVERALL SEQUENCE** 





### **DETAILED PROCEDURE**

# 1.CHECK "A/F ALPHA-B1"

- Start engine.
- Confirm that the testing conditions are met. Refer to <u>EC-1130</u>, "<u>Testing Condition</u>".
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

NOTE:

### TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[MR TYPE 2] < SERVICE INFOMATION > Check "A/F ALPHA-B1" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little. Α OK or NG OK >> GO TO 17. NG (Less than the SP value)>>GO TO 2. EC 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 make sure that the indication is within the SP value. OK or NG D OK >> GO TO 4. NG (More than the SP value)>>GO TO 19. 3.CHECK "B/FUEL SCHDL" Е Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. OK or NG F 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" Stop the engine. Н 2. Disconnect PCV hose, and then plug it. Start engine. 4. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. OK or NG OK >> GO TO 5. NG >> GO TO 6. CHANGE ENGINE OIL Stop the engine. K Change engine oil. Refer to LU-17, "Changing 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 L short during winter). The symptom will not be detected after changing engine oil or changing driving condition. M >> INSPECTION END O.CHECK FUEL PRESSURE N Check fuel pressure. (Refer to EC-1086, "Fuel Pressure Check".) OK or NG OK >> GO TO 9. NG (Fuel pressure is too high)>>Replace fuel pressure regulator, refer to EC-1086, "Fuel Pressure Check". GO TO 8. NG (Fuel pressure is too low)>>GO TO 7. Р .DETECT MALFUNCTIONING PART

- Check the following.
- Clogged and bent fuel hose and fuel tube
- Clogged fuel filter
- Fuel pump and its circuit (Refer to EC-1513.)
- If NG, repair or replace the malfunctioning part. (Refer to EC-1086, "Fuel Pressure Check".) If OK, replace fuel pressure regulator.

EC-1133

>> GO TO 8.

# 8.CHECK "A/F ALPHA-B1"

- 1. Start engine.
- 2. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

#### OK or NG

OK >> INSPECTION END

NG >> GO TO 9.

## 9. PERFORM POWER BALANCE TEST

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- Make sure that the 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.
- Ignition coil and its circuit (Refer to <u>EC-1518</u>.)
- Fuel injector and its circuit (Refer to <u>EC-1508</u>.)
- Intake air leakage
- Low compression pressure (Refer to <u>EM-185, "On-Vehicle Service"</u>.)
- If NG, repair or replace the malfunctioning part.

If OK, replace fuel injector. (It may be caused by leakage from fuel injector or clogging.)

>> GO TO 11.

# 11.CHECK "A/F ALPHA-B1"

- 1. Start engine.
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the 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, refer to EC-1210, "DTC Confirmation Procedure".
- For DTC P0131, refer to EC-1216, "DTC Confirmation Procedure".
- For DTC P0132, refer to <u>EC-1222</u>, "<u>DTC Confirmation Procedure</u>".
- For DTC P0133, refer to EC-1228, "DTC Confirmation Procedure"
- For DTC P2A00, refer to EC-1488, "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"

- Start engine.
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

### OK or NG

# TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< SERVICE INFOMATION > [MR TYPE 2]	
OK >> INSPECTION END NG >> GO TO 15.	А
15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR	
<ol> <li>Stop the engine.</li> <li>Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.</li> </ol>	EC
>> GO TO 16.	0
16.check "A/F Alpha-B1"	С
<ol> <li>Start engine.</li> <li>Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.</li> </ol>	D
OK or NG	_
OK >> INSPECTION END  NG >> Detect malfunctioning part according to <u>EC-1095</u> , "Symptom Matrix Chart".	Е
17.check "B/Fuel schol"	F
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.	Г
OK or NG	G
OK >> INSPECTION END NG (More than the SP value)>>GO TO 18.	
NG (Less than the SP value)>>GO TO 25.	Н
18. DETECT MALFUNCTIONING PART	
<ol> <li>Check for the cause of large engine friction. Refer to the following.</li> <li>Engine oil level is too high</li> </ol>	
<ul> <li>Engine oil viscosity</li> <li>Belt tension of alternator, A/C compressor, etc. is excessive</li> </ul>	
<ul><li>Noise from engine</li><li>Noise from transmission, etc.</li></ul>	J
<ol><li>Check for the cause of insufficient combustion. Refer to the following.</li></ol>	
<ul> <li>Valve clearance malfunction</li> <li>Intake valve timing control function malfunction</li> </ul>	Κ
- Camshaft sprocket installation malfunction, etc.	
>> Repair or replace malfunctioning part, and then GO TO 30.	L
19. CHECK INTAKE SYSTEM	
Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.  • Crushed air ducts	M
Malfunctioning seal of air cleaner element	
<ul><li>Uneven dirt of air cleaner element</li><li>Improper specification of intake air system</li></ul>	Ν
OK or NG	
OK >> GO TO 21.  NG >> Repair or replace malfunctioning part, and then GO TO 20.	0
20.check "A/F ALPHA-B1" AND "B/FUEL SCHDL"	
Select "A/F ALPHA-B1" and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the each indication is within the SP value.	Р
OK or NG	
OK >> INSPECTION END NG ("B/FUEL SCHDL" is more, "A/F ALPHA-B1" is less than the SP value)>>GO TO 21.	
21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR	

1. Stop the engine.

[MR TYPE 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"

< SERVICE INFOMATION >

- Start engine.
- 2. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

### OK or NG

OK >> 1. Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to <u>EC-1170</u>.

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 make sure 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

- Replace ECM.
- Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>".

  3. Perform <u>EC-1084</u>, "<u>VIN Registration</u>".
- 4. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 5. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 6. Perform EC-1084, "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 of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of 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 make sure that the indication is within the SP value.

### OK or NG

>> INSPECTION END OK

NG (Less than the SP value)>>GO TO 27.

### 2/.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

### OK or NG

>> 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 leak after the mass air flow sensor. Refer to the following.

## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< SERVICE INFOMATION >

- · Disconnection, looseness, and cracks in air duct
- · Looseness of oil filler cap
- · Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks of PCV valve
- Disconnection or cracks of EVAP purge hose, open stuck of EVAP canister purge volume control solenoid valve
- Malfunctioning seal of rocker cover gasket
- Disconnection, looseness, or cracks of hoses, such as vacuum hose, connecting to intake air system parts
- · Malfunctioning seal of intake air system, etc.

>> GO TO 30.

# $29.\mathsf{CHECK}$ "A/F ALPHA-B1" AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1" and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the each indication is within the SP value.

### OK or NG

OK >> INSPECTION END

NG >> Detect malfunctioning part according to <u>EC-1095</u>, "Symptom Matrix Chart".

# 30. CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then make sure that the indication is within the SP value.

### OK or NG

OK >> INSPECTION END

NG >> Detect malfunctioning part according to <a href="EC-1095">EC-1095</a>, "Symptom Matrix Chart".

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[MR TYPE 2]

## TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description INFOID:000000004499953

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:0000000004499954

# 1. INSPECTION START

Erase (1st trip) DTCs.

Refer to EC-1052, "Emission-related Diagnostic Information".

>> GO TO 2.

# 2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.

Refer to EC-1144, "Ground Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

# 3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-25, "How to Perform Efficient Diagnosis for an Electrical Incident", "INCIDENT SIMULATION TESTS".

### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

# 4. CHECK CONNECTOR TERMINALS

Refer to GI-22, "How to Check Terminal", "HOW TO PROBE CONNECTORS", "How to Check Enlarged Contact Spring of Terminal".

### OK or NG

OK >> INSPECTION END

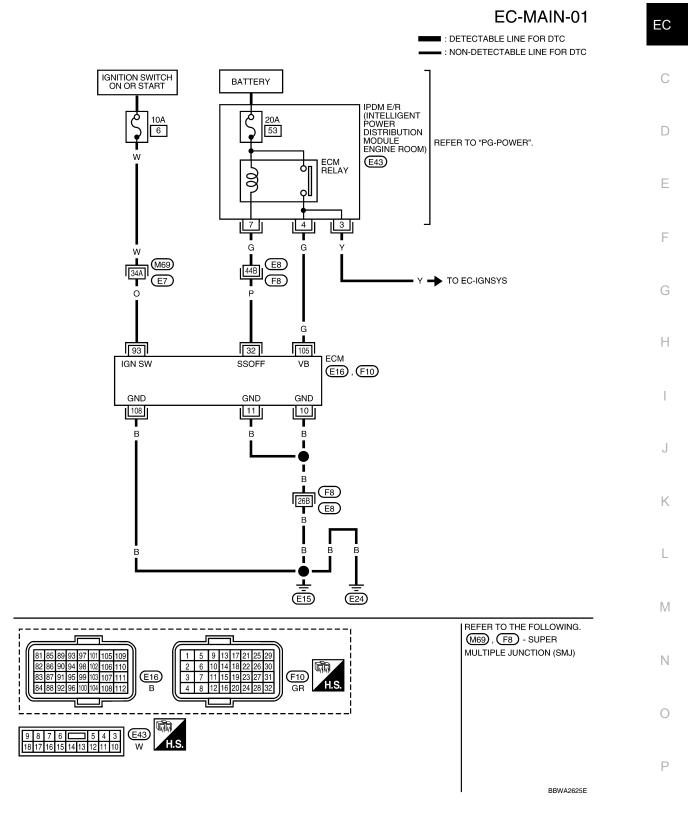
NG >> Repair or replace connector.

[MR TYPE 2]

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## POWER SUPPLY AND GROUND CIRCUIT

Wiring Diagram



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

### < SERVICE INFOMATION >

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
10 11	B B	ECM ground	[Engine is running] • Idle speed	Body ground
32	2 P	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
		(Sell Stiut-Oil)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch: OFF]	OV
93	О	Ignition switch	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
108	В	ECM ground	[Engine is running] • Idle speed	Body ground

# Diagnosis Procedure

INFOID:0000000004499956

# 1.INSPECTION START

Start engine.

### Is engine running?

### Yes or No

Yes >> GO TO 8. No >> GO TO 2.

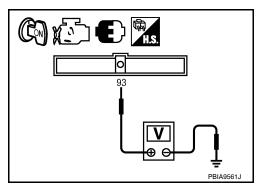
# 2. CHECK ECM POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF and then ON.
- 2. Check voltage between ECM terminal 93 and ground with CON-SULT-III or tester.

### **Voltage: Battery voltage**

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3. DETECT MALFUNCTIONING PART

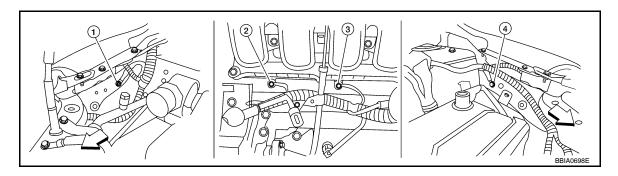
Check the following.

- · Harness connectors M69, E7
- 10A 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 screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



Vehicle front

- Body ground E24 1.
- Engine ground F9
- Engine ground F16

4. Body ground E15

### OK or NG

OK >> GO TO 5.

NG >> Repair or replace ground connections.

# 5.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

- Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminals 10, 11, 108 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.

### O.DETECT MALFUNCTIONING PART

### Check the following.

- · Harness connectors F8, E8
- · Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

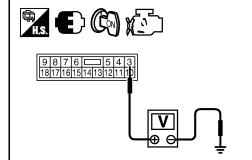
# 7.CHECK ECM POWER SUPPLY CIRCUIT-II

- Reconnect ECM harness connector.
- Turn ignition switch ON.
- 3. Check voltage between IPDM E/R terminal 3 and ground with CONSULT-III or tester.

## Voltage: Battery voltage

## OK or NG

OK >> Go to <u>EC-1518</u>. NG >> GO TO 8.



# 8.CHECK ECM POWER SUPPLY CIRCUIT-III

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and then OFF.

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### OWER SUPPLI AND GROUND CIRCUIT

Check voltage between ECM terminal 105 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 14.

< SERVICE INFOMATION >

NG (Battery voltage does not exist.)>>GO TO 9.

NG (Battery voltage exists for more than a few seconds.)>>GO TO

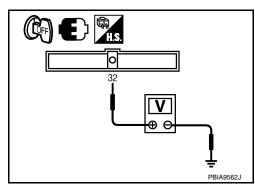
9.CHECK ECM POWER SUPPLY CIRCUIT-IV

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Check voltage between ECM terminal 32 and ground with CON-SULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 10. NG >> GO TO 11.



# 10. CHECK ECM POWER SUPPLY CIRCUIT-V

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E43.
- Check harness continuity between ECM terminal 105 and IPDM E/R 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 17.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# 11. CHECK ECM POWER SUPPLY CIRCUIT-VI

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E43.
- Check harness continuity between ECM terminal 32 and IPDM E/R terminal 7. Refer to Wiring Diagram.

## Continuity should exist.

4. Also check harness for short to ground and short to power.

### OK or NG

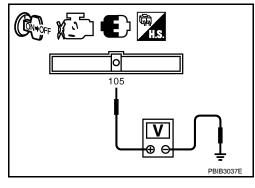
OK >> GO TO 13. NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E8, F8
- 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.



[MR TYPE 2]

## POWER SUPPLY AND GROUND CIRCUIT

[MR TYPE 2] < SERVICE INFOMATION >

# 13. CHECK 20A FUSE

- Disconnect 20A fuse from IPDM E/R.
- 2. Check 20A fuse.

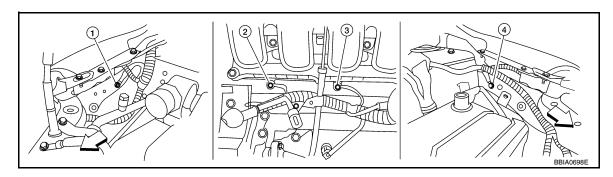
### OK or NG

OK >> GO TO 17.

NG >> Replace 20A fuse.

14. CHECK GROUND CONNECTIONS

1. Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24 1.
- Engine ground F9
- Engine ground F16

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Body ground E15

## OK or NG

OK >> GO TO 15.

NG >> Repair or replace ground connections.

# 15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

- Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminals 10, 11, 108 and ground. Refer to Wiring Diagram.

## Continuity should exist.

3. Also check harness for short to power.

### OK or NG

OK >> GO TO 17.

NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

### Check the following.

- · Harness connectors F8, E8
- · Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

# 17. CHECK INTERMITTENT INCIDENT

### Refer to EC-1138.

### OK or NG

OK >> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R".

NG >> Repair open circuit or short to power in harness or connectors. EC

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## **Ground Inspection**

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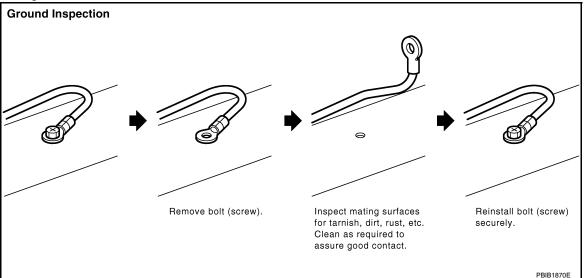
Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

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.

For detailed ground distribution information, refer to PG-29, "Ground Distribution".



## **DTC U0101 CAN COMMUNICATION LINE**

< SERVICE INFOMATION > [MR TYPE 2]

## DTC U0101 CAN COMMUNICATION LINE

Description INFOID:000000004306003

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

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### 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:0000000004306005

- 1. Turn ignition switch ON and wait at least 3 seconds.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1146, "Diagnosis Procedure".

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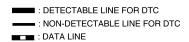
EC-1145

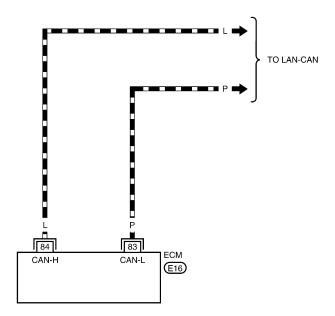
< SERVICE INFOMATION >

Wiring Diagram

[MR TYPE 2] INFOID:0000000004306006

## EC-CAN-01







BBWA2626E

Diagnosis Procedure

Go to LAN-26, "CAN System Specification Chart".

INFOID:0000000004306007

## **DTC U0140 CAN COMMUNICATION LINE**

< SERVICE INFOMATION > [MR TYPE 2]

## DTC U0140 CAN COMMUNICATION LINE

Description INFOID:0000000004477023

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:0000000004477024

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0140 0140	Lost communication with BCM	When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) with BCM for 2 seconds or more.	CAN communication line between BCM and ECM     CAN communication line is open or shorted.

### **DTC Confirmation Procedure**

INFOID:0000000004477025

- 1. Turn ignition switch ON and wait at least 3 seconds.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1148, "Diagnosis Procedure".

EC-1147

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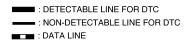
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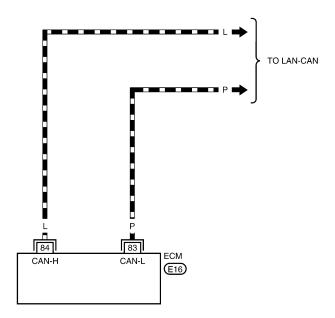
Wiring Diagram

< SERVICE INFOMATION >

[MR TYPE 2] INFOID:0000000004477026

### EC-CAN-01







BBWA2626E

Diagnosis Procedure

INFOID:0000000004477027

Go to LAN-26, "CAN System Specification Chart".

## **DTC U1001 CAN COMMUNICATION LINE**

< SERVICE INFOMATION > [MR TYPE 2]

## DTC U1001 CAN COMMUNICATION LINE

Description INFOID:000000004477028

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:0000000004477029

### The MIL will not light up for this self-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:0000000004477030

- 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-1150, "Diagnosis Procedure".

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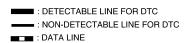
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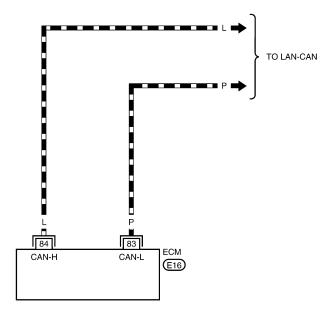
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< SERVICE INFOMATION > Wiring Diagram

[MR TYPE 2] INFOID:0000000004477031

EC-CAN-01







BBWA2626E

Diagnosis Procedure

INFOID:0000000004477032

Go to LAN-26, "CAN System Specification Chart".

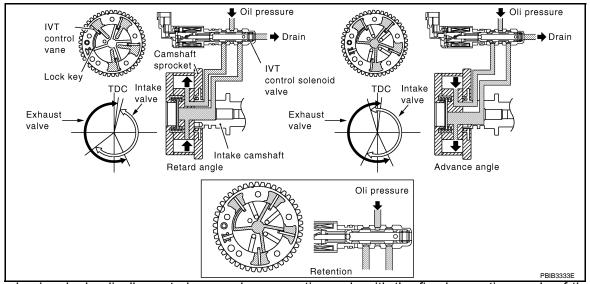
## DTC P0011 IVT CONTROL

Description INFOID:0000000004499967

### SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed and piston position		
Engine coolant temperature sensor	Engine coolant temperature	Intake valve timing control	Intake valve timing control solenoid valve
ABS actuator and electric unit (control unit)	Vehicle speed*	tiring control	Soleriola valve
Combination meter	verlicie speeu		

<sup>\*:</sup> This signal is sent to the ECM through 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 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.

### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	Engine: After warming up  Air and distance assistate OFF	Idle	−5° - 5°CA
	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0° - 40°CA
Engine: After warming up     Air conditioner switch: OFF     Shift lever: P or N (A/T, CVT),     Neutral (M/T)     No load	3 ,	Idle	0% - 2%
	Shift lever: P or N (A/T, CVT), Neutral (M/T)	When revving engine up to 2,000 rpm quickly	Approx. 0% - 90%

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## On Board Diagnosis Logic

INFOID:0000000004499969

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Intake valve timing control solenoid valve Accumulation of debris to the signal pick-up portion of the camshaft Timing chain installation Foreign matter caught in the oil groove for intake valve timing control

### **FAIL-SAFE MODE**

ECM enters in fail-safe mode when the malfunction is detected.

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:0000000004499970

#### **CAUTION:**

Always drive at a safe speed.

### NOTE:

- If DTC P0011 is displayed with DTC P0075, first perform trouble diagnosis for DTC P0075.
   See EC-1165.
- If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

### 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 10 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)
B/FUEL SCHDL	More than 3.87 msec
Shift lever	P or N position (A/T, CVT) Neutral position (M/T)

- 4. Let engine idle for 10 seconds.
- If 1st trip DTC is detected, go to <u>EC-1153</u>, "<u>Diagnosis Procedure</u>".
   If 1st trip DTC is not detected, go to next step.
- 6. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	2,000 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Shift lever	1st or 2nd position
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

7. If 1st trip DTC is detected, go to EC-1153, "Diagnosis Procedure".

< SERVICE INFOMATION > [MR TYPE 2]

#### WITH GST

Follow the procedure "WITH CONSULT-III" above.

Diagnosis Procedure

INFOID:0000000004499971

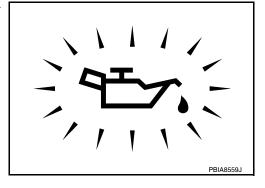
## 1. CHECK OIL PRESSURE WARNING LAMP

- 1. Start engine.
- 2. Check oil pressure warning lamp and confirm it is not illuminated.

#### OK or NG

OK >> GO TO 2.

NG >> Go to <u>LU-16</u>, "Inspection".



## 2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-1154, "Component Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Replace intake valve timing control solenoid valve.

## 3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1298, "Component Inspection".

#### OK or NG

OK >> GO TO 4.

NG >> Replace crankshaft position sensor (POS).

## 4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1303, "Component Inspection".

#### OK or NG

OK >> GO TO 5.

NG >> Replace camshaft position sensor (PHASE).

## 5. CHECK CAMSHAFT (INTAKE)

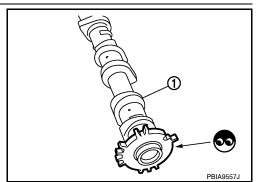
#### Check the following.

- Accumulation of debris to the signal plate of camshaft (1) rear end
- · Chipping signal plate of camshaft rear end

#### OK or NG

OK >> GO TO 6.

NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



## 6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

#### Yes or No

Yes >> Check timing chain installation. Refer to EM-161, "Removal and Installation".

No >> GO TO 7.

## 7. CHECK LUBRICATION CIRCUIT

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#### < SERVICE INFOMATION >

Refer to EM-170, "Removal and Installation".

#### OK or NG

OK >> GO TO 8.

NG >> Clean lubrication line.

## 8. CHECK INTERMITTENT INCIDENT

#### Refer to EC-1138.

For Wiring Diagram, refer to <u>EC-1294, "Wiring Diagram"</u> for CKP sensor (POS) and <u>EC-1300, "Wiring Diagram"</u> for CMP sensor (PHASE).

#### >> INSPECTION END

## **Component Inspection**

INFOID:0000000004499972

#### INTAKE VALVE TIMING CONTROL SOLENOID VALVE

- 1. Disconnect intake valve timing control solenoid valve harness connector.
- Check resistance between intake valve timing control solenoid valve as follows.

Terminal	Resistance
1 and 2	6.7 - 7.7Ω [at 20°C (68°F)]
1 or 2 and ground	$\infty\Omega$ (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.
- Provide 12V DC between intake valve timing control solenoid valve terminals and then interrupt it. Make sure that the plunger moves as shown in the figure.

#### **CAUTION:**

Do not apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve. **NOTE:** 

Always replace O-ring when intake valve timing control solenoid valve is removed.

# PBIB2388E

INFOID:0000000004499973

#### Removal and Installation

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-161, "Removal and Installation".

## DTC P0031, P0032 A/F SENSOR 1 HEATER

< SERVICE INFOMATION >

[MR TYPE 2]

## DTC P0031, P0032 A/F SENSOR 1 HEATER

Description INFOID:0000000004499974

#### SYSTEM DESCRIPTION

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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 heat-
Mass air flow sensor	Amount of intake air	neater control	er

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:0000000004499975

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
A/F S1 HTR (B1)	Engine: After warming up, idle the engine     (More than 140 seconds after starting engine.)	4 - 100%

## On Board Diagnosis Logic

INFOID:0000000004499976

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. [An excessively low voltage signal is sent to ECM through the air fuel ratio (A/F) sensor 1 heater.]	Harness or connectors [Air fuel ratio (A/F) sensor 1 heater circuit is open or shorted.]     Air fuel ratio (A/F) sensor 1 heater
P0032 0032	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. [An excessively high voltage signal is sent to ECM through the air fuel ratio (A/F) sensor 1 heater.]	<ul> <li>Harness or connectors         [Air fuel ratio (A/F) sensor 1 heater circuit is shorted.]     </li> <li>Air fuel ratio (A/F) sensor 1 heater</li> </ul>

#### **DTC Confirmation Procedure**

INFOID:0000000004499977

#### 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:**

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

- 1. Start engine and run it for at least 10 seconds at idle speed.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1157</u>, "<u>Diagnosis Procedure</u>".

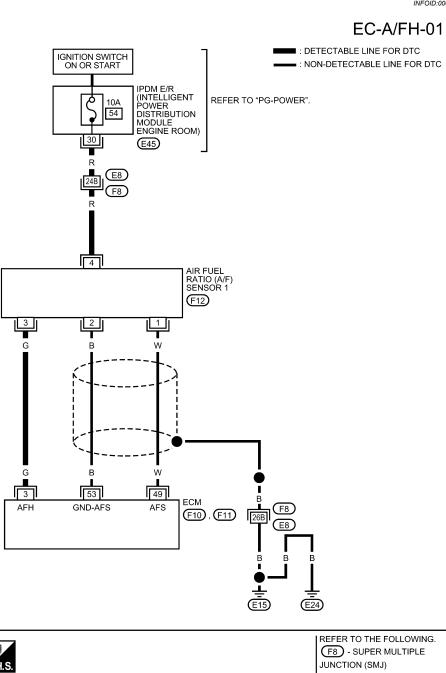
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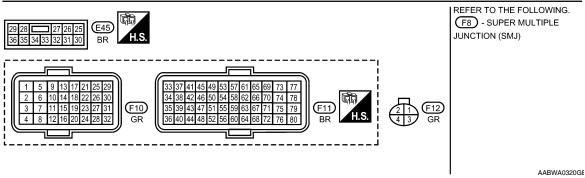
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Wiring Diagram

INFOID:0000000004499978





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

[MR TYPE 2]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

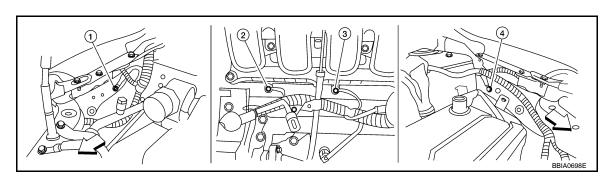
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24

Body ground E15

- Engine ground F9
- Engine ground F16

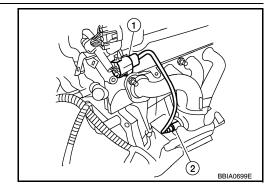
#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Turn ignition switch ON. 2.
- Air fuel ratio (A/F) sensor 1 (2)



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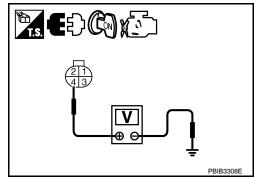
#### < SERVICE INFOMATION >

3. Check voltage between A/F sensor 1 terminal 4 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 E8, F8
- 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 3 and A/F sensor 1 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 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-1158, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace air fuel ratio (A/F) sensor 1.

#### O.CHECK INTERMITTENT INCIDENT

Perform EC-1138.

#### >> INSPECTION END

#### Component Inspection

AIR FUEL RATIO (A/F) SENSOR 1 HEATER

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[MR TYPE 2]

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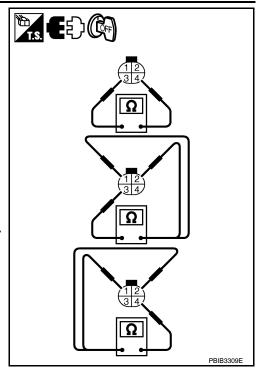
1. Check resistance between A/F sensor 1 terminals as follows.

Terminal No.	Resistance
3 and 4	1.8 - 2.44 Ω [at 25°C (77°F)]
3 and 1, 2	$\Omega$ $\infty$
4 and 1, 2	(Continuity should not exist)

2. If NG, 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 Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



Removal and Installation

AIR FUEL RATIO SENSOR HEATER

Refer to EM-144, "Removal and Installation".

INFOID:0000000004499981

## DTC P0037, P0038 HO2S2 HEATER

Description INFOID:000000004499982

#### SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	- Engine speed	- Heated oxygen sensor 2	
Crankshaft position sensor (POS)	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		Heated oxygen sensor 2 heater
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

#### **OPERATION**

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
<ul> <li>Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	ON

#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004499983

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	<ul> <li>Engine speed: Below 3,600 rpm after the following conditions are met</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	ON
	Engine speed: Above 3,600 rpm	OFF

## On Board Diagnosis Logic

INFOID:0000000004499984

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	Harness or connectors     (Heated oxygen sensor 2 heater circuit is open or shorted.)     Heated oxygen sensor 2 heater
P0038 0038	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.)	<ul> <li>Harness or connectors         (Heated oxygen sensor 2 heater circuit is shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>

#### **DTC Confirmation Procedure**

INFOID:0000000004499985

#### 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:**

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

1. Start engine and warm it up to the normal operating temperature.

[MR TYPE 2]

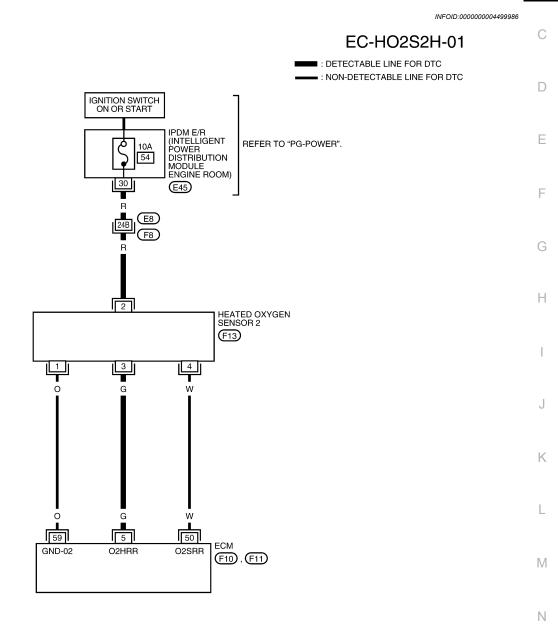
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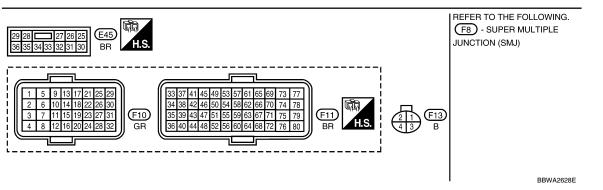
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- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check 1st trip DTC.
- 6. If 1st trip DTC is detected, go to EC-1162, "Diagnosis Procedure".

Wiring Diagram





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.

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  >>> 10.0V/Div 50ms/Div T  PBIA8148J
			[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	О	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

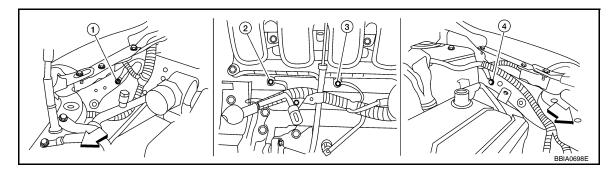
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

INFOID:0000000004499987

## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- Engine ground F16

4. Body ground E15

#### OK or NG

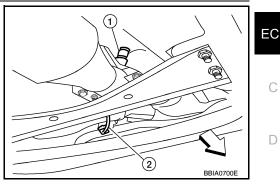
OK >> GO TO 2.

[MR TYPE 2] < SERVICE INFOMATION >

NG >> Repair or replace ground connections.

## 2.CHECK HO2S2 POWER SUPPLY CIRCUIT

- 1. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 2. Turn ignition switch ON.

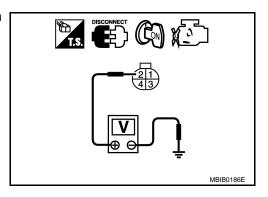


3. Check voltage between HO2S2 terminal 2 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



## 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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.

## f 4.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 5 and HO2S2 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

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## ${f 5}$ .CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-1164, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

#### 6.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

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## Component Inspection

INFOID:0000000004499988

#### **HEATED OXYGEN SENSOR 2 HEATER**

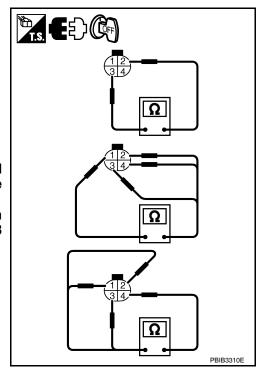
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	3.4 - 4.4 Ω [at 25°C (77°F)]
1 and 2, 3, 4	$\Omega$
4 and 1, 2, 3	(Continuity should not exist)

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 oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



Removal and Installation

**HEATED OXYGEN SENSOR 2** 

Refer to EM-144, "Removal and Installation".

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INFOID:0000000004499990

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#### DTC P0075 IVT CONTROL SOLENOID VALVE

## Component Description

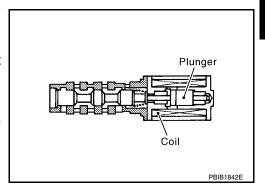
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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.



INFOID:0000000004499991

#### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
3 3 -	Idle	0% - 2%	
INT/V SOL (B1)	<ul> <li>Air conditioner switch: OFF</li> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0% - 90%

## On Board Diagnosis Logic

DTC No. Trouble diagnosis name DTC detecting condition Possible cause

An improper voltage is sent to the ECM

Harness or connectors

P0075 Intake valve timing control solenoid valve circuit

An improper voltage is sent to the ECM through intake valve timing control solenoid valve circuit is open or shorted.)

• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.)

• Intake valve timing control solenoid valve

#### **DTC Confirmation Procedure**

INFOID:0000000004499993

INFOID:0000000004499992

#### 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.

- 1. Start engine and let it idle for 5 seconds.
- 2. Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-1167, "Diagnosis Procedure".

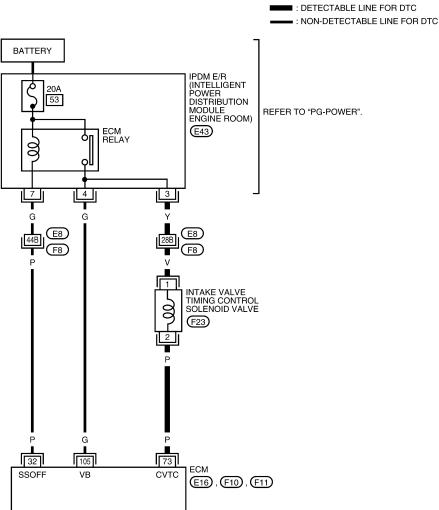
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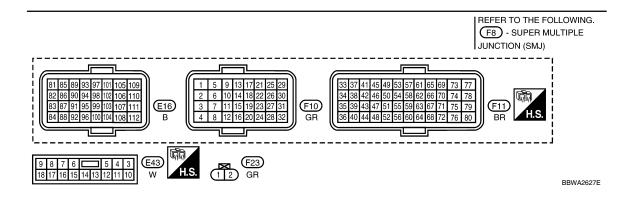
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Wiring Diagram

INFOID:0000000004499994

## EC-IVC-01





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

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INFOID:0000000004499995

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.

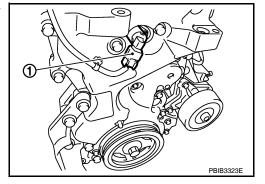
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32 P		ECM relay	[Engine is running] [Ignition switch: OFF]  • For a few seconds after turning ignition switch OFF	0 - 1.0V
		(Self shut-off)	<ul><li>[Ignition switch: OFF]</li><li>More than a few seconds after turning ignition switch OFF</li></ul>	BATTERY VOLTAGE (11 - 14V)
			[Engine is running]  • Warm-up condition  • Idle speed	BATTERY VOLTAGE (11 - 14V)
73	P	Intake valve timing control solenoid valve	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	7 - 10V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

## 1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect intake valve timing control solenoid valve (1) harness connector.
- 3. Turn ignition switch ON.

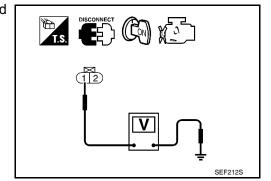


4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 3. NG >> GO TO 2.



## 2. DETECT MALFUNCTION PART

Check the following.

#### < SERVICE INFOMATION >

- · Harness connectors E8, F8
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R
  - >> Repair or replace 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.
- Check harness continuity between ECM terminal 73 and intake valve timing 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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-1168, "Component Inspection".

#### OK or NG

OK >> GO TO 5.

NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

## Component Inspection

INFOID:0000000004501126

#### 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 as follows.

Terminal	Resistance
1 and 2	6.7 - 7.7Ω [at 20°C (68°F)]
1 or 2 and ground	${}^{\infty}\Omega$ (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.
- Provide 12V DC between intake valve timing control solenoid valve terminals and then interrupt it. Make sure that the plunger moves as shown in the figure.

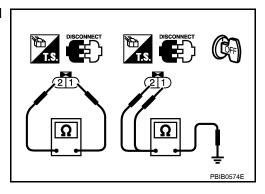
#### **CAUTION:**

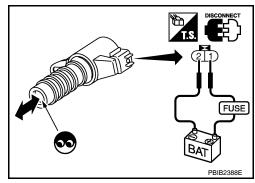
Do not apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve.

#### NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.





#### **DTC P0075 IVT CONTROL SOLENOID VALVE**

< SERVICE INFOMATION >

[MR TYPE 2]

Removal and Installation

INFOID:0000000004501127

## INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-161, "Removal and Installation".

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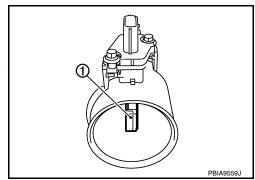
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#### DTC P0101 MAF SENSOR

## Component Description

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004499999

Specification data are reference values.

MONITOR ITEM	CONI	SPECIFICATION	
MAS A/F SE-B1	• See <u>EC-1130</u> .		
	Engine: After warming up	Idle	10% - 35%
CAL/LD VALUE Neutral (M/T)	Air conditioner switch: OFF	2,500 rpm	10% - 35%
Engine: After warming up     Shift lever: P or N (A/T, CVT),     Neutral (M/T)     Air conditioner switch: OFF     No load		Idle	1.0 - 4.0 g·m/s
	2,500 rpm	4.0 - 10.0 g·m/s	

## On Board Diagnosis Logic

INFOID:0000000004500000

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101	Mass air flow sensor cir-	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	Harness or connectors     (Mass air flow sensor circuit is open or shorted.)     Mass air flow sensor     EVAP control system pressure sensor     Intake air temperature sensor
0101	cuit range/performance	В)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	<ul> <li>Harness or connectors (Mass air flow sensor circuit is open or shorted.)</li> <li>Intake air leaks</li> <li>Mass air flow sensor</li> <li>EVAP control system pressure sensor</li> <li>Intake air temperature sensor</li> </ul>

#### **DTC Confirmation Procedure**

INFOID:0000000004500001

# 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.

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#### < SERVICE INFOMATION >

#### 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.
- Run engine for at least 10 seconds at idle speed.
- 3. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1174</u>, "<u>Diagnosis Procedure</u>".

#### PROCEDURE FOR MALFUNCTION B

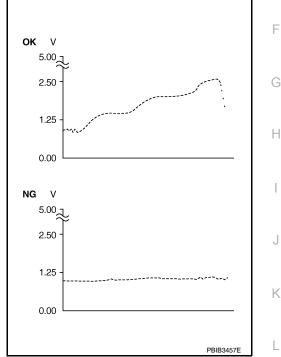
#### **CAUTION:**

Always drive vehicle at a safe speed.

- With CONSULT-III
- 1. Turn ignition switch ON.
- 2. Start engine and warm it up to normal operating temperature.

  If engine cannot be started, go to EC-1174, "Diagnosis Procedure".
- 3. Select "DATA MONITOR" mode with CONSULT-III.
- 4. Check the voltage of "MAS A/F SE-B1" with "DATA MONITOR".
- 5. Increases engine speed to about 4,000 rpm.
- Monitor the linear voltage rise in response to engine speed increases.

If NG, go to <u>EC-1174, "Diagnosis Procedure"</u>. If OK, go to following step.



7. 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
Shift lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

- 8. Check 1st trip DTC.
- 9. If 1st trip DTC is detected, go to EC-1174, "Diagnosis Procedure".

#### Overall Function Check

## eran Function Check

#### PROCEDURE FOR MALFUNCTION B

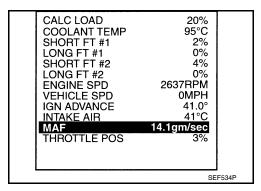
Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st DTC might not be confirmed.

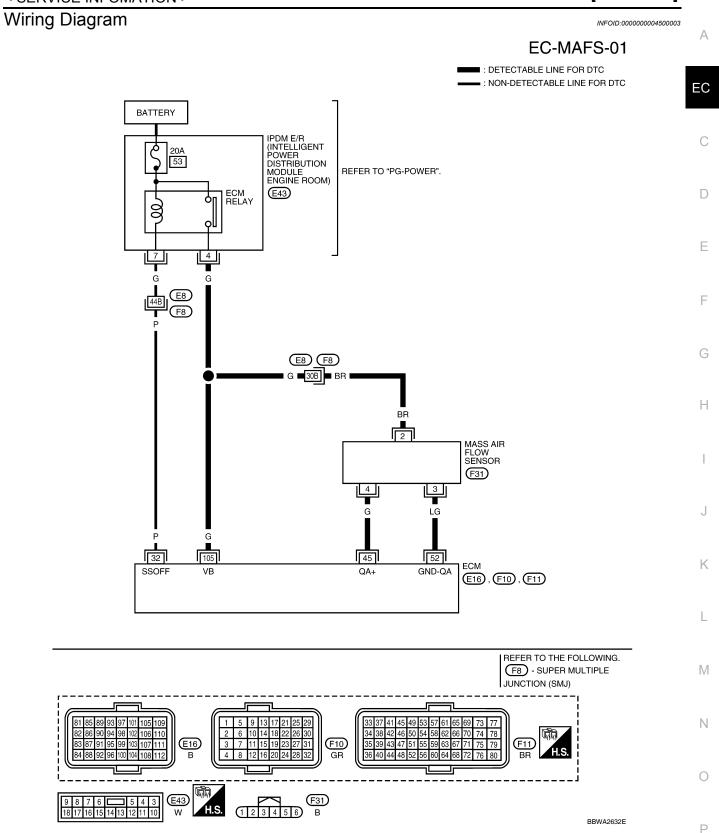
With GST

#### **DTC P0101 MAF SENSOR**

< SERVICE INFOMATION > [MR TYPE 2]

- 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 about 4,000 rpm in engine speed.
- 5. If NG, go to EC-1174, "Diagnosis Procedure".





Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

INFOID:0000000004500004

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	B2 P ECM relay (Self shut-off)		[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
		(Sell Stidt-Oil)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
45	45 G Mass air flow sensor		[Engine is running]  • Warm-up condition  • Idle speed	0.8 - 1.1V
40	J	wass all now sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.7V
52	LG	Sensor ground (Mass air flow sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

## Diagnosis Procedure

1. INSPECTION START

Which malfunction (A or B) is duplicated?

#### A or B

A >> GO TO 3. B >> GO TO 2.

## 2. CHECK INTAKE AIR LEAK

Check the following for connections.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

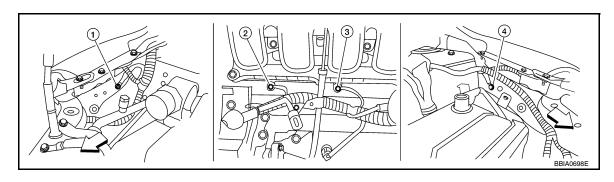
#### OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

## 3. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to <u>EC-1144, "Ground Inspection"</u>.



Vehicle front .

Body ground E24 1.

Body ground E15

Engine ground F9

Engine ground F16

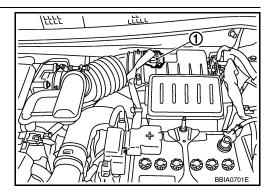
OK or NG

OK >> GO TO 4.

NG >> Repair or replace ground connections.

f 4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow (MAF) sensor (1) harness connector.
- Turn ignition switch ON.

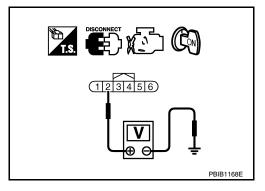


Check voltage between MAF sensor terminal 2 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 6. NG >> GO TO 5.



## DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- Harness for open or short between mass air flow sensor and IPDM E/R
- Harness for open or short between mass air flow sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

## $oldsymbol{6}.$ CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between MAF sensor terminal 3 and ECM terminal 52. 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.

#### 1. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between MAF sensor terminal 4 and ECM terminal 45. Refer to Wiring Diagram.

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#### 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 or short to power in harness or connectors.

#### 8.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1188, "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-1350, "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-1176, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> Replace mass air flow sensor.

## 11. CHECK INTERMITTENT INCIDENT

Perform EC-1138.

#### >> INSPECTION END

## Component Inspection

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#### 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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*

- \*: Check for linear voltage rise in response to engine being increased to about 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 following.
  - · Crushed air ducts
  - · Malfunctioning seal of air cleaner element
  - Uneven dirt of air cleaner element
  - · Improper specification of intake air system parts

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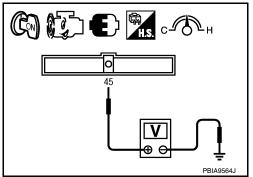
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- If NG, repair or replace malfunctioning part and perform step 2 to 4 again. If OK, go to next step.
- 6. Turn ignition switch OFF.
- Disconnect mass air flow sensor harness connector and reconnect it again.
- 8. Perform step 2 to 4 again.
- If NG, 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 45 (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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*



- \*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.
- 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 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 step 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 step 2 and 3 again.
- If NG, clean or replace mass air flow sensor.

#### Removal and Installation

MASS AIR FLOW SENSOR

Refer to EM-139, "Removal and Installation".

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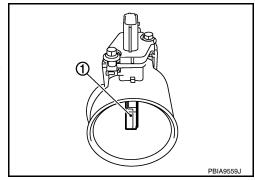
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## DTC P0102, P0103 MAF SENSOR

## Component Description

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



#### CONSULT-III Reference Value in Data Monitor Mode

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Specification data are reference values.

MONITOR ITEM	CONE	SPECIFICATION	
MAS A/F SE-B1	• See <u>EC-1130</u> .		
	Engine: After warming up	Idle	10% - 35%
CAL/LD VALUE  Neutra  • Air cor	<ul> <li>Shift lever: P or N (A/T, CVT), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,500 rpm	10% - 35%
Engine: After warming up     Shift lever: P or N (A/T, CVT),     Neutral (M/T)     Air conditioner switch: OFF     No load		Idle	1.0 - 4.0 g·m/s
	2,500 rpm	4.0 - 10.0 g·m/s	

## On Board Diagnosis Logic

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#### 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     (Mass air flow sensor circuit is open or shorted.)     Intake air leaks     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     (Mass air flow 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 lights up.

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**

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#### 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.

## DTC P0102, P0103 MAF SENSOR

< SERVICE INFOMATION > [MR TYPE 2]

#### PROCEDURE FOR DTC P0102

- 1. Start engine and wait at least 5 seconds.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1181, "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 <u>EC-1181</u>, "<u>Diagnosis Procedure</u>". 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-1181, "Diagnosis Procedure".

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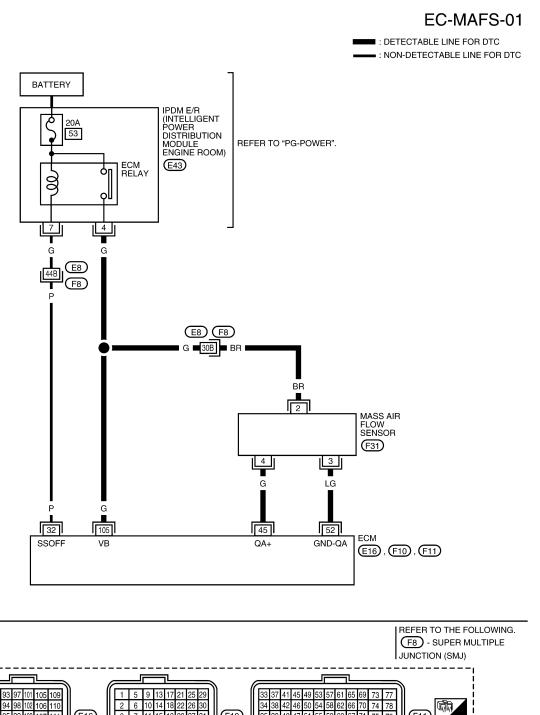
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Wiring Diagram

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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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#### < SERVICE INFOMATION >

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	Р	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
			[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
45	G	Mass air flow sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0.8 - 1.1V
			<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.4 - 1.7V
52	LG	Sensor ground (Mass air flow sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

## Diagnosis Procedure

## 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

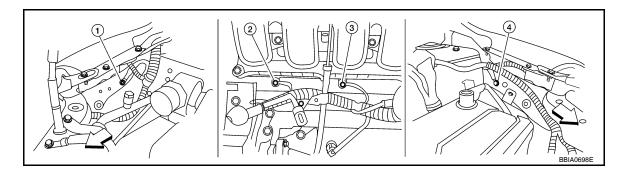
#### OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

## 3.check ground connections

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



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Body ground E15

- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- Engine ground F16

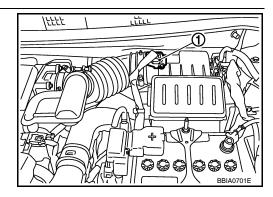
#### OK or NG

OK >> GO TO 4.

NG >> Repair or replace ground connections.

## f 4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect mass air flow (MAF) sensor (1) harness connector.
- 2. Turn ignition switch ON.

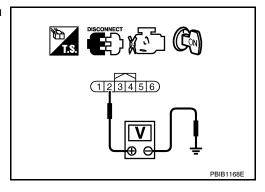


Check voltage between MAF sensor terminal 2 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 6. NG >> GO TO 5.



#### 5. DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness connectors E8, F8
- 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between MAF sensor terminal 3 and ECM terminal 52. 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

 Check harness continuity between MAF sensor terminal 4 and ECM terminal 45. Refer to Wiring Diagram.

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#### 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-1183, "Component Inspection".

#### OK or NG

OK >> GO TO 9.

NG >> Replace mass air flow sensor.

## 9. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

## Component Inspection

#### MASS AIR FLOW SENSOR

#### With CONSULT-III

- 1. Reconnect all harness connectors disconnected.
- 2. Start engine and warm it up to normal operating temperature.
- 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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 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 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 step 2 to 4 again.

If OK, go to next step.

- Turn ignition switch OFF.
- 7. Disconnect mass air flow sensor harness connector and reconnect it again.
- 8. Perform step 2 to 4 again.
- 9. If NG, clean or replace mass air flow sensor.

#### Without CONSULT-III

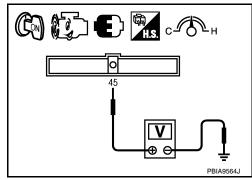
- 1. Reconnect all harness connectors disconnected.
- 2. Start engine and warm it up to normal operating temperature.

EC-1183

#### < SERVICE INFOMATION >

Check voltage between ECM terminal 45 (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.)	0.8 - 1.1
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.7
Idle to about 4,000 rpm	0.8 - 1.1 to 2.4*



- \*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.
- 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 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 step 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 step 2 and 3 again.
- 8. If NG, clean or replace mass air flow sensor.

## Removal and Installation

MASS AIR FLOW SENSOR

Refer to EM-139, "Removal and Installation".

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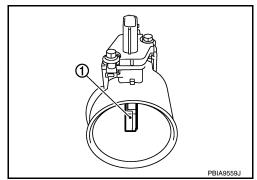
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## DTC P0112, P0113 IAT SENSOR

## Component Description

The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



#### <Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 46 (Intake air temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

## On Board Diagnosis Logic

Trouble diagnosis DTC No. DTC detecting condition Possible cause name Intake air tempera-P0112 An excessively low voltage from the sensor is ture sensor circuit · Harness or connectors 0112 sent to ECM. low input (Intake air temperature sensor circuit is open or shorted.) Intake air tempera-P0113 An excessively high voltage from the sensor is Intake air temperature sensor ture sensor circuit 0113 sent to ECM.

#### **DTC Confirmation Procedure**

high input

#### 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.

- 1. Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1186</u>, "<u>Diagnosis Procedure</u>".

> 0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F)

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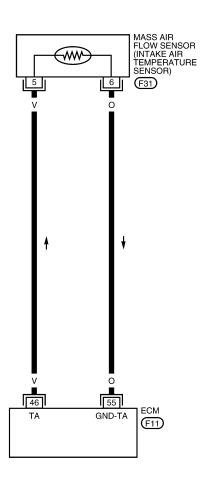
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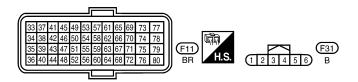
Wiring Diagram

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#### EC-IATS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA2633E

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## Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to <u>EC-1144, "Ground Inspection"</u>.

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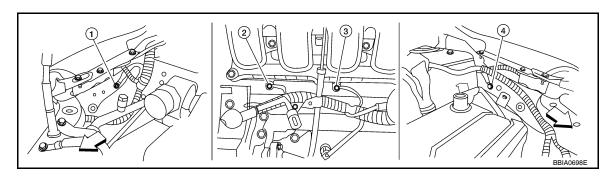
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- Vehicle front
- Body ground E24 1.

Body ground E15

- Engine ground F9
- Engine ground F16

OK or NG

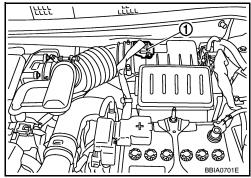
4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow sensor (with intake air temperature sensor) (1) harness connector.
- 2. Turn ignition switch ON.



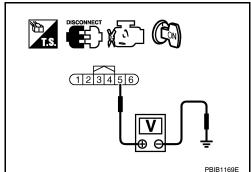
3. Check voltage between mass air flow sensor terminal 5 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### 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

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Check harness continuity between mass air flow sensor terminal 6 and ECM terminal 55. Refer to Wiring Diagram.

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

OK

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK INTAKE AIR TEMPERATURE SENSOR

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#### < SERVICE INFOMATION >

Refer to EC-1188, "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-1138.

#### >> INSPECTION END

#### Component Inspection

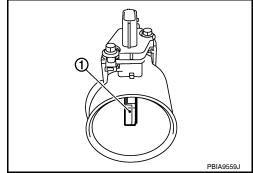
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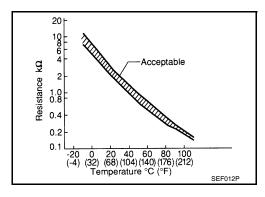
#### INTAKE AIR TEMPERATURE SENSOR

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

If NG, replace mass air flow sensor (with intake air temperature sensor).





#### Removal and Installation

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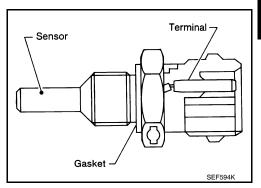
#### MASS AIR FLOW SENSOR

Refer to EM-139, "Removal and Installation".

## DTC P0116 ECT SENSOR

## Component Description

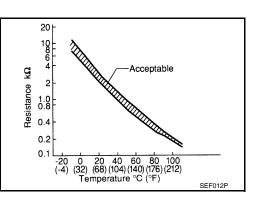
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.



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.

## On Board Diagnosis Logic

### NOTE:

If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-1193, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0116 0116	Engine coolant tempera- ture 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)

## **DTC Confirmation Procedure**

#### 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:**

### Before performing the following procedure, do not add fuel.

- Start engine and warm it up to normal operating temperature.
- Rev engine up to 2,000 rpm for more than 10 minutes.
- Move the vehicle to a cool place, then stop engine and turn ignition switch OFF.
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals 4 and 5.
- Soak the vehicle until the resistance between "fuel level sensor unit and fuel pump" terminals 4 and 5 becomes  $0.5 \text{ k}\Omega$  higher than the value measured before soaking. **CAUTION:**

Never turn ignition switch ON during soaking time.

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#### NOTE:

Soak time changes depending on ambient air temperature. It may take several hours.

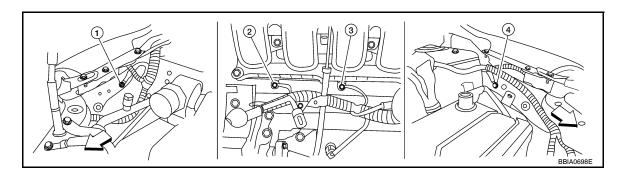
- 6. Start engine and let it idle for 5 minutes.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is detected, go to EC-1190, "Diagnosis Procedure".

## Diagnosis Procedure

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## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

### 4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1190, "Component Inspection".

### OK or NG

OK >> GO TO 3.

NG >> Replace engine coolant temperature sensor.

## 3. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

Refer to EC-1194, "Wiring Diagram".

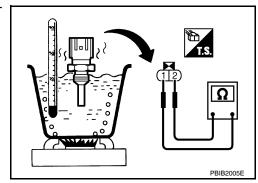
### >> INSPECTION END

## Component Inspection

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### **ENGINE COOLANT TEMPERATURE SENSOR**

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



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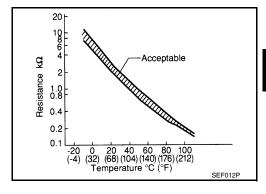
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### <Reference data>

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.



#### INFOID:0000000004500028

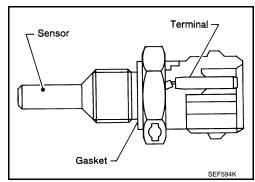
## Removal and Installation

ENGINE COOLANT TEMPERATURE SENSOR Refer to <u>CO-47</u>, "<u>Component</u>".

## DTC P0117, P0118 ECT SENSOR

## **Component Description**

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

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.

# 

#### CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

## On Board Diagnosis Logic

INFOID:0000000004500023

### These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC detecting condition	Possible Cause
P0117 0117	Engine coolant tem- perature sensor cir- cuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Engine coolant temperature sensor circuit is)
P0118 0118	Engine coolant tem- perature sensor cir- cuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.)  • Engine coolant temperature sensor

### **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

## **DTC P0117, P0118 ECT SENSOR**

## < SERVICE INFOMATION >

[MR TYPE 2]

Detected items	Engine operating condition in fail-safe mode		
	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)	
Engine coolant temper-	Just as ignition switch is turned ON or START	40°C (104°F)	
ature sensor circuit	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 engine is running.	e sensor is activated, the cooling fan operates while	

## **DTC Confirmation Procedure**

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### 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.

## WITH CONSULT-III

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Check DTC.
- If DTC is detected, go to EC-1194, "Diagnosis Procedure".

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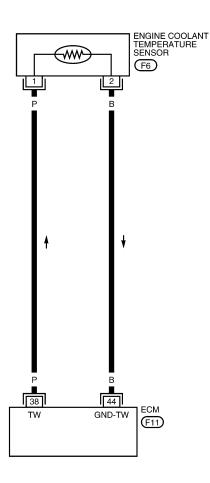
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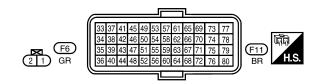
Wiring Diagram

INFOID:0000000004500025

### EC-ECTS-01

■ : DETECTABLE LINE FOR DTC = : NON-DETECTABLE LINE FOR DTC





## Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".

### EC-1194

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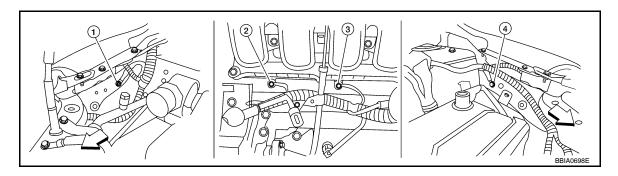
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Vehicle front

1. Body ground E24

Body ground E15

2. Engine ground F9

3. Engine ground F16

OK or NG

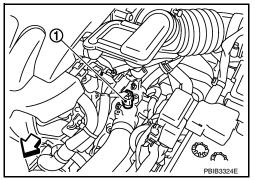
4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect engine coolant temperature (ECT) sensor (1) harness connector.
- Vehicle front
- 2. Turn ignition switch ON.



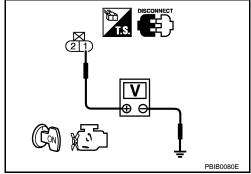
3. Check voltage between ECT sensor terminal 1 and ground with CONSULT-III or tester.

### Voltage: Approximately 5V

### OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



## 3. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 44 and ECT sensor 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 ENGINE COOLANT TEMPERATURE SENSOR

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### < SERVICE INFOMATION >

Refer to EC-1190, "Component Inspection".

### OK or NG

OK >> GO TO 5.

NG >> Replace engine coolant temperature sensor.

## 5. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

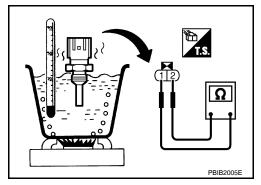
### >> INSPECTION END

## Component Inspection

#### INFOID:0000000004501094

## ENGINE COOLANT TEMPERATURE SENSOR

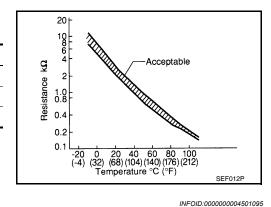
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



#### <Reference data>

Temperature °C (°F)	Resistance $k\Omega$
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

### ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-47, "Component".

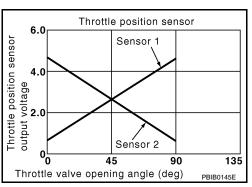
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## DTC P0122, P0123 TP SENSOR

## Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM

CONDITION

SPECIFICATION

Ignition switch: ON (Engine stopped)

TP SEN 2-B1\*

Shift lever: D (A/T, CVT), 1st (M/T)

CONDITION

Accelerator pedal: Fully released

Accelerator pedal: Fully depressed

Accelerator pedal: Fully depressed

Less than 4.75V

## On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

NOTE:

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-1396</u>.

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.)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	Electric throttle control actuator (TP sensor 2)

#### FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

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**

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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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- Start engine and let it idle for 1 second.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1199, "Diagnosis Procedure".

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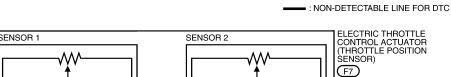
<sup>\*:</sup> Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

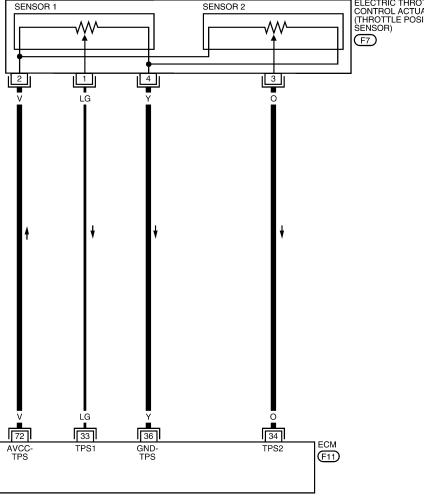
Wiring Diagram

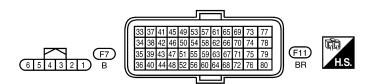
INFOID:0000000004500033

## EC-TPS2-01

■ : DETECTABLE LINE FOR DTC







BBWA2656E

Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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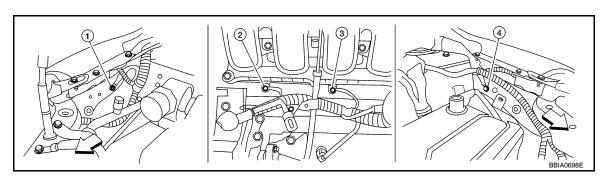
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33 LG			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36V
33 LG Throttle position sensor 1	Througe position sensor 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75V	
34 O	The all the control of	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	Less than 4.75V	
J <del>4</del>	0	Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36V
36	Y	Sensor ground (Throttle position sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V

## Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.

2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



Vehicle front

1. Body ground E24

2. Engine ground F9

3. Engine ground E16

4. Body ground E15

OK or NG

OK

>> GO TO 2.

NG >> Repair or replace ground connections.

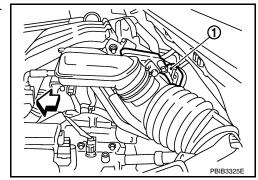
2.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

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### [MR TYPE 2]

### < SERVICE INFOMATION >

- Disconnect electric throttle control actuator (1) harness connec-
- : Vehicle front
- Turn ignition switch ON.



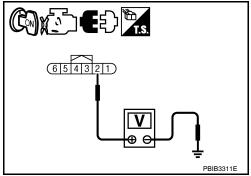
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT-III or tester.

### **Voltage: Approximately 5V**

### 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 throttle position sensor 2 ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 36. 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 THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 34 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 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## ${f 5.}$ CHECK THROTTLE POSITION SENSOR

Refer to EC-1201, "Component Inspection".

### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- Perform <u>EC-1084</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-1084</u>, "<u>Idle Air Volume Learning</u>".

## **DTC P0122, P0123 TP SENSOR**

< SERVICE INFOMATION >

[MR TYPE 2]

INFOID:0000000004500035

### >> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

## Component Inspection

### THROTTLE POSITION SENSOR

- Reconnect all harness connectors disconnected.
- 2. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 3. Turn ignition switch ON.
- 4. Set shift lever to D position (A/T, CVT) or 1st position (M/T).
- 5. Check voltage between ECM terminals 33 (TP sensor 1 signal), 34 (TP sensor 2 signal) and ground under the following conditions.

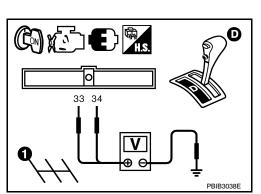
Terminal	Accelerator pedal	Voltage
33	Fully released	More than 0.36V
(Throttle position sensor 1)	Fully depressed	Less than 4.75V
34	Fully released	Less than 4.75V
(Throttle position sensor 2)	Fully depressed	More than 0.36V

- If NG, replace electric throttle control actuator and go to the next step.
- 7. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 8. Perform EC-1084, "Idle Air Volume Learning".

### Removal and Installation

### ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-141, "Removal and Installation".



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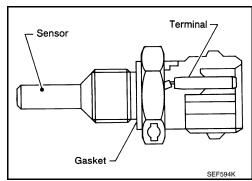
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## DTC P0125 ECT SENSOR

## Component Description

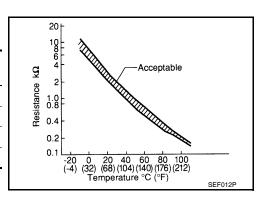
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.



#### CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

## On Board Diagnosis Logic

### NOTE:

- If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to EC-1193, "DTC Confirmation Procedure".
- If DTC P0125 is displayed with P0116, first perform the trouble diagnosis for DTC P0116. Refer to <u>EC-1202</u>, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine cool- ant temperature for closed loop fuel control	<ul> <li>Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.</li> <li>Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul>	<ul> <li>Harness or connectors (High resistance in the circuit)</li> <li>Engine coolant temperature sensor</li> <li>Thermostat</li> </ul>

### **DTC Confirmation Procedure**

INFOID:0000000004500039

INFOID:0000000004500038

### **CAUTION:**

Be careful not to overheat engine.

### 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.

### WITH CONSULT-III

- 1. Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "COOLAN TEMP/S" 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 following step.

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.

- Check DTC.
- If DTC is detected, go to <u>EC-1203</u>, "<u>Diagnosis Procedure</u>".

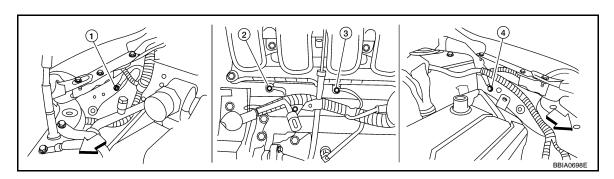
### WITH GST

Follow the procedure "WITH CONSULT-III" above.

## Diagnosis Procedure

## 1.check ground connections

- Turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24 1.

Body ground E15

- Engine ground F9
- Engine ground F16

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1204, "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

NG >> Repair or replace thermostat. Refer to CO-45, "Removal and Installation".

## 4.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

Refer to EC-1194, "Wiring Diagram".

## >> INSPECTION END

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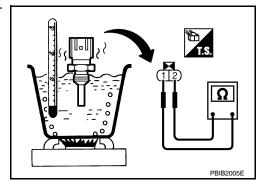
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## **Component Inspection**

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### ENGINE COOLANT TEMPERATURE SENSOR

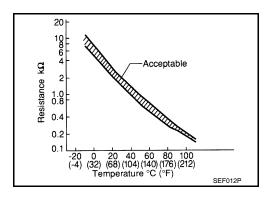
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



### <Reference data>

Temperature °C (°F)	Resistance $k\Omega$	
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:0000000004501099

ENGINE COOLANT TEMPERATURE SENSOR Refer to CO-47, "Component".

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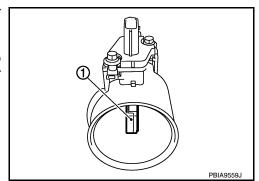
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## DTC P0127 IAT SENSOR

## Component Description

The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



#### <Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

<sup>\*:</sup> This data is reference value and is measured between ECM terminal 46 (Intake air temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

## On Board Diagnosis Logic

1.0 0.8 0.4 0.2 0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F) SEF012P INFOID:0000000004500044

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     (Intake temperature sensor circuit is open or shorted)     Intake air temperature sensor

### **DTC Confirmation Procedure**

### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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:**

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

- Wait until engine coolant temperature is less than 96°C (205°F) 1.
- 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.
  - Perform the following steps before engine coolant temperature is above 96°C (205°F).

Acceptable ĝ Resistance

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### < SERVICE INFOMATION >

- 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 <a href="EC-1206">EC-1206</a>, "Diagnosis Procedure".

### WITH GST

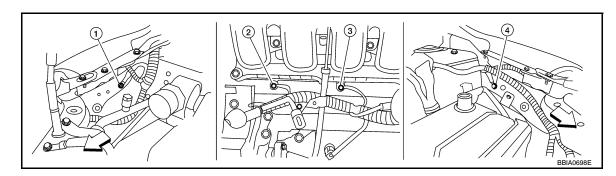
Follow the procedure "With CONSULT-III" above.

## Diagnosis Procedure

INFOID:0000000004500046

## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

## Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1206, "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-1138.

Refer to EC-1186, "Wiring Diagram".

### >> INSPECTION END

## Component Inspection

INFOID:0000000004501163

INTAKE AIR TEMPERATURE SENSOR

## **DTC P0127 IAT SENSOR**

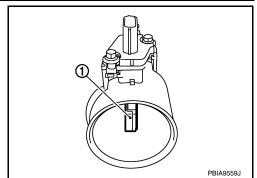
## < SERVICE INFOMATION >

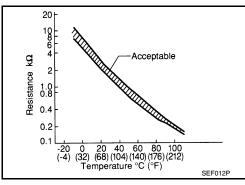
[MR TYPE 2]

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

MASS AIR FLOW SENSOR

Refer to EM-139, "Removal and Installation".

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[MR TYPE 2]

INFOID:0000000004500049

## DTC P0128 THERMOSTAT FUNCTION

## On Board Diagnosis Logic

#### NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303 or P0304, first perform the trouble diagnosis for DTC P0300, P0301, P0302, P0303, P0304. Refer to <a href="EC-1283">EC-1283</a>, "DTC Confirmation Procedure".

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 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.	<ul><li>Thermostat</li><li>Leakage from sealing portion of thermostat</li><li>Engine coolant temperature sensor</li></ul>

### **DTC Confirmation Procedure**

INFOID:0000000004500050

### WITH CONSULT-III

## **CAUTION:**

Always drive vehicle at a safe speed.

#### 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:**

- 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 53°C (127°F).
- Before performing the following procedure, do not fill with the fuel.
- 1. Turn A/C switch OFF.
- 2. Turn blower fan switch OFF.
- Turn ignition switch ON.
- Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III.
- 5. Check the indication of "COOLAN TEMP/S".
  - If it is below 53°C (127°F), go to following step.
  - If it is above 53°C (127°F), cool down the engine to less than 53°C (127°F). Then go to next steps.
- Start engine.
- Drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	More than 56 km/h (35 MPH)

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.

- 8. Check 1st trip DTC.
- 9. If 1st trip DTC is detected, go to EC-1208, "Diagnosis Procedure".

### WITH GST

Follow the procedure "With CONSULT-III" above.

## Diagnosis Procedure

INFOID:0000000004500051

## 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1209, "Component Inspection".

### OK or NG

OK >> GO TO 2.

NG >> Replace engine coolant temperature sensor.

## 2.CHECK THERMOSTAT

## **DTC P0128 THERMOSTAT FUNCTION**

< SERVICE INFOMATION >

Refer to CO-45, "Removal and Installation".

OK or NG

OK >> INSPECTION END

NG >> Replace thermostat.

## Component Inspection

## INFOID:0000000004500052

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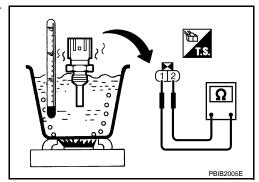
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[MR TYPE 2]

### ENGINE COOLANT TEMPERATURE SENSOR

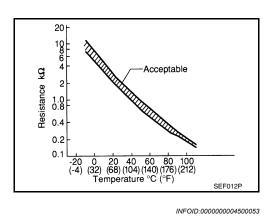
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



### <Reference data>

Engine coolant temperature °C (°F)	Resistance $k\Omega$
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.



## Removal and Installation

## ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-47, "Component".

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## DTC P0130 A/F SENSOR 1

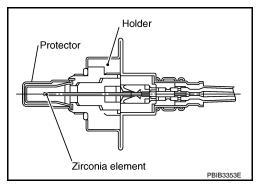
## Component Description

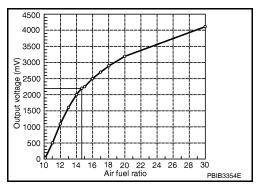
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement  $\blacksquare$  = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide  $\blacksquare$  range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).





## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION	
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible Cause
P0130 0130	Air fuel ratio (A/F) sensor 1	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in the range other than approx. 2.2V.	Harness or connectors     [Air fuel ratio (A/F) sensor 1 circuit is open or shorted.]
0100	Circuit	B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2V.	Air fuel ratio (A/F) sensor 1

### **DTC Confirmation Procedure**

INFOID:0000000004500057

INFOID:0000000004500055

INFOID:0000000004500056

### Perform PROCEDURE FOR MALFUNCTION A first.

If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

### PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.

### DTC P0130 A/F SENSOR 1

#### [MR TYPE 2] < SERVICE INFOMATION >

- Let engine idle for 2 minutes.
- 3. Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1213, "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.
- Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" indication. If the indication is constantly approx. 2.2V and does not fluctuates, go to EC-1213, "Diagnosis Procedure".
- If the indication fluctuates around 2.2V, go to next step. 4. Select "A/F SEN1 (B1) P1276" (for DTC P0130) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Touch "START".
- When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen.

ENG SPEED	1,000 - 3,200 rpm (A/T, CVT) 1,350 - 3,200 rpm (M/T)
VHCL SPEED SE	More than 64 km/h (40 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Shift lever	D position with OD OFF (A/T) D position (CVT) 5th position (M/T)

### If "TESTING" is not displayed after 20 seconds, retry from step 2.

Release accelerator pedal fully.

#### NOTE:

Never apply brake during releasing the accelerator pedal.

- 8. Make sure that "TESTING" changes to "COMPLETED".
  - If "TESTING" changed to "OUT OF CONDITION", retry from step 6.
- 9. Make sure that "OK" is displayed after touching "SELF-DIAG RESULT". If "NG" is displayed, go to EC-1213, "Diagnosis Procedure".

### **Overall Function Check**

### PROCEDURE MALFUNCTION B

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.
- Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
- 3. Set shift lever to D position with OD ON (A/T), D position (CVT) or 5th position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

### NOTE:

Never apply brake during releasing the accelerator pedal.

- 4. Repeat steps 2 and 3 for five times.
- 5. Stop the vehicle and turn ignition switch OFF.
- 6. Wait at least 10 seconds and restart engine.
- Repeat steps 2 and 3 for five times.
- 8. Stop the vehicle and connect GST to the vehicle.
- Make sure that no 1st trip DTC is displayed. If the 1st trip DTC is displayed, go to EC-1213, "Diagnosis Procedure".

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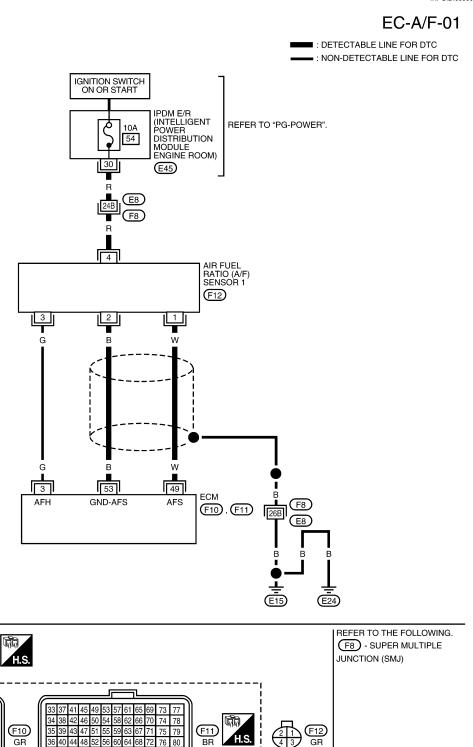
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Wiring Diagram

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Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

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### < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

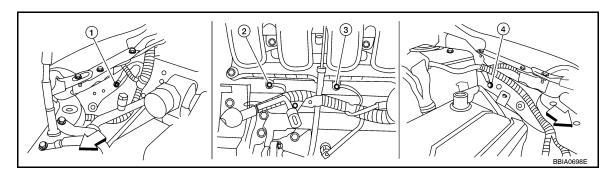
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24

Body ground E15

- Engine ground F9
- Engine ground F16

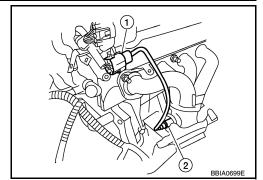
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect A/F sensor 1 harness connector (1).
- Turn ignition switch ON.



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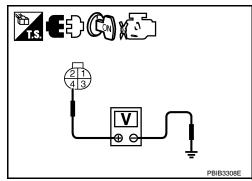
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Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



## 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-1138.

### OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

## **6.**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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### >> INSPECTION END

## DTC P0130 A/F SENSOR 1

# < SERVICE INFOMATION >

Removal and Installation

[MR TYPE 2]

## AIR FUEL RATIO SENSOR HEATER

Refer to EM-144, "Removal and Installation".

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## DTC P0131 A/F SENSOR 1

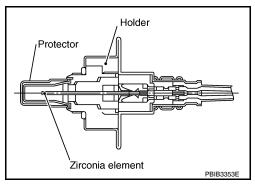
## Component Description

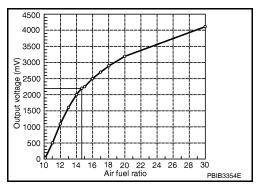
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement  $\blacksquare$  = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide  $\blacksquare$  range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).





## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0131 0131	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. 0V.	<ul> <li>Harness or connectors         [Air fuel ratio (A/F) sensor circuit is open or shorted.]</li> <li>Air fuel ratio (A/F) sensor 1</li> </ul>

### **DTC Confirmation Procedure**

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INFOID:0000000004501133

INFOID:0000000004500064

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

### WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III.
- Check "A/F SEN1 (B1)" indication.
   If the indication is constantly approx. 0V, go to <u>EC-1219</u>, "<u>Diagnosis Procedure</u>".

## DTC P0131 A/F SENSOR 1

## < SERVICE INFOMATION >

If the indication is not constantly approx. 0V, go to next step.

- 4. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
- 5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
- 6. Maintain the following conditions for about 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Shift lever	Suitable position

### NOTE:

- Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 4.
- 7. Check 1st trip DTC.
- If 1st trip DTC is displayed, go to <u>EC-1219, "Diagnosis Procedure"</u>.

## WITH GST

Follow the procedure "WITH CONSULT-III" above.

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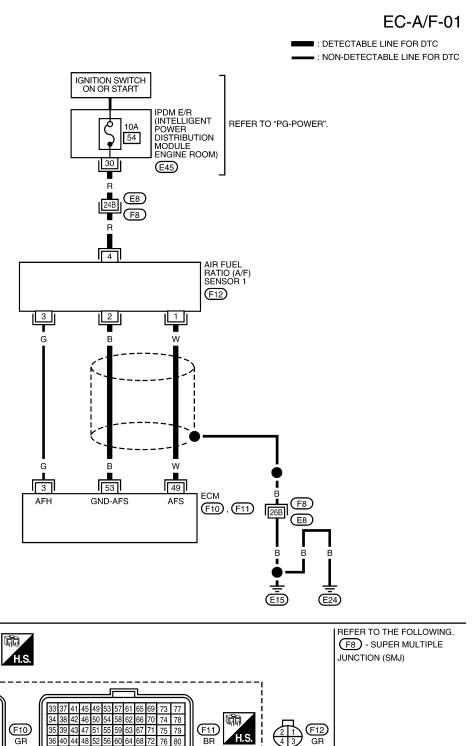
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Wiring Diagram

INFOID:0000000004501139



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

(E45)

### < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

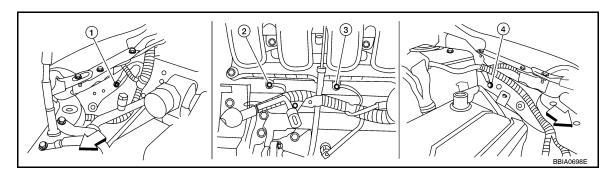
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24

Body ground E15

- Engine ground F9
- Engine ground F16

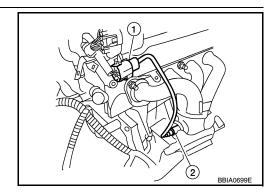
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect A/F sensor 1 harness connector (1).
- Turn ignition switch ON.



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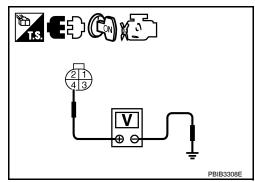
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3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



## 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-1138.

### OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

## 6.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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### >> INSPECTION END

## DTC P0131 A/F SENSOR 1

[MR TYPE 2] < SERVICE INFOMATION >

## Removal and Installation

INFOID:0000000004501129

## AIR FUEL RATIO SENSOR HEATER

Refer to EM-144, "Removal and Installation".

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## DTC P0132 A/F SENSOR 1

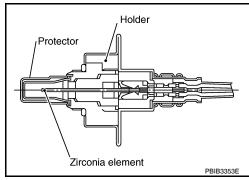
## Component Description

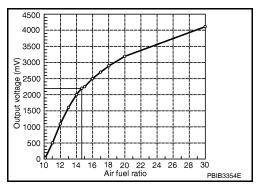
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement  $\blacksquare$  = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide  $\blacksquare$  range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004501135

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

INFOID:0000000004500071

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132 0132	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. 5V.	Harness or connectors     [Air fuel ratio (A/F) sensor circuit is open or shorted.]     Air fuel ratio (A/F) sensor 1

## **DTC Confirmation Procedure**

INFOID:0000000004500072

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

### WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "A/F SEN1 (B1)" in "DATA MONITOR" mode with CONSULT-III.
- Check "A/F SEN1 (B1)" indication.
   If the indication is constantly approx. 5V, go to <u>EC-1225</u>, "<u>Diagnosis Procedure</u>".

## DTC P0132 A/F SENSOR 1

## < SERVICE INFOMATION > [MR TYPE 2]

If the indication is not constantly approx. 5V, go to next step.

- 4. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
- 5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
- 6. Maintain the following conditions for about 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Shift lever	Suitable position

### NOTE:

- · Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step
   4.
- 7. Check 1st trip DTC.
- If 1st trip DTC is displayed, go to <u>EC-1225, "Diagnosis Procedure"</u>.

## WITH GST

Follow the procedure "WITH CONSULT-III" above.

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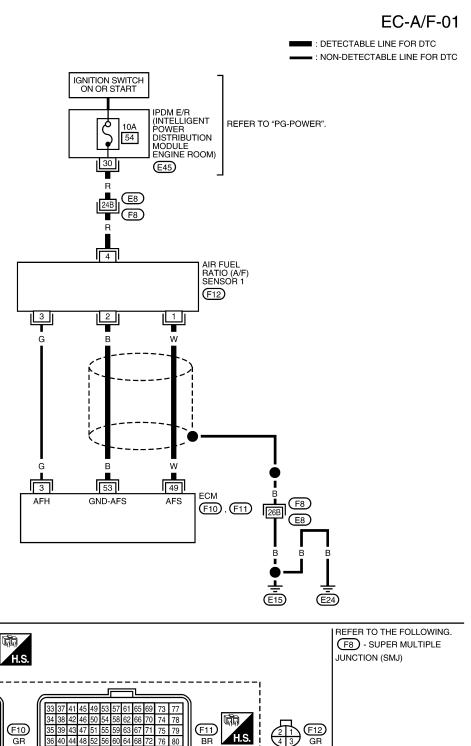
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Wiring Diagram

INFOID:0000000004501140



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

(E45)

### < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

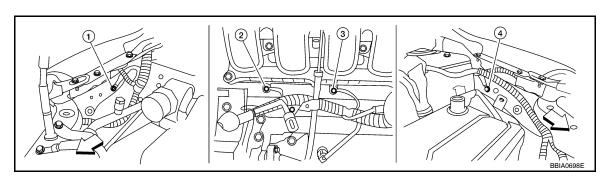
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten three ground screws on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

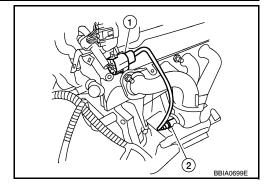
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect A/F sensor 1 harness connector (1).
- 2. Turn ignition switch ON.



EC-1225

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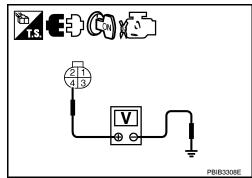
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Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



# 3.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-1138.

### OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

### **6.**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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### >> INSPECTION END

### DTC P0132 A/F SENSOR 1

# < SERVICE INFOMATION >

Removal and Installation

INFOID:0000000004501130

[MR TYPE 2]

### AIR FUEL RATIO SENSOR HEATER

Refer to EM-144, "Removal and Installation".

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### DTC P0133 A/F SENSOR 1

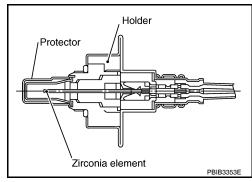
### Component Description

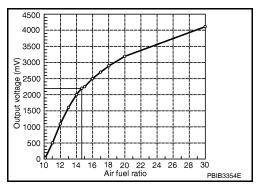
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement  $\blacksquare$  = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide  $\blacksquare$  range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).





# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004501137

Specification data are reference values.

MONITOR ITEM	CON	ONDITION SPECIFICATION	
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

# On Board Diagnosis Logic

INFOID:0000000004500078

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 air fuel ratio (A/F) sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the air fuel ratio (A/F) sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F sensor 1 signal cycling time index) is inordinately long or not.

DTC No.	Trouble diag- nosis name	DTC detecting condition	Possible Cause
P0133 0133	Air fuel ratio (A/F) sensor 1 circuit slow re- sponse	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 [Air fuel ratio (A/F) sensor circuit is open or shorted.] Air fuel ratio (A/F) sensor 1 Air fuel ratio (A/F) sensor heater 1 Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks PCV Mass air flow sensor

### **DTC Confirmation Procedure**

INFOID:0000000004500079

NOTE:

### DTC P0133 A/F SENSOR 1

[MR TYPE 2] < SERVICE INFOMATION >

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

### 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.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
- Let engine idle for 1 minute.
- Select "A/F SEN1(B1) P1278/P1279" of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Touch "START".
  - If "COMPLETED" appears on CONSULT-III screen, go to step 10.
  - If "COMPLETED" does not appear on CONSULT-III screen, go to the following step.
- 7. After perform the following procedure, "TESTING" will be displayed on the CONSULT-III screen.
- Increase the engine speed up to 4,000 to 5,000 rpm and keep it for 10 seconds.
- b. Fully release accelerator pedal and then let engine idle for about 10 seconds.
- If "TESTING" is not displayed after 10 seconds, refer to EC-1130.
- 8. Wait for about 20 seconds at idle under the condition that "TESTING" is displayed on the CONSULT-III
- Make sure that "TESTING" changes to "COMPLETED".
  - If "TESTING" changed to "OUT OF CONDITION", refer to EC-1130.
- 10. Make sure that "OK" is displayed after touching "SELF-DIAG RESULT". If "NG" is displayed, go to EC-1231, "Diagnosis Procedure".

### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- Select Service \$01 with GST.
- Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.

Make sure that the total percentage should be within  $\pm 15\%$ .

If OK, go to the following step.

If NG, 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
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
- Let engine idle for 1 minute.
- 7. Increase the engine speed up to 4,000 to 5,000 rpm and keep it for 10 seconds.
- 8. Fully release accelerator pedal and then let engine idle for about 1 minute.
- Select Service \$07 with GST.

If 1st trip DTC is detected, go to EC-1231, "Diagnosis Procedure".

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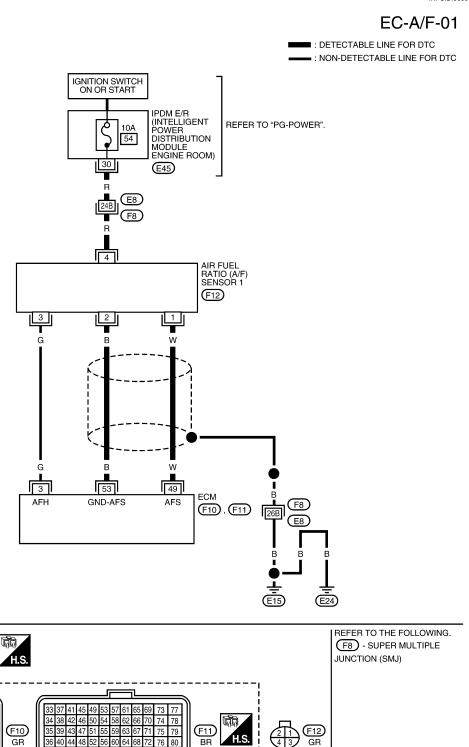
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Wiring Diagram

INFOID:0000000004501143



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

(E45)

### < SERVICE INFOMATION >

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

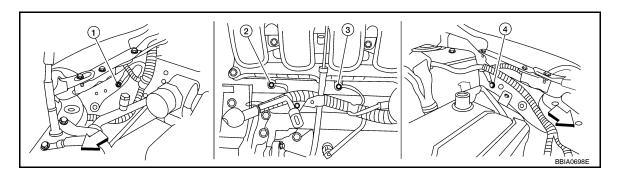
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten engine screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24
- Engine ground F9
- Engine ground F16

Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-144, "Removal and Installation".

>> GO TO 3.

# 3. CHECK EXHAUST GAS LEAK

Start engine and run it at idle.

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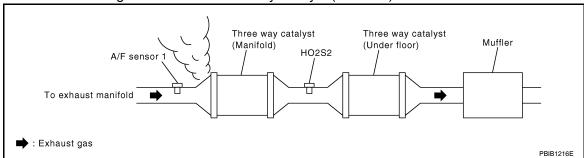
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Listen for an exhaust gas leak before three way catalyst (manifold).



### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

### 4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

### OK or NG

OK >> GO TO 5.

NG >> Repair or replace.

### 5.CLEAR THE SELF-LEARNING DATA

### With CONSULT-III

- Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- Clear the self-learning control coefficient by touching "CLEAR" or "START".
- 4. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Stop engine and reconnect mass air flow sensor harness connector.
- Make sure DTC P0102 is displayed.
- Erase the DTC memory. Refer to <u>EC-1052</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".
- Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.
  Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

# 

### Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0172. Refer to <u>EC-1258</u> or <u>EC-1264</u>.

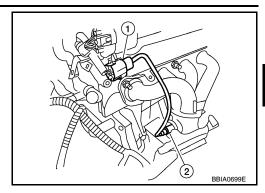
No >> GO TO 6.

# 6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

#### [MR TYPE 2] < SERVICE INFOMATION >

- Disconnect A/F sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor (2)
- 3. Turn ignition switch ON.

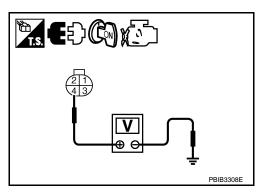


4. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

### OK or NG

OK >> GO TO 8. NG >> GO TO 7.



### 7.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- 3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

### Continuity should exist.

4. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

### 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-1158, "Component Inspection".

### OK or NG

OK >> GO TO 10.

NG >> GO TO 13. EC

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# 10.CHECK MASS AIR FLOW SENSOR

Refer to EC-1176, "Component Inspection".

### OK or NG

OK >> GO TO 11.

NG >> Replace mass air flow sensor.

11. CHECK PCV VALVE

Refer to EC-1048, "Component Inspection".

### OK or NG

OK >> GO TO 12.

NG >> Repair or replace PCV valve.

12. CHECK INTERMITTENT INCIDENT

### Perform EC-1138.

### OK or NG

OK >> GO TO 13.

NG >> Repair or replace.

13.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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

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### >> INSPECTION END

Removal and Installation

AIR FUEL RATIO SENSOR HEATER

Refer to EM-144, "Removal and Installation".

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### **DTC P0137 HO2S2**

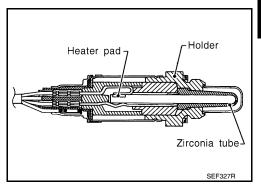
### Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air/fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



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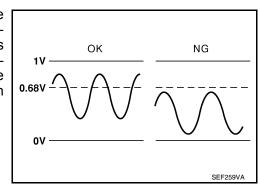
### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1)	Revving engine from idle to 3,000 rpm quickly after the following	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	<ul> <li>conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	LEAN ←→ RICH

### On Board Diagnosis 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 before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137 0137	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor is not reached to the specified voltage.	Harness or connectors (Heated oxygen sensor 2 circuit open or shorted.) Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air leaks

### **DTC Confirmation Procedure**

### 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.

### WITH CONSULT-III

### **TESTING CONDITION:**

For the best results, perform DTC WORK SUPPORT at a temperature of 0 to 30°C (32 to 86°F).

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- 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.
- Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F).
- 7. Open engine hood.
- 8. Select "HO2S2 (B1) P1147" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Following the instruction of CONSULT-III.

### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

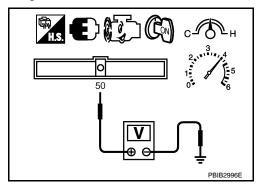
- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
   If "NG" is displayed, refer to <u>EC-1238, "Diagnosis Procedure"</u>.
   If "CAN NOT BE DIAGNOSED" is displayed, perform the following.
- Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- b. Return to step 1.

### **Overall Function Check**

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 the normal operating temperature.
- 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.
- Let engine idle 1 minute.
- 5. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V at least once during this procedure.
  - If the voltage can be confirmed in step 6, step 7 is not necessary.
- Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T).
  - The voltage should be above 0.68V at least once during this procedure.
- If NG, go to <u>EC-1238</u>, "<u>Diagnosis Procedure</u>".



[MR TYPE 2] < SERVICE INFOMATION > Wiring Diagram INFOID:0000000004500088 Α EC-HO2S2-01 : DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC EC IGNITION SWITCH ON OR START IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) C REFER TO PG-POWER . **E**45 D Е F 2 HEATED OXYGEN SENSOR 2 (F13) 4 1 3 Н 50 59 5 GND-02 O2SRR (F10), (F11) K REFER TO THE FOLLOWING. F8 - SUPER MULTIPLE M JUNCTION (SMJ) Ν (F11) (F10) 0

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	O	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  → 10.0V/Div 50ms/Div T  PBIAB148J
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

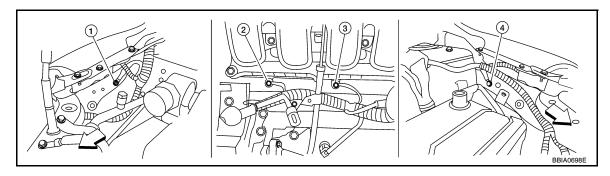
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004500089

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CLEAR THE SELF-LEARNING DATA

### With CONSULT-III

- Start engine and warm it up to normal operating temperature.
- 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.

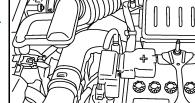
Is the 1st trip DTC P0171 detected?

Is it difficult to start engine?

### Without CONSULT-III

- 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. Make sure DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to EC-1052, "Emission-related Diagnostic Information".
- 7. Make sure DTC P0000 is displayed.
- Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 detected? Is it difficult to start engine?



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### Yes or No

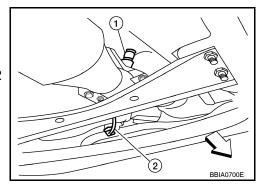
Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1258.

No >> GO TO 3.

# 3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 3. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 59 and HO2S2 terminal 1.

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.

### f 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 50 and HO2S2 terminal 4. Refer to Wiring Diagram.

### Continuity should exist.

Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

### 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-1240, "Component Inspection".

OK or NG

EC-1239

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OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

### 6.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

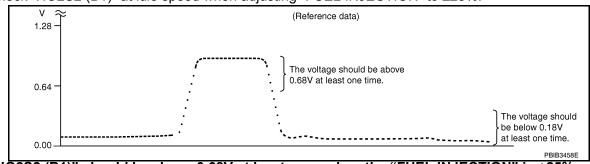
### Component Inspection

INFOID:0000000004500090

### **HEATED OXYGEN SENSOR 2**

### With CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 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)" as the monitor item with CONSULT-III.
- 6. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)" should be below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

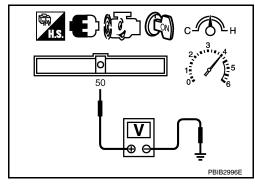
### Without CONSULT-III

- 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. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V and below 0.18V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.

- 7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T). The voltage should be above 0.68 and below 0.18V at least once during this procedure.
- If NG, replace heated oxygen sensor 2.



### **DTC P0137 HO2S2**

< SERVICE INFOMATION > [MR TYPE 2]

### **CAUTION:**

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### Removal and Installation

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### **HEATED OXYGEN SENSOR 2**

Refer to EM-144, "Removal and Installation".

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### **DTC P0138 HO2S2**

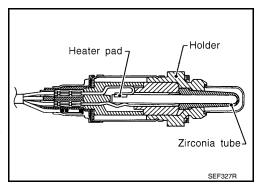
### **Component Description**

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air/fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



INFOID:0000000004501150

### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1)	Revving engine from idle to 3,000 rpm quickly after the following	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	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	LEAN ←→ RICH

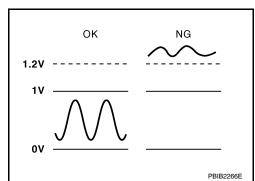
### On Board Diagnosis Logic

INFOID:0000000004500094

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 before the three way catalyst (manifold) causes the longer switching time.

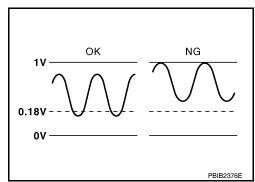
### **MALFUNCTION A**

To judge the malfunctions of rear heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition 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 the various driving condition such as fuel-cut.



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DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
		A)	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (Heated oxygen sensor 2 circuit is open or shorted.)     Heated oxygen sensor 2
	Heated oxygen sensor 2 circuit high voltage	B)	The minimum voltage from the sensor is not reached to the specified voltage.	Harness or connectors (Heated oxygen sensor circuit is open or shorted.) Heated oxygen sensor 2 Fuel pressure Fuel injector
TC Cor	nfirmation Procedu	ıre		INFOID:000000004500095
	ROCEDURE FOR MAL not be confirmed, per		CION A first. PROCEDURE FOR MALFUNCT	TION B.
DTC Con ast 10 sec	conds before conductin	g the	next test.	turn ignition switch OFF and wait at
. Start er	JRE FOR MALFUNC ngine and warm it up to inition switch OFF and v	the r	normal operating temperature.	
Let eng	ngine and keep the eng gine idle for 2 minutes. 1st trip DTC.	ine sp	peed between 3,500 and 4,000 rp	m for at least 1 minute under no load.
	ip DTC is detected, go JRE FOR MALFUNC		-1246, "Diagnosis Procedure". I B	
	NSULT-III			
or the bes . Turn ig . Start e	nition switch ON and se	elect ' o the	DRK SUPPORT at a temperature "DATA MONITOR" mode with COnormal operating temperature.	•
Start er	inition switch OFF and vingine and keep the engigine idle for 1 minute.			m for at least 1 minute under no load.
6. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F). If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F).				
•	engine hood. "HO2S2 (B1) P1146" o	f "⊔∩	2S2" in "DTC WORK SUPPORT"	mode with CONSULT-III
Followi	ing the instruction of CO			Mode with Consult-III.
14 11 4 .			"COMPLETED" is displayed.	

### **Overall Function Check**

b. Return to step 1.

INFOID:0000000004500096

Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).

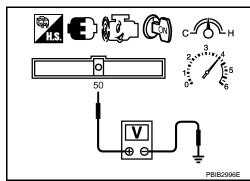
### PROCEDURE FOR MALFUNCTION B

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 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 1 minute.
- 5. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.18V at least once during this procedure.
  - If the voltage can be confirmed in step 6, step 7 is not necessary.
- Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T).
  - The voltage should be below 0.18V at least once during this procedure.





[MR TYPE 2] < SERVICE INFOMATION > Wiring Diagram INFOID:0000000004501153 Α EC-HO2S2-01 : DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC EC IGNITION SWITCH ON OR START IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) C REFER TO PG-POWER . **E**45 D Е F 2 HEATED OXYGEN SENSOR 2 (F13) 4 1 3 Н 50 59 5 GND-02 O2SRR (F10), (F11) K REFER TO THE FOLLOWING. F8 - SUPER MULTIPLE M JUNCTION (SMJ) Ν (F11) (F10) 0

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

BBWA2629E

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	O	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V  → 10.0V/Div 50ms/Div T  PBIAB148J
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

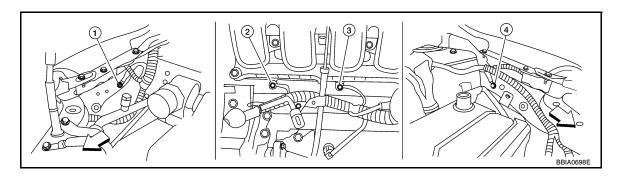
# Diagnosis Procedure

INFOID:0000000004500098

# PROCEDURE FOR MALFUNCTION A

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten engine screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

### OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

# $\overline{2}$ .check ho2s2 ground circuit for open and short

- 1. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 59 and HO2S2 terminal 1. Refer to Wiring Diagram.

# (1) BRIA0700E

### Continuity should exist.

4. 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 50 and HO2S2 terminal 4. Refer to Wiring Diagram.

### Continuity should exist.

2. Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

### 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.

### $oldsymbol{5}$ .CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1249, "Component Inspection".

### OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

### 6.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

### PROCEDURE FOR MALFUNCTION B

### 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten engine screw on the body. Refer to EC-1144, "Ground Inspection".

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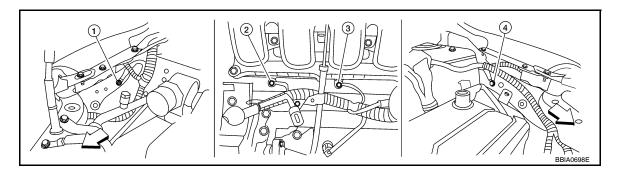
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- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

### 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.
- 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 detected?

Is it difficult to start engine?

### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Stop engine and reconnect mass air flow sensor harness connector
- 5. Make sure that DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to <u>EC-1052</u>, "<u>Emission-related</u> <u>Diagnostic Information</u>".
- 7. Make sure that DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected?

Is it difficult to start engine?

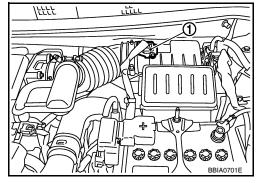
### Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to <u>EC-1264</u>.

No >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.



### **DTC P0138 HO2S2**

### < SERVICE INFOMATION >

[MR TYPE 2]

- 2. Disconnect heated oxygen sensor 2 harness connector (2).
- : Vehicle front
- Heated oxygen sensor 2 (1)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between ECM terminal 59 and HO2S2 terminal 1. Refer to Wiring Diagram.

# 2 BBIA0700E

### 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.

### f 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

 Check harness continuity between ECM terminal 50 and HO2S2 terminal 4. Refer to Wiring Diagram.

### Continuity should exist.

Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

### 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-1249, "Component Inspection".

### OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

### 6. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

### Component Inspection

**HEATED OXYGEN SENSOR 2** 

# With 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.
- Let engine idle for 1 minute.
- 5. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.

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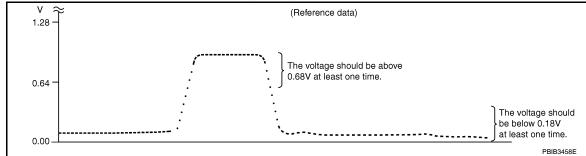
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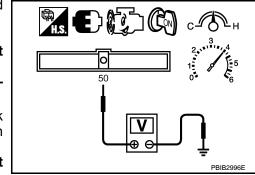
6. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to  $\pm 25\%$ .



- "HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
- "HO2S2 (B1)" should be below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### Without CONSULT-III

- 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. Set voltmeter probes between ECM terminal 50 (HO2S2 signal) and ground.
- 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 0.68V and below 0.18V at least once during this procedure.
  - If the voltage can be confirmed at step 6, step 7 is not necessary.
- 7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T). The voltage should be above 0.68 and below 0.18V at least once during this procedure.



- 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### Removal and Installation

**HEATED OXYGEN SENSOR 2** 

Refer to EM-144, "Removal and Installation".

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### **DTC P0139 HO2S2**

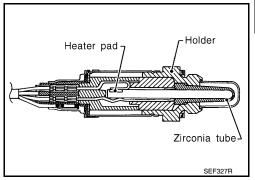
### **Component Description**

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air/fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



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INFOID:0000000004500103

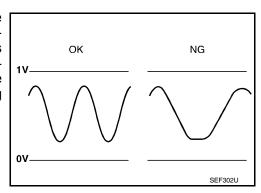
### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1)	Revving engine from idle to 3,000 rpm quickly after the following	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	<ul> <li>conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	LEAN ←→ RICH

### On Board Diagnosis 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 before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	<ul> <li>Harness or connectors (Heated oxygen sensor circuit is open or shorted.)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

### **DTC Confirmation Procedure**

### 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.

### WITH CONSULT-III

### **TESTING CONDITION:**

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30 °C (32 to 86 °F).

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INFOID:0000000004500104

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F). If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F).
- Select "HO2S2 (B1) P0139" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 8. Following the instruction of CONSULT-III.

### NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

- 9. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to <u>EC-1254, "Diagnosis Procedure"</u>. If "CAN NOT BE DIAGNOSED" is displayed, perform the following.
- Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- b. Return to step 1.

### **Overall Function Check**

INFOID:0000000004500105

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 the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- Set voltmeter probes between ECM terminal 50 (HO2S2 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.)

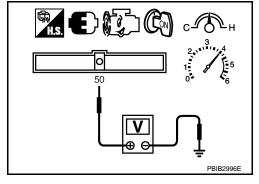
A change of voltage should be more than 0.8V for 1 second

during this procedure. If the voltage can be confirmed in step 6, step 7 is not necessary.

 Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T).

A change of voltage should be more than 0.8V for 1 second during this procedure.

8. If NG, go to EC-1254, "Diagnosis Procedure".



[MR TYPE 2]

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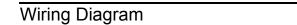
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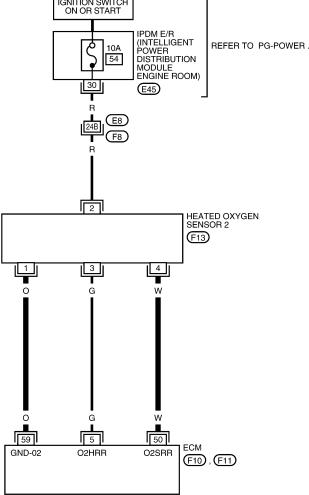
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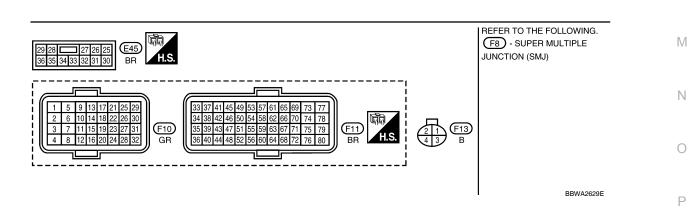




: DETECTABLE LINE FOR DTC







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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	G	Heated oxygen sensor 2 heater	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	Approximately 10V
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>[Engine is running]</li> <li>Engine speed: Above 3,600 rpm.</li> </ul>	BATTERY VOLTAGE (11 - 14V)
50	w	Heated oxygen sensor 2	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load.</li> </ul>	0 - Approximately 1.0V
59	0	Sensor ground (Heated oxygen sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

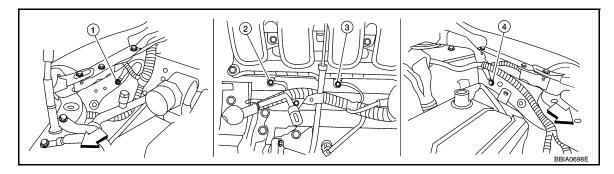
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004500107

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CLEAR THE SELF-LEARNING DATA

### With CONSULT-III

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### < SERVICE INFOMATION >

- 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 P0172 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.
- Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure that DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to <u>EC-1052</u>, "Emission-related <u>Diagnostic Information"</u>.
- 7. Make sure that DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

### Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-1258 or EC-1264.

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 (2).
- Vehicle front
- Heated oxygen sensor 2 (1)
- 3. Disconnect ECM harness connector.
- Check harness continuity between HO2S2 terminal 1 and ECM terminal 59. 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.

### $oldsymbol{4}.$ CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 terminal 4 and ECM terminal 50. Refer to Wiring Diagram.

### Continuity should exist.

Check harness continuity between ECM terminal 50 or HO2S2 terminal 4 and ground. Refer to Wiring Diagram.

### Continuity should not exist.

3. Also check harness for short to power.

### OK or NG

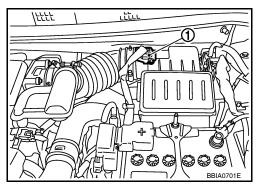
OK >> GO TO 5.

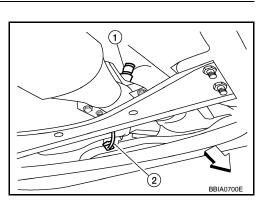
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

### 5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1256, "Component Inspection".

OK or NG





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OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

### 6.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

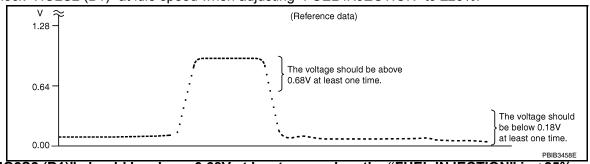
### Component Inspection

INFOID:0000000004501156

### **HEATED OXYGEN SENSOR 2**

### With 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. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 6. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)" should be below 0.18V 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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### Without CONSULT-III

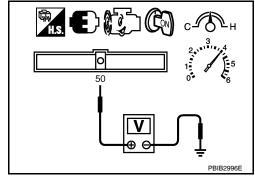
- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Set voltmeter probes between ECM terminal 50 (HO2S2 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 0.68V and below 0.18V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.

7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with OD OFF (A/T), D position (CVT) or 3rd gear position (M/T). The voltage should be above 0.68 and below 0.18V at least once during this procedure.

8. If NG, replace heated oxygen sensor 2.



### **DTC P0139 HO2S2**

< SERVICE INFOMATION > [MR TYPE 2]

### **CAUTION:**

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

### Removal and Installation

INFOID:0000000004501148

### **HEATED OXYGEN SENSOR 2**

Refer to EM-144, "Removal and Installation".

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### DTC P0171 FUEL INJECTION SYSTEM FUNCTION

### On Board Diagnosis Logic

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the 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 lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Air fuel ratio (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	Fuel injection system too lean	<ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)</li> </ul>	<ul> <li>Intake air leaks</li> <li>Air fuel ratio (A/F) sensor 1</li> <li>Fuel injector</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Lack of fuel</li> <li>Mass air flow sensor</li> <li>Incorrect PCV hose connection</li> </ul>

### **DTC Confirmation Procedure**

INFOID:0000000004500111

### 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.

### WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.
- 4. Clear the self-learning control coefficient by touching "CLEAR".
- 5. Start engine.

If it is difficult to start engine, the fuel injection system has a malfunction.

Perform 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.

- If engine starts, go to <u>EC-1261</u>. "<u>Diagnosis Procedure</u>".
   If engine does not start, check exhaust and intake air leak visually.
- 6. Keep engine at idle for at least 5 minutes.
- 7. Check 1st trip DTC.

The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to <u>EC-1261</u>, <u>"Diagnosis Procedure"</u>.

### 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.

### **DTC P0171 FUEL INJECTION SYSTEM FUNCTION**

< SERVICE INFOMATION > [MR TYPE 2]

# VHCL SPEED SE CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to <u>EC-1261</u>, "<u>Diagnosis Procedure</u>".

50 - 120 km/h (31 - 75 MPH)

### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Disconnect mass air flow sensor (1) harness connector.
- 4. Restart engine and let idle for at least 5 seconds.
- 5. Stop engine and reconnect mass air flow sensor (1) harness connector.
- Select Service \$03 with GST. Make sure DTC P0102 is detected.
- Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine.

If it is difficult to start engine, the fuel injection system has a malfunction.

Perform 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.

- If engine starts, go to <u>EC-1261</u>, "<u>Diagnosis Procedure</u>".
   If engine does not start, check exhaust and intake air leak visually.
- Keep engine at idle for at least 5 minutes.
- 10. Check 1st trip DTC.

The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to <u>EC-1261</u>, "<u>Diagnosis Procedure"</u>.

### 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.
- 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 trip DTC is detected, go to <u>EC-1261, "Diagnosis Procedure"</u>.

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Wiring Diagram INFOID:0000000004500112 EC-FUEL-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) REFER TO "PG-POWER". 10A 55 10A 54 (E45) 31 30 # E8 F8 SB SB SB 4 1 FUEL INJECTOR NO. 1 FUEL INJECTOR NO. 2 FUEL INJECTOR NO. 3 FUEL INJECTOR NO. 4 AIR FUEL RATIO (A/F) SENSOR 1 9 9 9 (F17) (F18) (F19) (F20) (F12) 31 30 29 3 53 49 25 ECM INJ #1 INJ #2 INJ #3 INJ #4 GND-AFS AFS (F10) (E8 (F11) REFER TO THE FOLLOWING. F8 - SUPER MULTIPLE (E45) JUNCTION (SMJ) (F10) (F11)

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

(F17), (F18), (F19), (F20)

GR

#### **DTC P0171 FUEL INJECTION SYSTEM FUNCTION**

< SERVICE INFOMATION >

[MR TYPE 2]

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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.

TER NA NO	VL WIRE	ITEM	CONDITION	DATA (DC Voltage)
3	G G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V  >>> 10.0V/Div 50ms/DivT  PBIA8148J
2! 29	-	Fuel injector No. 4 Fuel injector No. 3	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  »10.0 V/Div 50 ms/Div T  PBIB0529E
30 3·		Fuel injector No. 2 Fuel injector No. 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE  (11 - 14V)  Discrete statement of the st
49	9 W	A/F sensor 1	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	Approximately 1.8V Output voltage varies with air fuel ratio.
53	3 B	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

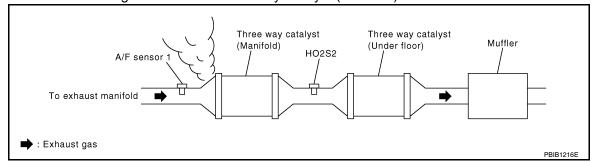
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

INFOID:0000000004500113

## 1. CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before three way catalyst (manifold).



#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

#### < SERVICE INFOMATION >

- Listen for an intake air leak after the mass air flow sensor.
- Check PCV hose connection.

#### OK or NG

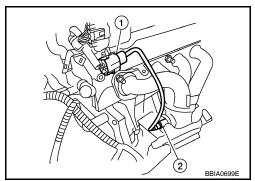
OK >> GO TO 3.

NG >> Repair or replace.

## 3.check air fuel ratio (a/f) sensor 1 circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor 1 (2)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53



#### Continuity should exist.

5. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

#### 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-1086, "Fuel Pressure Check".
- Install fuel pressure gauge and check fuel pressure. Refer to EC-1086, "Fuel Pressure Check".

#### At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 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-1513.)
- Fuel pressure regulator (Refer to EC-1086, "Fuel Pressure Check".)
- Fuel lines (Refer to FL-4.)
- · Fuel filter for clogging

#### >> Repair or replace.

## 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.

at idling : 1.0 - 4.0 g·m/sec at 2,500 rpm : 2.0 - 10.0 g·m/sec

With GST

#### **DTC P0171 FUEL INJECTION SYSTEM FUNCTION**

#### DIC FULL FOR INSECTION STSTEM FUNCTION

< SERVICE INFOMATION > 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.

at idling : 1.0 - 4.0 g·m/sec at 2,500 rpm : 2.0 - 10.0 g·m/sec

OK or NG

OK >> GO TO 7.

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or

ground. Refer to EC-1170.

7. CHECK FUNCTION OF FUEL INJECTORS

With CONSULT-III

1. Let engine idle.

2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.

3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-III

1. Let engine idle.

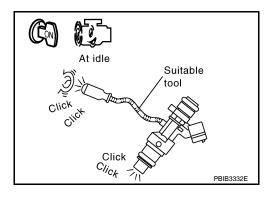
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

OK or NG

OK >> GO TO 8.

NG >> Perform trouble diagnosis for <u>EC-1508</u>.



## 8. CHECK FUEL INJECTOR

- 1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 2. Turn ignition switch OFF.
- 3. Reconnect all harness connectors disconnected.
- 4. Remove fuel tube assembly. Refer to EM-156.

Keep fuel hose and all fuel injector connected to fuel tube.

The fuel injector harness connectors should remain connected.

- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.
- 7. Crank engine for about 3 seconds. Make sure that fuel sprays out from fuel injectors.

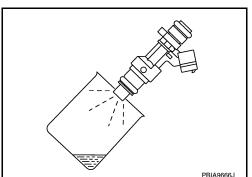
Fuel should be sprayed evenly for each fuel injector.

#### OK or NG

OK >> GO TO 9.

NG >> Replace fuel injectors from which fuel does not spray

out. Always replace O-ring with new ones.



## 9. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

>> INSPECTION END

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[MR TYPE 2]

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INFOID:0000000004500114

#### DTC P0172 FUEL INJECTION SYSTEM FUNCTION

## On Board Diagnosis Logic

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the 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 lights up the MIL (2 trip detection logic)

Sensor	Input Signal to ECM	ECM function	Actuator
Air fuel ratio (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	Fuel injection system too rich	<ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)</li> </ul>	<ul> <li>Air fuel ratio (A/F) sensor 1</li> <li>Fuel injector</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul>

#### **DTC Confirmation Procedure**

INFOID:0000000004500115

#### 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.

#### WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.
- Clear the self-learning control coefficient by touching "CLEAR".
- 5. Start engine.
  - If it is difficult to start engine, the fuel injection system has a malfunction.
  - Perform 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.

- If engine starts, go to <u>EC-1267</u>. "<u>Diagnosis Procedure</u>".
  - If engine does not start, remove ignition plugs and check for fouling, etc.
- 6. Keep engine at idle for at least 5 minutes.
- Check 1st trip DTC.

The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to <u>EC-1267</u>, "<u>Diagnosis Procedure</u>".

#### 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)

#### **DTC P0172 FUEL INJECTION SYSTEM FUNCTION**

< SERVICE INFOMATION > [MR TYPE 2]

#### **CAUTION:**

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to <u>EC-1267</u>, "<u>Diagnosis Procedure</u>".

#### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Disconnect mass air flow sensor (1) harness connector.
- Restart engine and let idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- Select Service \$03 with GST. Make sure DTC P0102 is detected.
- 7. Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine.

If it is difficult to start engine, the fuel injection system has a malfunction.

Perform 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-1267, "Diagnosis Procedure".

If engine does not start, remove ignition plugs and check for fouling, etc.

- 9. Keep engine at idle for at least 5 minutes.
- 10. Check 1st trip DTC.

The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to <u>EC-1267</u>, "<u>Diagnosis Procedure"</u>.

#### 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 trip DTC is detected, go to <u>EC-1267</u>, "<u>Diagnosis Procedure</u>".

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Wiring Diagram INFOID:0000000004501178 EC-FUEL-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) REFER TO "PG-POWER". 10A 55 10A 54 (E45) 31 30 # E8 F8 SB SB SB 4 1 FUEL INJECTOR NO. 1 FUEL INJECTOR NO. 2 FUEL INJECTOR NO. 3 FUEL INJECTOR NO. 4 AIR FUEL RATIO (A/F) SENSOR 1 9 9 9 (F17) (F18) (F19) (F20) (F12) 31 30 29 3 53 49 25 ECM INJ #1 INJ #2 INJ #3 INJ #4 GND-AFS AFS (F10) (E8 (F11) REFER TO THE FOLLOWING. F8 - SUPER MULTIPLE (E45) JUNCTION (SMJ) (F10) (F11)

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

(F17), (F18), (F19), (F20)

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#### **DTC P0172 FUEL INJECTION SYSTEM FUNCTION**

< SERVICE INFOMATION >

[MR TYPE 2]

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.

	TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
<del>-</del>	3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
_	25 29	V	Fuel injector No. 4 Fuel injector No. 3	[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE  (11 - 14V)  >> 10.0 V/Div 50 ms/Div T  PBIB0529E
	30 31	OL	Fuel injector No. 2 Fuel injector No. 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE  (11 - 14V)  >> 10.0 V/DIV 50 ms/DIV T  PBIA4943J
-	49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
	53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

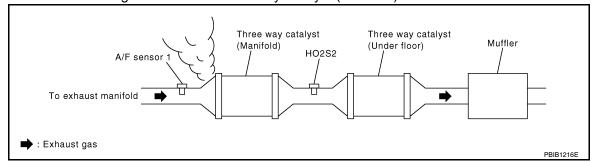
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

INFOID:0000000004500117

## 1. CHECK EXHAUST GAS LEAK

- Start engine and run it at idle.
- Listen for an exhaust gas leak before three way catalyst (manifold). 2.



#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2.CHECK FOR INTAKE AIR LEAK

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#### [MR TYPE 2]

#### < SERVICE INFOMATION >

Listen for an intake air leak after the mass air flow sensor.

#### OK or NG

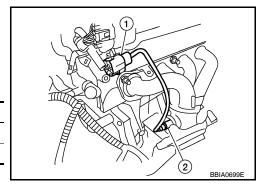
OK >> GO TO 3.

NG >> Repair or replace.

## 3.check air fuel ratio (a/f) sensor 1 circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor 1 (2)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal	
1	49	
2	53	



#### Continuity should exist.

5. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

#### 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-1086, "Fuel Pressure Check".
- Install fuel pressure gauge and check fuel pressure. Refer to EC-1086, "Fuel Pressure Check".

#### At idling: Approximately 350 kPa (3.57 kg/cm2, 51 psi)

#### OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

## ${f 5}$ .DETECT MALFUNCTIONING PART

#### Check the following.

- Fuel pump and circuit (Refer to <u>EC-1513</u>.)
- Fuel pressure regulator (Refer to EC-1086, "Fuel Pressure Check".)

>> Repair or replace.

## 6.CHECK MASS AIR FLOW SENSOR

#### With CONSULT-III

- Install all removed parts.
- Start engine and warm it up to normal operating temperature.
- 3. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III.

at idling : 1.0 - 4.0 g·m/sec at 2,500 rpm : 2.0 - 10.0 g·m/sec

#### With GST

- 1. Install all removed parts.
- 2. Start engine and warm it up to normal operating temperature.
- Check mass air flow sensor signal in Service \$01 with GST.

## EC-1268

#### **DTC P0172 FUEL INJECTION SYSTEM FUNCTION**

[MR TYPE 2] < SERVICE INFOMATION >

at idling : 1.0 - 4.0 g·m/sec at 2,500 rpm : 2.0 - 10.0 g·m/sec

OK or NG

NG

OK >> GO TO 7.

> >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-1170.

## .CHECK FUNCTION OF FUEL INJECTORS

#### With CONSULT-III

- 1. Let engine idle.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.

#### Without CONSULT-III

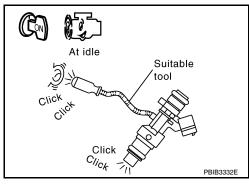
- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

#### Clicking noise should be heard.

#### OK or NG

OK >> GO TO 8.

NG >> Perform trouble diagnosis for EC-1508.



## 8. CHECK FUEL INJECTOR

- Remove fuel injector assembly. Refer to EM-156.
  - Keep fuel hose and all fuel injector connected to fuel tube.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Reconnect all harness connectors disconnected.
- 4. Disconnect all injector harness connectors.
- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.
- 7. Crank engine for about 3 seconds. Make sure fuel does not drip from fuel injector.

#### OK or NG

OK (Does not drip.)>>GO TO 9.

NG (Drips.)>>Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

#### 9. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

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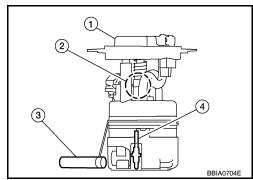
INFOID:0000000004500118

## DTC P0181 FTT SENSOR

## Component Description

The fuel tank temperature sensor (4) 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)
- Fuel level sensor (3)



#### <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

<sup>\*:</sup> This data is reference values and is measured between ECM terminal 43 (Fuel tank temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result damage the ECM's transistor. Use ground other than ECM, such as ground.

## On Board Diagnosis Logic

	20	
	10	
ď	10 - Acceptable -	
e G	2	
Resistance	1.0	
Res	0.4	
	0.2	
	0.1 -20 0 20 40 60 80 100 (-4) (32) (68) (104) (140) (176) (212)	
	(-4) (32) (66) (104) (140) (176) (212) Temperature °C (°F)	SEF012P

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/per-formance	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     (Fuel tank temperature sensor circuit is open or shorted)     Fuel tank temperature sensor

#### **DTC Confirmation Procedure**

#### 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.

#### WITH CONSULT-III

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.
  - If 1st trip DTC is detected, go to EC-1271, "Diagnosis Procedure".
  - If 1st trip DTC is not detected, go to following step.
- 3. Select "DATA MONITOR" mode with CONSULT-III.
- Check "COOLAN TEMP/S" value.
  - If the "COOLAN TEMP/S" is less than 60°C (140°F), the result will be OK. If the "COOLAN TEMP/S" is above 60°C (140°F), go to the following step.
- Cool engine down until "COOLAN TEMP/S" signal is less than 60°C (140°F).
- Wait at least 10 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1271, "Diagnosis Procedure".

#### WITH GST

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[MR TYPE 2]

Follow the procedure "WITH CONSULT-III" above.

Wiring Diagram

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#### EC-FTTS-01

: DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC EC

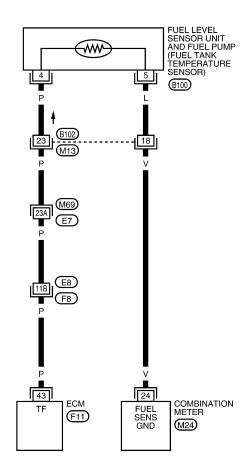
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REFER TO THE FOLLOWING. M69, F8 - SUPER MULTIPLE JUNCTION (SMJ) Ν 0 Р BBWA2636E

## Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.

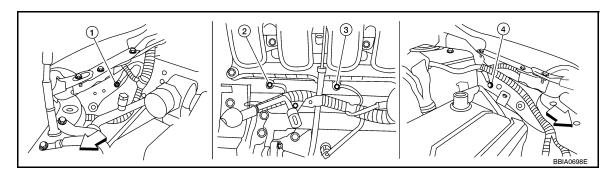
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2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

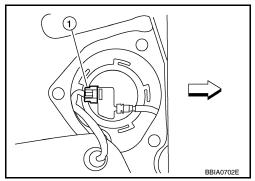
#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector (1).
- : Vehicle front
- 3. Turn ignition switch ON.

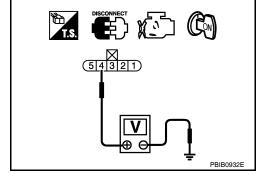


Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



## 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- · 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.
- 4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
- 1. Turn ignition switch OFF.

- Disconnect combination meter harness connector.
- Check harness continuity between "fuel level sensor unit and fuel pump" terminal 5 and combination meter terminal 24. 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.

## ${f 5}$ .DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B102, M13
- Harness for open or short between "fuel level sensor unit and fuel pump" and ground.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## **6.**CHECK FUEL TANK TEMPERATURE SENSOR

Refer to, EC-1273, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> Replace "fuel level sensor unit and fuel pump".

## 7.CHECK INTERMITTENT INCIDENT

Perform EC-1138.

#### >> INSPECTION END

## Component Inspection

#### FUEL TANK TEMPERATURE SENSOR

1. Check resistance between "fuel level sensor unit and fuel pump" terminal 4 and 5 by heating with hot water as shown in the fig-

Temperature °C (°F)	Resistance k $\Omega$
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace "fuel level sensor unit and fuel pump".

# Hot water

#### Removal and Installation

#### FUEL TANK TEMPERATURE SENSOR

Refer to FL-5, "Removal and Installation".

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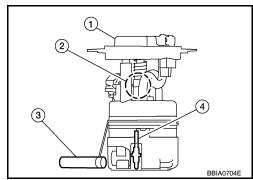
INFOID:0000000004501179

## DTC P0182, P0183 FTT SENSOR

## Component Description

The fuel tank temperature sensor (4) 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)
- Fuel level sensor (3)



#### <Reference data>

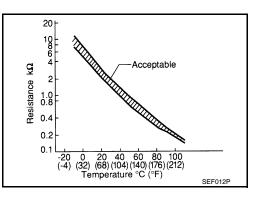
Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

<sup>\*:</sup> This data is reference values and is measured between ECM terminal 43 (Fuel tank temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result damage the ECM's transistor. Use ground other than ECM, such as ground.

## On Board Diagnosis Logic



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     (Fuel tank temperature sensor circuit is	
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.)  • Fuel tank temperature sensor	

#### **DTC Confirmation Procedure**

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#### 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.

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1275, "Diagnosis Procedure"</u>.

[MR TYPE 2]

Wiring Diagram

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#### EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

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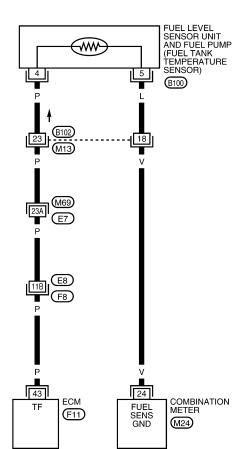
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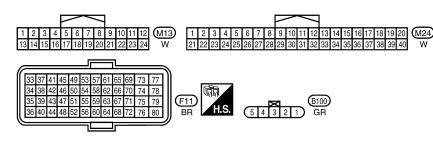
REFER TO THE FOLLOWING.

(M69), (F8) - SUPER

MULTIPLE JUNCTION (SMJ)

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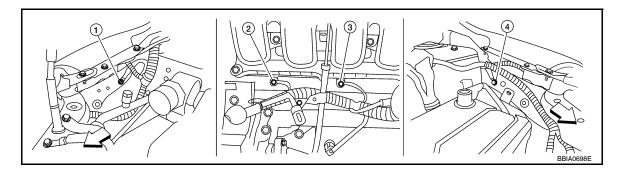
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## Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

## 4. Body ground E15

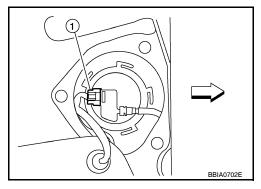
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## 2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector (1).
- : Vehicle front
- 3. Turn ignition switch ON.

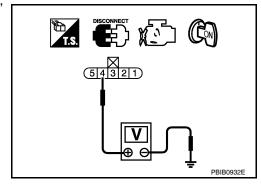


4. Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 4. NG >> GO TO 3.



## 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E8, F8
- · Harness connectors M69, E7
- Harness connectors B102, M13
- · 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.

## 4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect combination meter harness connector.

3. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 5 and combination meter terminal 24. Refer to Wiring Diagram.

#### Continuity should exist.

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 B102, M13
- Harness for open or short between "fuel level sensor unit and fuel pump" and ground.

>> Repair open circuit or short to ground or short to power in harness or connectors.

#### 6. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to, EC-1277, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> Replace "fuel level sensor unit and fuel pump".

#### 7. CHECK INTERMITTENT INCIDENT

Perform <u>EC-1138</u>.

#### >> INSPECTION END

## Component Inspection

#### FUEL TANK TEMPERATURE SENSOR

 Check resistance between "fuel level sensor unit and fuel pump" terminal 4 and 5 by heating with hot water as shown in the figure.

Temperature °C (°F)	Resistance k $\Omega$
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace "fuel level sensor unit and fuel pump".

# Hot water 12345 PBIB0931E

#### Removal and Installation

FUEL TANK TEMPERATURE SENSOR

Refer to FL-5, "Removal and Installation".

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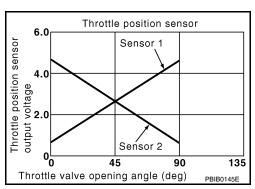
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## DTC P0222, P0223 TP SENSOR

## Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004501171

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TD OFN 4 D4	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36V
TP SEN 1-B1 TP SEN 2-B1*	<ul><li>(Engine stopped)</li><li>Shift lever: D (A/T, CVT),</li><li>1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75V

<sup>\*:</sup> Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

#### On Board Diagnosis Logic

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These self-diagnoses have the one trip detection logic.

NOTE:

If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-1396</u>.

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.	<ul> <li>Harness or connectors         (TP sensor 1 circuit is open or shorted.)         (APP sensor 2 circuit is shorted.)</li> <li>Electric throttle control actuator         (TP sensor 1)</li> <li>Accelerator pedal position sensor         (APP sensor 2)</li> </ul>
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, the ECM enters fail-safe mode and the MIL lights up.

#### Engine operation condition in fail-safe mode

#### **DTC Confirmation Procedure**

INFOID:0000000004500135

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

Start engine and let it idle for 1 second.

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.

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- < SERVICE INFOMATION >
- Check DTC.
- If DTC is detected, go to EC-1280, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000004500136 EC EC-TPS1-01 : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC ELECTRIC THROTTLE CONTROL ACTUATOR (THROTTLE POSITION SENSOR) SENSOR 1 SENSOR 2 **F7** Ш 3 ĹĠ 33 72 36 AVCC-TPS GND-TPS (F11) **F11** 

BBWA2655E

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.

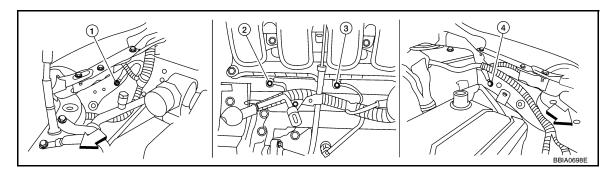
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33 LG		Throttle position sensor 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36V
			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	Less than 4.75V
34 O	Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	Less than 4.75V	
34 O		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36V	
36	Y	Sensor ground (Throttle position sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V

## Diagnosis Procedure

INFOID:0000000004500137

## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- . Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

#### OK or NG

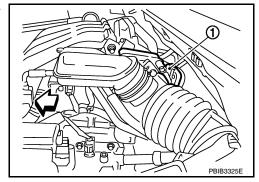
OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

#### [MR TYPE 2] < SERVICE INFOMATION >

- Disconnect electric throttle control actuator (1) harness connec-
- : Vehicle front
- 2. Turn ignition switch ON.



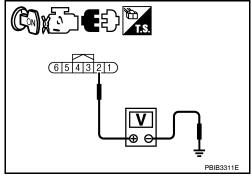
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT-III or tester.

#### Voltage: Approximately 5V

#### OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness connectors.



## ${f 3.}$ CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 36 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

#### Continuity should exist.

4. Also check harness for short to ground or 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.

## $oldsymbol{4}.$ CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 33 and electric throttle control actuator 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 5.

>> Repair open circuit or short to ground or short to power in harness or connectors. NG

#### CHECK THROTTLE POSITION SENSOR

Refer to EC-1282, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- Perform <u>EC-1084</u>, "Throttle Valve Closed Position Learning".
   Perform <u>EC-1084</u>, "Idle Air Volume Learning".

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#### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

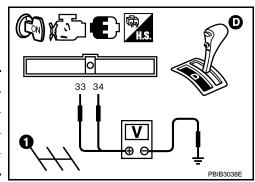
## Component Inspection

#### INFOID:0000000004501172

#### THROTTLE POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 3. Turn ignition switch ON.
- 4. Set shift lever to D position (A/T, CVT) or 1st position (M/T).
- Check voltage between ECM terminals 33 (TP sensor 1 signal), 34 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
33	Fully released	More than 0.36V
(Throttle position sensor 1)	Fully depressed	Less than 4.75V
34	Fully released	Less than 4.75V
(Throttle position sensor 2)	Fully depressed	More than 0.36V



- 6. If NG, replace electric throttle control actuator and go to the next step.
- 7. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 8. Perform EC-1084, "Idle Air Volume Learning".

#### Removal and Installation

INFOID:0000000004501173

#### ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-141, "Removal and Installation".

< SERVICE INFOMATION > [MR TYPE 2]

# DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

## On Board Diagnosis Logic

INFOID:0000000004500140

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crank-shaft 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 (POS) 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 on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	Improper spark plug     Insufficient compression
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	Incorrect fuel pressure Fuel injector circuit is open or shorted Fuel injector Intake air leak The ignition signal circuit is open or shorte Lack of fuel Drive plate or flywheel Air fuel ratio (A/F) sensor 1 Incorrect PCV hose connection
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.	

#### **DTC Confirmation Procedure**

INFOID:0000000004500141

#### **CAUTION:**

Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

#### 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.

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Restart engine and let it idle for about 15 minutes.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1284, "Diagnosis Procedure"</u>.
   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 and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to table below.

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[MR TYPE 2]

Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following condition should be satisfied at the same time:

Engine speed	Engine speed in the freeze frame data $\pm$ 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data $\pm$ 10 km/h (6 MPH)
Basic fuel schedule Basic fuel schedule in the freeze frame data $\times$ (1 $\pm$ 0.1)	
Engine coolant temperature	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F)
(T) condition	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F)

The time to driving varies according to the engine speed in the freeze frame data. Refer to the following table.

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:0000000004500142

## 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.

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

## 2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

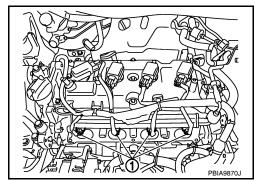
## 3. PERFORM POWER BALANCE TEST

#### With CONSULT-III

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- 2. Is there any cylinder which does not produce a momentary engine speed drop?

#### Without CONSULT-III

When disconnecting each fuel injector (1) harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



[MR TYPE 2] < SERVICE INFOMATION >

Yes >> GO TO 4. No >> GO TO 9.

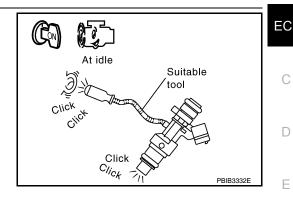
## 4. CHECK FUEL INJECTOR

Does each fuel injector make an operating sound at idle?

#### Yes or No

Yes >> GO TO 5.

No >> Check fuel injector(s) and circuit(s). Refer to <u>EC-1508</u>.



## 5.CHECK FUNCTION OF IGNITION COIL-I

#### **CAUTION:**

Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pres-

#### NOTE:

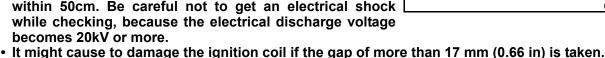
Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- : Vehicle front
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 -0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



#### CAUTION:

 Do not approach to the spark plug and the ignition coil within 50cm. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.



NOTE: When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is mal-

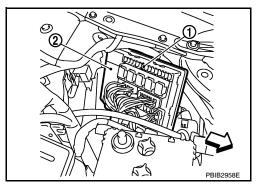
#### OK or NG

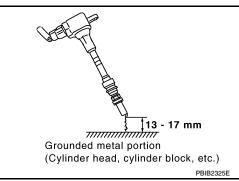
OK >> GO TO 9. NG >> GO TO 6.

functioning.

#### **6.**CHECK FUNCTION OF IGNITION COIL-II

- 1. Turn ignition switch OFF.
- Disconnect spark plug and connect a known-good spark plug.





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#### < SERVICE INFOMATION >

[MR TYPE 2]

3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

#### Spark should be generated.

#### OK or NG

OK >> GO TO 7.

NG >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-1518</u>.

#### 7. CHECK SPARK PLUG

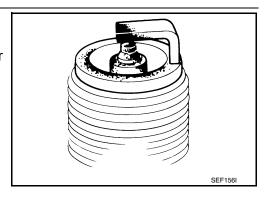
Check the initial spark plug for fouling, etc.

#### OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <a href="EM-227">EM-227</a>, "Standard and Limit".

NG >> 1. Repair or clean spark plug.

2. GO TO 8.



## 8. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- 2. Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

#### Spark should be generated.

#### OK or NG

OK >> INSPECTION END

NG >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <a href="EM-227">EM-227</a>, "Standard and Limit".

## 9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-185, "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

- Install all removed parts.
- Release fuel pressure to zero. Refer to <u>EC-1086, "Fuel Pressure Check"</u>.
- 3. Install fuel pressure gauge and check fuel pressure. Refer to EC-1086, "Fuel Pressure Check".

## At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 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 <u>EC-1513</u>.)
- Fuel pressure regulator (Refer to EC-1086, "Fuel Pressure Check".)
- Fuel lines (Refer to FL-4, "Checking Fuel Line".)
- · Fuel filter for clogging
  - >> Repair or replace.

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## 12. CHECK IGNITION TIMING

Check the following items. Refer to EC-1078, "Basic Inspection".

Items	Specifications
	A/T: 700 $\pm$ 50 rpm (in P or N position)
Target idle speed	CVT: 700 ± 50 rpm (in P or N position)
	M/T: 700 $\pm$ 50 rpm (in Neutral position)
	A/T: 13 ± 5° BTDC (in P or N position)
Ignition timing	CVT: 13 ± 5° BTDC (in Neutral position)
	M/T: $13 \pm 5^{\circ}$ BTDC (in Neutral position)

OK or NG

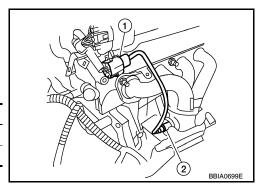
OK >> GO TO 13.

NG >> Follow the <u>EC-1078</u>, "Basic Inspection".

13. Check air fuel ratio (a/f) sensor 1 circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor 1 (2)
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53



#### Continuity should exist.

5. Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

#### 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 AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to EC-1158, "Component Inspection".

#### OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

15.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 tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

#### >> INSPECTION END

16. CHECK MASS AIR FLOW SENSOR

< SERVICE INFOMATION > [MR TYPE 2]

#### With CONSULT-III

1. Start engine and warm it up to normal operating temperature.

2. Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-III.

at idling : 1.0 - 4.0 g·m/sec at 2,500 rpm : 2.0 - 10.0 g·m/sec

#### 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.

at idling : 1.0 - 4.0 g·m/sec at 2,500 rpm : 2.0 - 10.0 g·m/sec

#### 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 <u>EC-1170</u>.

## 17. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-1095, "Symptom Matrix Chart".

#### OK or NG

OK >> GO TO 18.

NG >> Repair or replace.

## 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. Refer to <u>EC-1052</u>, <u>"Emission-related Diagnostic Information"</u>.

>> GO TO 19.

## 19. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

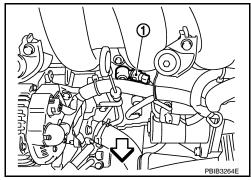
INFOID:0000000004500143

## DTC P0327, P0328 KS

## **Component Description**

The knock sensor (1) 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.

• Vehicle front



## On Board Diagnosis Logic

The MIL will not light up for these self-diagnoses.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause	
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Knock sensor circuit is open or shorted.)	
P0328 0328	Knock sensor circuit high	An excessively high voltage from the sensor is sent to FCM		

## **DTC Confirmation Procedure**

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:**

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

- 1. Start engine 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-1291, "Diagnosis Procedure".

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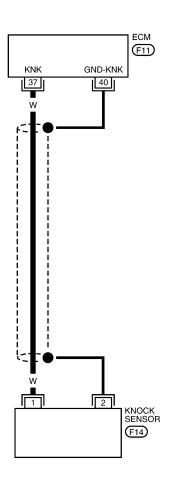
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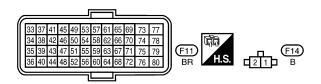
Wiring Diagram

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#### EC-KS-01

■ : DETECTABLE LINE FOR DTC ■ : NON-DETECTABLE LINE FOR DTC





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Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
37	W	Knock sensor	[Engine is running] • Idle speed	Approximately 2.5V
40	_	Sensor ground (Knock sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

## Diagnosis Procedure

INFOID:0000000004500147

## 1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check resistance between ECM terminal 37 and ground. Refer to Wiring Diagram.

#### NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .

#### Resistance: Approximately 532 - 588k $\Omega$ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

#### OK or NG

OK >> GO TO 4. NG >> GO TO 2.

## 2.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

- 1. Disconnect knock sensor (1) harness connector.
- : Vehicle front
- 2. Check harness continuity between ECM terminal 37 and knock sensor 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 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.check knock sensor

Refer to EC-1292, "Component Inspection".

#### OK or NG

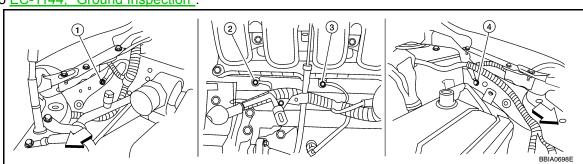
OK >> GO TO 6.

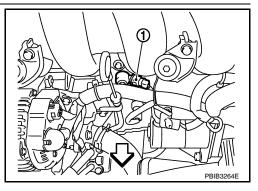
NG >> Replace knock sensor.

#### 4. CHECK GROUND CONNECTIONS

Loosen and retighten ground screws on the body.

Refer to EC-1144, "Ground Inspection".





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Body ground E15

: Vehicle front

1. Body ground E24

2. Engine ground F9

3. Engine ground F16

#### OK or NG

OK >> GO TO 5.

NG >> Repair or replace ground connections.

## 5. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Reconnect knock sensor harness connector.
- Check harness continuity between ECM terminal 40 and knock sensor 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 >> Repair open circuit or short to ground or short to power in harness or connectors.

## 6. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

#### Component Inspection

INFOID:0000000004500148

#### 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  $\text{M}\Omega.$ 

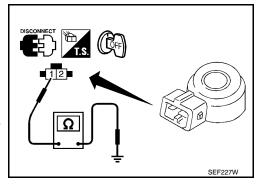
Resistance: Approximately 532 - 588k $\Omega$  [at 20°C (68°F)]

#### **CAUTION:**

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

2. If NG, replace knock sensor.

#### Removal and Installation



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#### **KNOCK SENSOR**

Refer to EM-199, "Component".

[MR TYPE 2]

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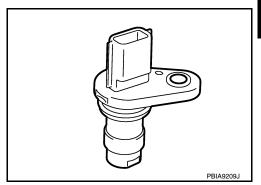
## DTC P0335 CKP SENSOR (POS)

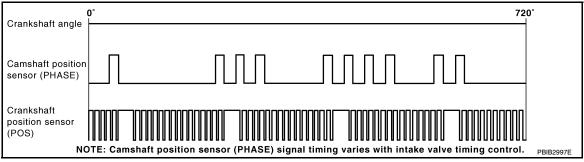
## **Component Description**

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution. The sensor consists of a permanent magnet and Hall IC. When the engine is running, the high and low parts of the teeth

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change. The changing gap causes the magnetic field near the sensor to change. Due to the changing magnetic field, the voltage from the sensor changes. The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.





#### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	9	Almost the same speed as the tachometer indication.

## On Board Diagnosis Logic

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	<ul> <li>The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.</li> <li>The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.</li> <li>The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.</li> </ul>	Harness or connectors [Crankshaft position sensor (POS) circuit is open or shorted.] (Accelerator pedal position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) Crankshaft position sensor (POS) Accelerator pedal position sensor Refrigerant pressure sensor EVAP control system pressure sensor Signal plate

#### **DTC Confirmation Procedure**

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#### 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:**

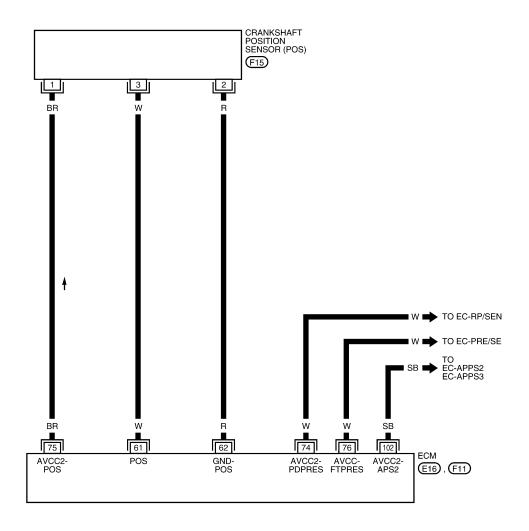
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

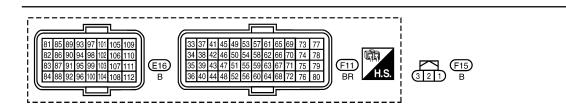
- 1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
- 2. Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to EC-1295, "Diagnosis Procedure".

## Wiring Diagram

INFOID:0000000004500154







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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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	С	
04	Crankshaft position		Crankshaft position	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	Approximately 4.0V	D E
61	W	sensor (POS)		Approximately 4.0V	F	
			[Engine is running] • Engine speed: 2,000 rpm	≥ 2.0 V/Div 5 ms/Div T	G	
62	R	Sensor ground [Crankshaft position sensor (POS)]	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V	I	
74	w	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V	J	
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V	K	
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V	1 \	
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V	L	

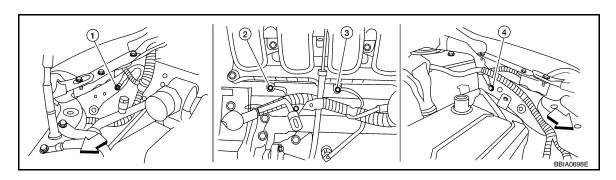
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

Loosen and retighten ground screws on the body. Refer to EC-1144, "Ground Inspection".



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Vehicle front

1. Body ground E24

Body ground E15

2. Engine ground F9

3. Engine ground F16

#### OK or NG

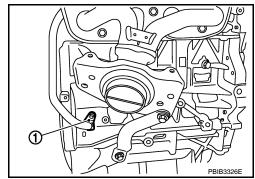
4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

## $2.\mathsf{CHECK}$ CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

- 1. Disconnect crankshaft position (CKP) sensor (POS) (1) harness connector.
- 2. Turn ignition switch ON.

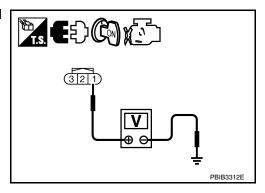


3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 8. NG >> GO TO 3.



# 3.CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between CKP sensor (POS) terminal 1 and ECM terminal 75. Refer to Wiring Diagram.

#### Continuity should exist.

#### OK or NG

OK >> GO TO 4.

NG >> Repair open circuit.

## 4. CHECK COMPONENTS POWER SUPPLY

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram	
74	Refrigerant pressure sensor terminal 3	EC-1528, "Wiring Diagram"	
75	Crankshaft position sensor (POS) terminal 1	EC-1294, "Wiring Diagram"	
76	EVAP control system pressure sensor terminal 3	EC-1353, "Wiring Diagram"	
102	APP sensor terminal 5	EC-1471, "Wiring Diagram"	

#### OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

NG

>> Replace the signal plate.

# 12. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

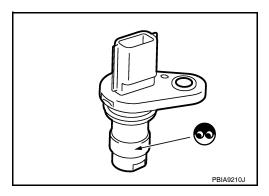
### >> INSPECTION END

# Component Inspection

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# CRANKSHAFT POSITION SENSOR (POS)

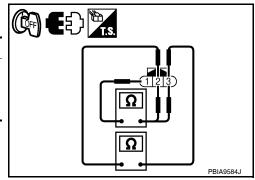
- 1. Loosen the fixing bolt of the sensor.
- 2. Disconnect crankshaft position sensor (POS) harness connector.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞
2 (+) - 3 (-)	

6. If NG, replace crankshaft position sensor (POS).



### Removal and Installation

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CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-199, "Component".

[MR TYPE 2]

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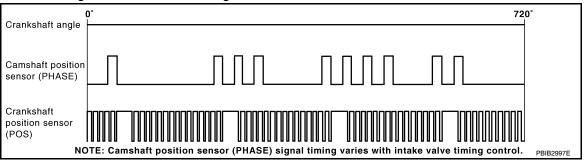
# DTC P0340 CMP SENSOR (PHASE)

# Component Description

The camshaft position sensor (PHASE) senses the protrusion of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position. When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals. The sensor consists of a permanent magnet and Hall IC. When engine is running, the high and low parts of the teeth cause the gap with the sensor to change. The changing gap causes the magnetic field near the sensor to change. Due to the changing magnetic field, the voltage from the sensor changes.

PRIABRYSI

ECM receives the signals as shown in the figure.



### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED		Almost the same speed as the tachometer indication.

# On Board Diagnosis Logic

### NOTE:

If DTC P0340 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1396.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0340 0340	Camshaft position sensor (PHASE) circuit	<ul> <li>The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.</li> <li>The cylinder No. signal is not set to ECM during engine running.</li> <li>The cylinder No. signal is not in the normal pattern during engine running.</li> </ul>	<ul> <li>Harness or connectors [Camshaft position sensor (PHASE) circuit is open or shorted.]</li> <li>Camshaft position sensor (PHASE)</li> <li>Camshaft (INT)</li> <li>Starter motor</li> <li>Starting system circuit</li> <li>Dead (Weak) battery</li> </ul>	

### **DTC Confirmation Procedure**

### 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:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.

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# **DTC P0340 CMP SENSOR (PHASE)**

< SERVICE INFOMATION > [MR TYPE 2]

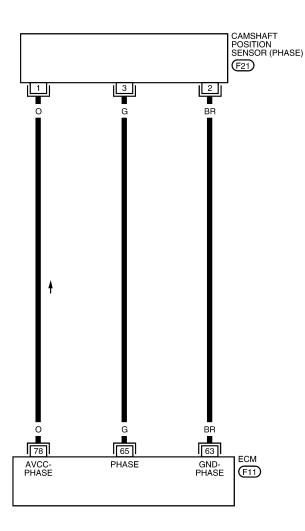
- Check 1st trip DTC.
- 3. If 1st trip DTC is detected, go to <u>EC-1301, "Diagnosis Procedure"</u>. If 1st trip DTC is not detected, go to next step.
- 4. Maintain engine speed at more than 800 rpm for at least 5 seconds.
- 5. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1301, "Diagnosis Procedure"</u>.

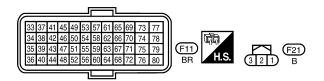
### Wiring Diagram

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### EC-PHASE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	BR	Sensor ground [Camshaft position sensor (PHASE)]	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
65	G	Camshaft position sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	1.0 - 2.0V
00	G	(PHASE)	[Engine is running] • Engine speed: 2,000 rpm	1.0 - 2.0V
78	О	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5V

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

1. CHECK STARTING SYSTEM

Turn ignition switch to 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-16, "Trouble Diagnosis with Multitasking Battery Diagnostic Station".)

# 2. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to EC-1144, "Ground Inspection".

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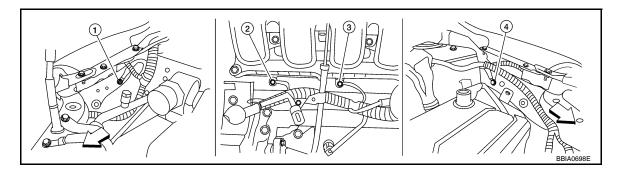
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- Vehicle front
- 1. Body ground E24

Body ground E15

- 2. Engine ground F9
- 3. Engine ground F16

### OK or NG

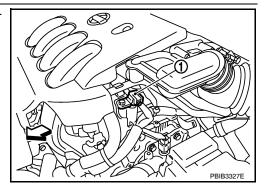
4.

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.
- : Vehicle front
- 2. Turn ignition switch ON.



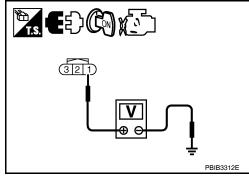
3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-III or tester.

### Voltage: Approximately 5V

### 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 CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between CMP sensor (PHASE) terminal 2 and ECM terminal 63. 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.

 ${f 5.}$ CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

# **DTC P0340 CMP SENSOR (PHASE)**

### < SERVICE INFOMATION >

[MR TYPE 2]

Check harness continuity between CMP sensor (PHASE) terminal 3 and ECM terminal 65. 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 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# **6.**CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1303, "Component Inspection".

### OK or NG

OK >> GO TO 7.

NG >> Replace camshaft position sensor (PHASE).

# 7.CHECK CAMSHAFT (INTAKE)

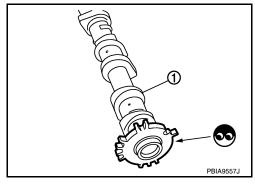
Check the following.

- Accumulation of debris to the signal plate of camshaft (1) rear end
- · Chipping signal plate of camshaft rear end

### OK or NG

OK >> GO TO 8.

NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



# 8. CHECK INTERMITTENT INCIDENT

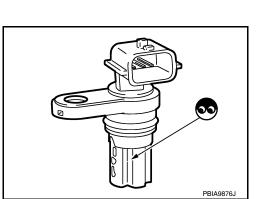
Refer to EC-1138.

### >> INSPECTION END

### Component Inspection

# **CAMSHAFT POSITION SENSOR (PHASE)**

- 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.



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# **DTC P0340 CMP SENSOR (PHASE)**

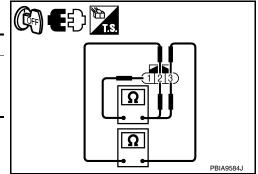
### < SERVICE INFOMATION >

[MR TYPE 2]

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞
2 (+) - 3 (-)	

6. If NG, replace camshaft position sensor (PHASE).



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# Removal and Installation

**CAMSHAFT POSITION SENSOR (PHASE)** 

Refer to EM-170, "Component".

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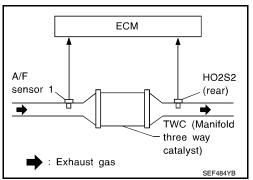
### DTC P0420 THREE WAY CATALYST FUNCTION

### On Board Diagnosis Logic

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	Three way catalyst (manifold) does not operate properly. Three way catalyst (manifold) does not have enough oxygen storage capacity.	Three way catalyst (manifold) Exhaust tube Intake air leaks Fuel injector Fuel injector leaks Spark plug Improper ignition timing

### **DTC Confirmation Procedure**

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.

### WITH CONSULT-III

### **TESTING CONDITION:**

### Do not hold engine speed for more than the specified minutes below.

- 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.
- 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.
- 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).
- Open engine hood.
- Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-III.
- Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely. If "INCMP" of "CATALYST" changed to "CMPLT", go to step 12.
- 10. Wait 5 seconds at idle.
- 11. Rev engine up to 2,000 to 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).

If not "CMPLT", stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.

12. Check 1st trip DTC.

If 1st trip DTC is detected, go to EC-1306, "Diagnosis Procedure".

### Overall Function Check

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.

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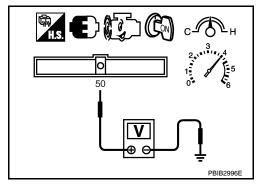
### < SERVICE INFOMATION >

### 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.
- 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 terminals 50 (HO2S2 signal) and ground.
- 7. Keep engine speed at 2,500 rpm constant under no load.
- Make sure that the voltage does not vary for more than 5 seconds.

If the voltage fluctuation cycle takes less than 5 seconds, go to EC-1306, "Diagnosis Procedure".

• 1 cycle:  $0.6 - 1.0 \rightarrow 0 - 0.3 \rightarrow 0.6 - 1.0$ 



# Diagnosis Procedure

# 1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

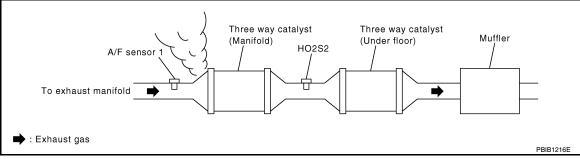
### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

# 2.CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before the three way catalyst (manifold).



### OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

# 3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

### 4. CHECK IGNITION TIMING

Check the following items. Refer to EC-1078, "Basic Inspection".

### DTC P0420 THREE WAY CATALYST FUNCTION

< SERVICE INFOMATION >

[MR TYPE 2]

Items	Specifications
	A/T: 700 $\pm$ 50 rpm (in P or N position)
Target idle speed	CVT: 700 ± 50 rpm (in P or N position)
	M/T: 700 ± 50 rpm (in Neutral position)
	A/T: 13 ± 5° BTDC (in P or N position)
Ignition timing	CVT: 13 ± 5° BTDC (in P or N position)
	M/T: 13 ± 5° BTDC (in Neutral position)

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OK or NG

OK >> GO TO 5.

NG >> Follow the EC-1078, "Basic Inspection".

5. CHECK FUEL INJECTOR

1. Stop engine and turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- 4. Check voltage between ECM terminals 25, 29, 30, 31 and ground with CONSULT-III or tester. Refer to Wiring Diagram for fuel injectors, <u>EC-1509</u>. "Wiring Diagram".

### Voltage: Battery voltage

OK or NG

OK >> GO TO 6.

NG >> Perform <u>EC-1510</u>, "Diagnosis Procedure".

6.CHECK FUNCTION OF IGNITION COIL-I

### **CAUTION:**

Do the following procedure in the place where ventilation is good without the combustible.

- 1. Turn ignition switch OFF.
- Remove fuel pump (1) fuse 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.

- : Vehicle front
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 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.
- Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

# Grounded metal portion (Cylinder head, cylinder block, etc.)

Spark should be generated.

### **CAUTION:**

 Do not approach to the spark plug and the ignition coil within 50cm. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more. G

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 It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

### OK or NG

>> GO TO 10. OK NG >> GO TO 7.

# 7.CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.

< SERVICE INFOMATION >

- 2. Disconnect spark plug and connect a known-good spark plug.
- Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

### Spark should be generated.

### OK or NG

OK >> GO TO 8.

NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1518.

### 8.CHECK SPARK PLUG

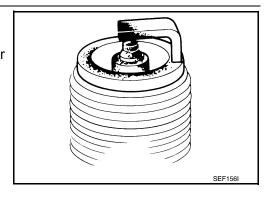
Check the initial spark plug for fouling, etc.

### OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-227, "Standard and Limit".

NG >> 1. Repair or clean spark plug.

GO TO 9.



[MR TYPE 2]

# 9. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- Crank engine for about 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-227, "Standard and Limit".

# 10. CHECK FUEL INJECTOR

- Turn ignition switch OFF.
- Remove fuel injector assembly.

Refer to EM-156, "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.
- Turn ignition switch ON.

Make sure 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-1138.

# **DTC P0420 THREE WAY CATALYST FUNCTION**

< SERVICE INFOMATION > [MR TYPE 2]

Trouble is fixed.>>INSPECTION END

Trouble is not fixed.>>Replace three way catalyst (manifold).

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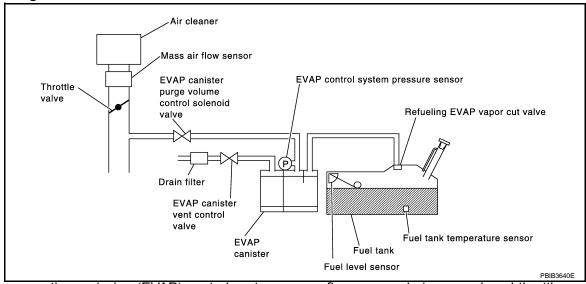
### DTC P0441 EVAP CONTROL SYSTEM

# System Description

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### NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123 P2127, P2128, 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.

### On Board Diagnosis Logic

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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 in- correct purge flow	<ul> <li>EVAP control system does not operate properly.</li> <li>EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.</li> </ul>	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     Drain filter

# **DTC Confirmation Procedure**

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### **CAUTION:**

Always drive vehicle at a safe speed.

### NOTÉ:

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

[MR TYPE 2]

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### < SERVICE INFOMATION >

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and let it idle for at least 70 seconds.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CON-SULT-III.
- Touch "START".
  - If "COMPLETED" is displayed, go to step 7.
- 6. When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

Shift lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,800 rpm
B/FUEL SCHDL	1.0 - 10.0 msec
COOLAN TEMP/S	More than 0°C

If TESTING is not changed for a long time, retry from step 2.

7. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to EC-1311, "Diagnosis Procedure".

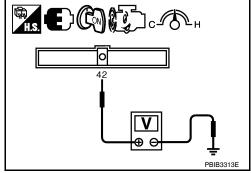
### **Overall Function Check**

Use this procedure 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.

### WITH GST

- 1. Lift up drive wheels.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and wait at least 70 seconds.
- 5. Set voltmeter probes to ECM terminals 42 (EVAP control system pressure sensor signal) and ground.
- Check EVAP control system pressure sensor value at idle speed and note it.
- 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
Shift lever	Any position other than P, N or R



- Verify 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.
- If NG, go to <u>EC-1311</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

# 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

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INFOID:0000000004500174

### < SERVICE INFOMATION >

### With CONSULT-III

- 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 <u>EC-1036</u>, "<u>Description</u>".
- Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- 4. Rev engine up to 2,000 rpm.
- 5. 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%	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.
- 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 <a href="EC-1036"><u>EC-1036</a>. "Description"</u>.
- Start engine and let it idle.

### Do not depress accelerator pedal even slightly.

5. Check vacuum gauge indication before 60 seconds passed after starting engine.

### Vacuum should not exist.

Revving engine up to 2,000 rpm after 100 seconds passed after starting engine.

### Vacuum should exist.

### OK or NG

OK >> GO TO 7. NG >> GO TO 4.

# 4. CHECK EVAP PURGE LINE

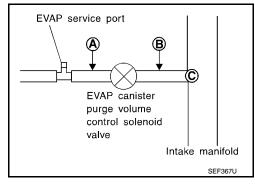
- 1. Turn ignition switch OFF.
- Check EVAP purge line for improper connection or disconnection. Refer to <u>EC-1036</u>. "<u>Description</u>".

### OK or NG

OK >> GO TO 5. NG >> Repair it.

# 5.CHECK EVAP PURGE HOSE AND PURGE PORT

- 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**.



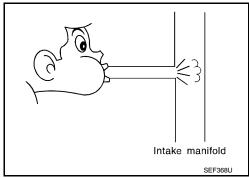
[MR TYPE 2] < SERVICE INFOMATION >

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

- 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-1334, "Component Inspection".

### OK or NG

OK

NG >> Replace EVAP canister purge volume control solenoid valve.

# f 8 .CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- 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-1351 or DTC P0452 and EC-1359 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.
- Check the rubber tube for clogging.

### OK or NG

OK >> GO TO 11.

NG >> Clean the rubber tube using an air blower.

# 11. CHECK DRAIN FILTER

Refer to EC-1314, "Component Inspection".

### OK or NG

OK >> GO TO 12.

NG >> Replace Drain filter.

# 12.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1340, "Component Inspection".

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### **DTC P0441 EVAP CONTROL SYSTEM**

### < SERVICE INFOMATION > [MR TYPE 2]

### OK or NG

OK >> GO TO 13.

NG >> Replace EVAP canister vent control valve.

# 13. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to EC-1036, "Description".

### OK or NG

OK >> GO TO 14.

NG >> Replace it.

# 14. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 15.

# 15. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

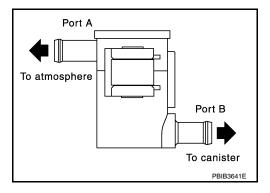
### >> INSPECTION END

### Component Inspection

INFOID:0000000004535232

### **DRAIN FILTER**

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.
- 7. If NG, replace drain filter.



[MR TYPE 2]

### DTC P0442 EVAP CONTROL SYSTEM

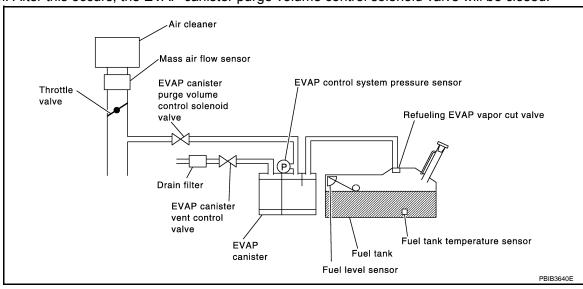
# On Board Diagnosis Logic

INFOID:0000000004500175

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 na	ne DTC detecting condition	Possible cause
EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	<ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister purge volume control solenoid valve and the circuit</li> <li>Fuel tank temperature sensor</li> <li>O-ring of EVAP canister vent control valve is missing or damaged</li> <li>Drain filter</li> <li>EVAP canister is saturated with water</li> <li>EVAP control system pressure sensor</li> <li>Fuel level sensor and the circuit</li> <li>Refueling EVAP vapor cut valve</li> <li>ORVR system leaks</li> </ul>

### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

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### **DTC Confirmation Procedure**

INFOID:0000000004500176

### 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:**

- 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).
- · Open engine hood before conducting following procedure.

### 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 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 instruction displayed.

### NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-1078, "Basic Inspection".

6. Make sure that "OK" is displayed.

If "NG" is displayed, refer to EC-1316, "Diagnosis Procedure".

### NOTE:

Make sure that EVAP hoses are connected to the EVAP canister purge volume control solenoid valve properly.

### WITH GST

### NOTE:

Be sure to read the explanation of Driving Pattern on <u>EC-1052</u>, "Emission-related Diagnostic Information" before driving vehicle.

- Start engine.
- 2. Drive vehicle according to Driving Pattern, EC-1052, "Emission-related Diagnostic Information".
- 3. Stop vehicle.
- 4. Turn ignition switch OFF and wait at least 10 seconds and then turn ignition switch ON.
- Select Service \$07 with GST.
- If P0442 is displayed on the screen, go to <u>EC-1316</u>, "<u>Diagnosis Procedure</u>".
- If P0441 is displayed on the screen, go to EC-1311, "Diagnosis Procedure" for DTC P0441.

# Diagnosis Procedure

INFOID:0000000004500177

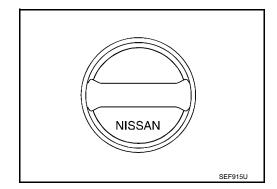
# 1. CHECK FUEL FILLER CAP DESIGN

- 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.

### **DTC P0442 EVAP CONTROL SYSTEM**

[MR TYPE 2] < SERVICE INFOMATION >

### 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 reteaching 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-1038, "Component Inspection".

### OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

### INSTALL THE PRESSURE PUMP

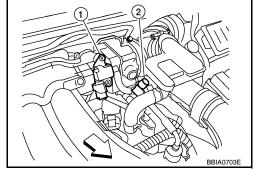
To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

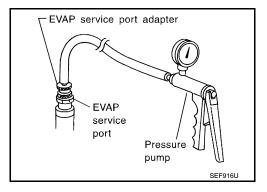
For the location of EVAP service port (2), refer to EC-1036, "Descrip-

- EVAP canister purge volume control solenoid valve (1)
- : Vehicle front

### NOTE:

Improper installation of the EVAP service port adapter 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.
- Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-III.
- 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.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.

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### [MR TYPE 2]

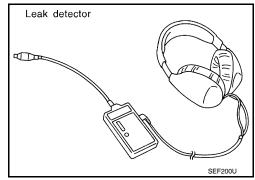
### < SERVICE INFOMATION >

Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1036, "Description".

### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



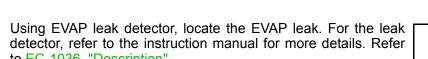
# 7. CHECK FOR EVAP LEAK

### Without CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
- EVAP control system pressure sensor (1)
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

### **CAUTION:**

- · Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.

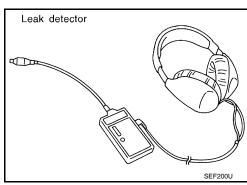




OK >> GO TO 8.

NG >> Repair or replace.

to EC-1036, "Description".



# 8. CHECK DRAIN FILTER

Refer to EC-1321, "Component Inspection".

### OK or NG

OK >> GO TO 9.

NG >> Replace drain filter.

# 9.check evap canister vent control valve

### Check the following,

- EVAP canister vent control valve is installed properly. Refer to EC-1040, "Removal and Installation".
- · EVAP canister vent control valve.

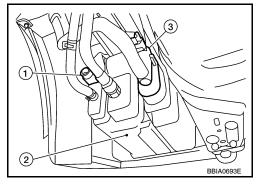
Refer to EC-1340, "Component Inspection".

### OK or NG

OK >> GO TO 10.

NG >> Repair or replace EVAP canister vent control valve and O-ring.

10.CHECK IF EVAP CANISTER SATURATED WITH WATER



### **DTC P0442 EVAP CONTROL SYSTEM**

### < SERVICE INFOMATION >

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

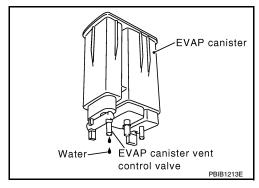
2. Does water drain from the EVAP canister?

### Yes or No

>> GO TO 11. Yes

No (With CONSULT-III)>>GO TO 13.

No (Without CONSULT-III)>>GO TO 14.



# 11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensorattached.

The weight should be less than 1.9 kg (4.2 lb).

### OK or NG

OK (With CONSULT-III)>>GO TO 13.

OK (Without CONSULT-III)>>GO TO 14.

>> GO TO 12.

# 12.detect malfunctioning part

Check the following.

- · EVAP canister for damage
- EVAP hose connected to EVAP canister for clogging or poor connection

>> Repair hose or replace EVAP canister.

# 13.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

### With CONSULT-III

- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine.
- 3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- Touch "Qu" on CONSULT-III screen to increase "PURG VOL CONT/V" opening to 100%.
- 5. Check vacuum hose for vacuum.

### Vacuum should exist.

### OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

# 14.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Stop engine.
- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 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 16. NG >> GO TO 15.

15. CHECK VACUUM HOSE

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### < SERVICE INFOMATION >

Check vacuum hoses for clogging or disconnection. Refer to EC-1106, "Vacuum Hose Drawing".

### OK or NG

OK >> GO TO 16.

NG >> Repair or reconnect the hose.

# 16. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1334, "Component Inspection".

### OK or NG

OK >> GO TO 17.

NG >> Replace EVAP canister purge volume control solenoid valve.

# 17. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1273, "Component Inspection".

### OK or NG

OK >> GO TO 18.

NG >> Replace fuel level sensor unit.

# 18. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1350, "Component Inspection".

### OK or NG

OK >> GO TO 19.

NG >> Replace EVAP control system pressure sensor.

# 19. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to <u>EC-1036</u>.

### OK or NG

OK >> GO TO 20.

NG >> Repair or reconnect the hose.

# 20. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 21.

# 21. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to  $\underline{\text{EC-}1042}$ .

### OK or NG

OK >> GO TO 22.

NG >> Repair or replace hoses and tubes.

# 22. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

### OK or NG

OK >> GO TO 23.

NG >> Repair or replace hoses, tubes or filler neck tube.

# 23.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1045, "Component Inspection".

### OK or NG

OK >> GO TO 24.

NG >> Replace refueling EVAP vapor cut valve with fuel tank.

# 24. CHECK FUEL LEVEL SENSOR

Refer to DI-19.

### **DTC P0442 EVAP CONTROL SYSTEM**

[MR TYPE 2] < SERVICE INFOMATION >

### OK or NG

OK >> GO TO 25.

NG >> Replace fuel level sensor unit.

# 25.check intermittent incident

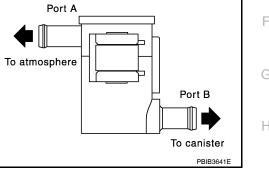
Refer to EC-1138.

### >> INSPECTION END

# Component Inspection

### DRAIN FILTER

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.
- 7. If NG, replace drain filter.



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< SERVICE INFOMATION >

# DTC P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID **VALVE**

Description INFOID:0000000004500178

### SYSTEM DESCRIPTION

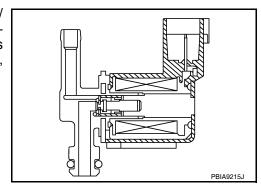
Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1			
Mass air flow sensor	Amount of intake air			
Engine coolant temperature sensor	Engine coolant temperature			
Battery	Battery voltage*1			
Throttle position sensor	Throttle position	ottle position EVAP can- ister purge		
Accelerator pedal position sensor	Accelerator pedal position	flow control	control solenoid valve	
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			
ABS actuator and electric unit (control unit)	Vahiola anad*2			
Combination meter	Vehicle speed* <sup>2</sup>			

<sup>\*1:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

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 uses a ON/ OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004500179

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	Engine: After warming up     Shift lever: P or N (A/T, CVT),     Neutral (M/T)     Air conditioner switch: OFF     No load	Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%
		2,000 rpm	0 - 50%

<sup>\*2:</sup> This signal is sent to the ECM though CAN communication line.

< SERVICE INFOMATION >

### On Board Diagnosis Logic

INFOID:0000000004500180

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0443	EVAP canister purge	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.)	
0443	volume control solenoid valve	B) The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	<ul> <li>EVAP canister vent control valve</li> <li>Drain filter</li> <li>EVAP canister</li> <li>Hoses (Hoses are connected incorrectly or clogged.)</li> </ul>	

### **DTC Confirmation Procedure**

INFOID:0000000004500181

# Perform PROCEDURE FOR MALFUNCTION A first. If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

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:**

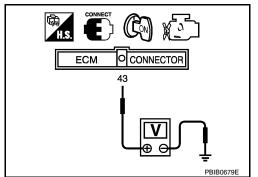
- Perform "DTC Confirmation Procedure" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 60°C (41 to 140°F).
- Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.

### With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Check that the following condition are met. FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
- Start engine and wait at least 60 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1326</u>. "<u>Diagnosis Procedure</u>".

### With GST

- Turn ignition switch ON.
- Set voltmeter probes to ECM terminal 43 (FTT sensor signal) and ground.
- 3. Check that the voltage is 3.1 4.2 V.
- Start engine and wait at least 60 seconds.
- Check 1st trip DTC.
- 6. If 1st trip DTC is detected, go to EC-1326, "Diagnosis Procedure".



### PROCEDURE FOR MALFUNCTION B

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

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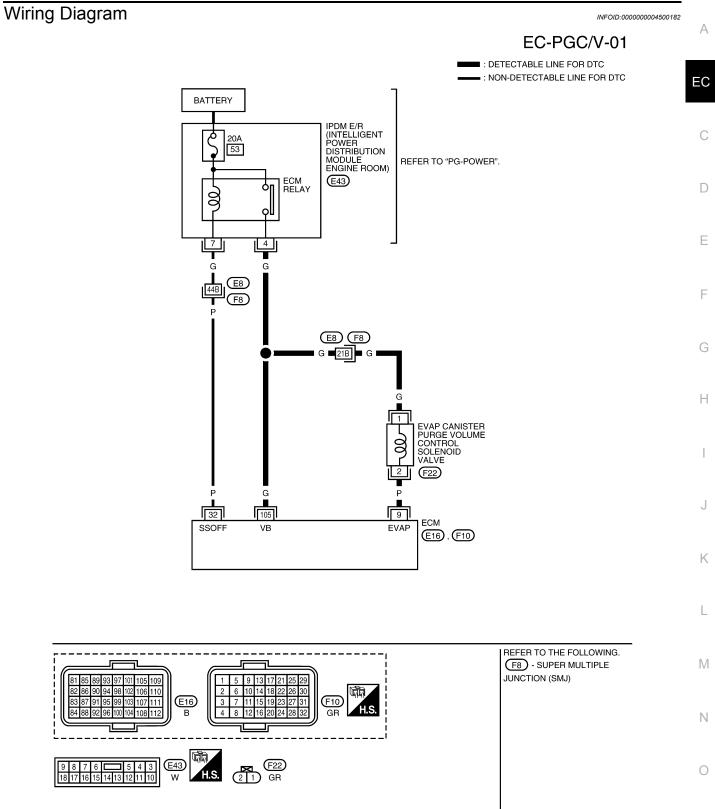
[MR TYPE 2]

- 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-1326, "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-1326, "Diagnosis Procedure".

[MR TYPE 2] < SERVICE INFOMATION >



Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

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< SERVICE INFOMATION >

[MR TYPE 2]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
9	Р	EVAP canister purge volume control solenoid valve	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Accelerator pedal: Not depressed even slightly, after engine starting.</li> </ul>	BATTERY VOLTAGE  (11 - 14V)  > 10.0V/Div 50 ms/Div  PBIB0050E
	control solenoid valve	control solenoid valve	<ul><li>[Engine is running]</li><li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li></ul>	Approximately 10V
32	Р	ECM relay (Self shut-off)	<ul><li>[Engine is running]</li><li>[Ignition switch: OFF]</li><li>For a few seconds after turning ignition switch OFF</li></ul>	0 - 1.0V
		(ocii siiut-oii)	<ul><li>[Ignition switch: OFF]</li><li>More than a few seconds after turning ignition switch OFF</li></ul>	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

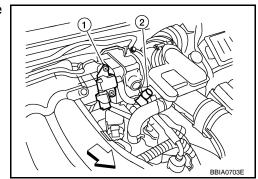
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004500183

# 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.
- EVAP service port (2)
- : Vehicle front
- 3. Turn ignition switch ON.



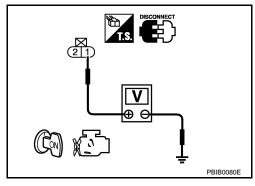
< SERVICE INFOMATION >

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 E8, F8
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R

>> 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

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 9 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.

# f 4 . CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- EVAP control system pressure sensor (1)
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 2. Check connectors for water.

### Water should not exist.

### OK or NG

OK >> GO TO 5.

NG >> Replace EVAP control system pressure sensor.

### CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1350, "Component Inspection".

### OK or NG

OK (With CONSULT-III)>>GO TO 6.

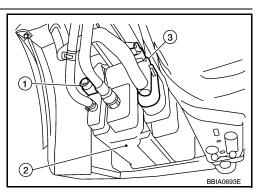
OK (Without CONSULT-III)>>GO TO 7.

NG >> Replace EVAP control system pressure sensor.

# 6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

### With CONSULT-III

- 1. Turn ignition switch OFF.
- Reconnect harness connectors disconnected.
- Start engine.



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[MR TYPE 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-1329, "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 DRAIN FILTER

Refer to EC-1314, "Component Inspection".

### OK or NG

OK >> GO TO 10.

NG >> Replace drain filter.

# 10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1340, "Component Inspection".

### OK or NG

OK >> GO TO 11.

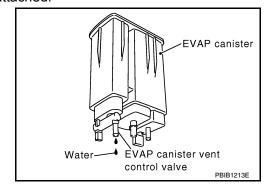
NG >> Replace EVAP canister vent control valve.

# 11. CHECK IF EVAP CANISTER SATURATED WITH WATER

- 1. Remove EVAP canister with EVAP canister vent control valve attached.
- 2. Does water drain from the EVAP canister?

### YES or NO

YES >> GO TO 12. NO >> GO TO 14.



# 12. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

### The weight should be less than 1.9 kg (4.2 lb).

### OK or NG

OK >> GO TO 14. NG >> GO TO 13.

# 13. DETECT MALFUNCTIONING PART

### Check the following.

EVAP canister for damage

< SERVICE INFOMATION >

• EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. 14. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

>> INSPECTION END

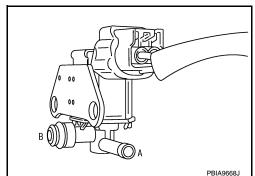
# Component Inspection

### 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.

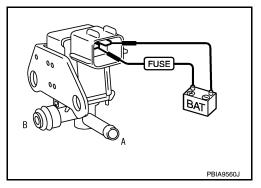
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100%	Yes
0%	No



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
12V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE Refer to EM-141, "Component".

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[MR TYPE 2]

# DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLE-NOID VALVE

Description INFOID:0000000004501184

### SYSTEM DESCRIPTION

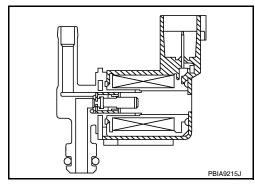
Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1			
Mass air flow sensor	Amount of intake air			
Engine coolant temperature sensor	Engine coolant temperature			
Battery	Battery voltage*1			
Throttle position sensor	Throttle position	ISTAT NITTAL I	EVAP canister purge volume	
Accelerator pedal position sensor	Accelerator pedal position	flow control	control solenoid valve	
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	i		
Fuel tank temperature sensor	Fuel temperature in fuel tank			
ABS actuator and electric unit (control unit)				
Combination meter	Vehicle speed* <sup>2</sup>			

<sup>\*1:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

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 uses a ON/ OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004501185

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	Engine: After warming up     Shift lever: P or N (A/T, CVT),     Neutral (M/T)     Air conditioner switch: OFF     No load	Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%
		2,000 rpm	0 - 50%

<sup>\*2:</sup> This signal is sent to the ECM though CAN communication line.

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[MR TYPE 2]

# On Board Diagnosis Logic

INFOID:0000000004500188

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     (EVAP canister purge volume control 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     (EVAP canister purge volume control solenoid valve circuit is shorted.)     EVAP canister purge volume control solenoid valve

### **DTC Confirmation Procedure**

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### 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:**

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

- 1. Start engine and let it idle for at least 13 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1333, "Diagnosis Procedure"</u>.

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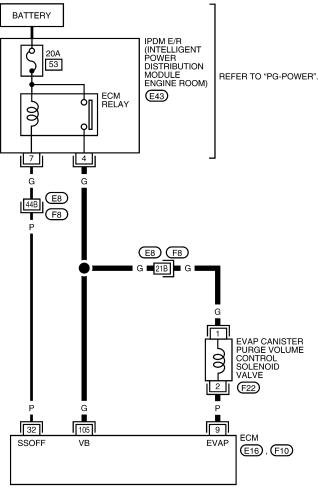
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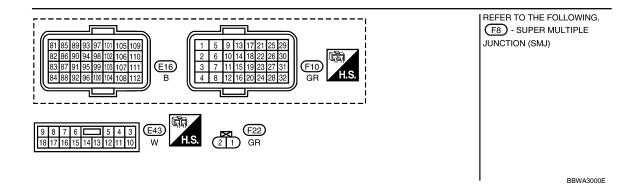
< SERVICE INFOMATION > [MR TYPE 2]

Wiring Diagram

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# EC-PGC/V-01 : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

# DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

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[MR TYPE 2]

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.

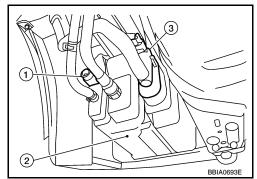
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	EC
9 P	D	EVAP canister purge volume	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Accelerator pedal: Not depressed even slightly, after engine starting.</li> </ul>	BATTERY VOLTAGE  (11 - 14V)	C
		control solenoid valve	<ul> <li>[Engine is running]</li> <li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li> </ul>	Approximately 10V	E F
32	32 P	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V	Н
			[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)	I
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	J

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

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.
- EVAP canister port (2)
- 3. Turn ignition switch ON.



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# DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

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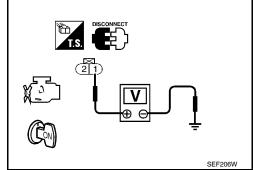
[MR TYPE 2]

 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 E8, F8
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
  - >> 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.
- Check harness continuity between ECM terminal 9 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.
- Start engine.
- 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-1329, "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-1138.

### >> INSPECTION END

# Component Inspection

INFOID:0000000004501187

# DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

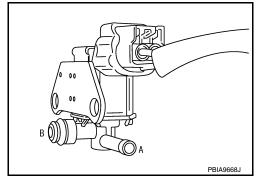
## < SERVICE INFOMATION >

[MR TYPE 2]

### With CONSULT-III

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

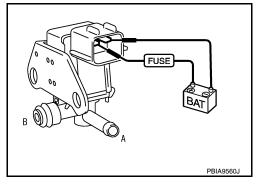
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B	
100%	Yes	
0%	No	



## 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
12V direct current supply between terminals 1 and 2	Yes
No supply	No



## Removal and Installation

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE Refer to EM-141, "Component".

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## Component Description

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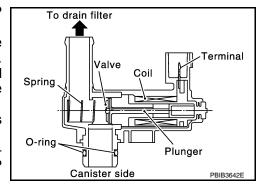
The EVAP canister vent control valve (3) is located on the EVAP canister (2) and is used to seal the canister vent.

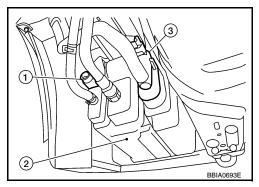
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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 diagnoses.

EVAP control system pressure sensor (1)





# CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004500195

[MR TYPE 2]

INFOID:0000000004500194

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	Ignition switch: ON	OFF

# On Board Diagnosis Logic

INFOID:0000000004500196

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     (EVAP canister vent control valve circuit is open or shorted.)     EVAP canister vent control valve     Drain filter

## **DTC Confirmation Procedure**

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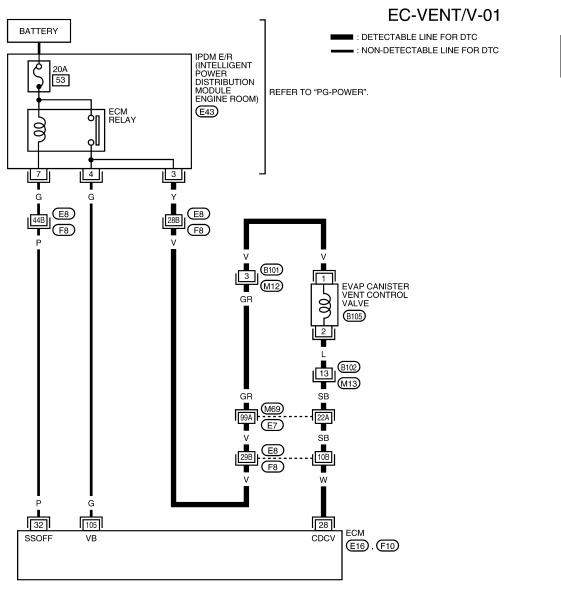
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

- Start engine and wait at least 8 seconds.
- Check 1st trip DTC. 2.
- If 1st trip DTC is detected, go to EC-1338, "Diagnosis Procedure".





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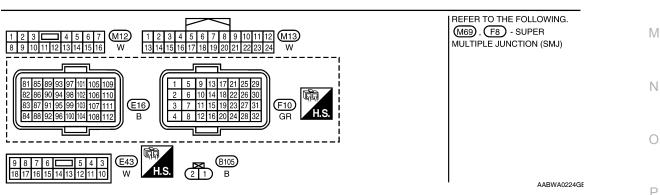
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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

## [MR TYPE 2]

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TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
28	W	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
32	32 P ECM relay (Self shut-off)	1	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
		(Sell Silut-Oil)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

INFOID:0000000004500199

# 1. INSPECTION START

1. 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.

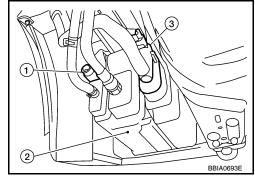
### Clicking noise should be heard.

### OK or NG

OK >> GO TO 8. NG >> GO TO 3.

# 3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect EVAP canister vent control valve (3) harness connector.
- EVAP control system pressure sensor (1)
- EVAP canister (2)
- 3. Turn ignition switch ON.



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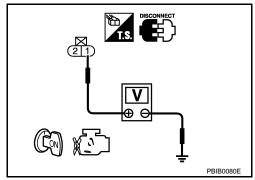
[MR TYPE 2]

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 E8, F8
- Harness connectors E7, M69
- Harness connectors M12, B101
- 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.

# ${f 5.}$ CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 28 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 E8, F8
- Harness connectors E7, M69
- Harness connectors M13. B102
- 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

- Disconnect rubber tube connected to EVAP canister vent control valve.
- Check the rubber tube for clogging.

### OK or NG

OK >> GO TO 8.

NG >> Clean the rubber tube using an air blower.

## **8.**CHECK DRAIN FILTER

Refer to EC-1314, "Component Inspection".

### OK or NG

OK >> GO TO 9.

NG >> Replace drain filter.

## $\mathbf{9}.$ CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1340, "Component Inspection".

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### OK or NG

OK >> GO TO 10.

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NG >> Replace EVAP canister vent control valve.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

## Component Inspection

#### INFOID:0000000004500200

[MR TYPE 2]

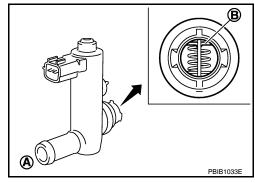
### EVAP CANISTER VENT CONTROL VALVE

## With CONSULT-III

- 1. Remove EVAP canister vent control valve from EVAP canister.
- 2. Check portion **B** of EVAP canister vent control valve for being rusted.

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.

Make sure new O-ring is installed properly.

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

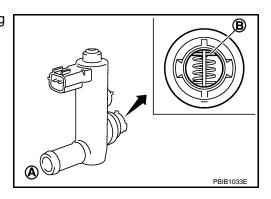
Operation takes less than 1 second.

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 being rusted.



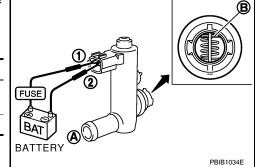
## < SERVICE INFOMATION >

[MR TYPE 2]

3. Check air passage continuity and operation delay time under the following conditions.

Make sure new O-ring is installed properly.

Condition	Air passage continuity between A and B
12V 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.
- Perform step 3 again.
   If NG, replace EVAP canister vent control valve.

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## Component Description

< SERVICE INFOMATION >

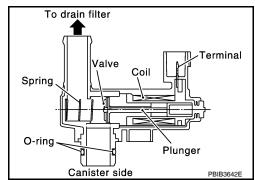
The EVAP canister vent control valve (3) is located on the EVAP canister (2) and is used to seal the canister vent.

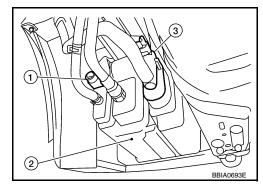
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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 diagnoses.

EVAP control system pressure sensor (1)





INFOID:0000000004501190

[MR TYPE 2]

INFOID:0000000004501189

## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	Ignition switch: ON	OFF

# On Board Diagnosis Logic

INFOID:0000000004500203

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.	<ul> <li>EVAP canister vent control valve</li> <li>EVAP control system pressure sensor and the circuit</li> <li>Blocked rubber tube to EVAP canister vent control valve</li> <li>Drain filter</li> <li>EVAP canister is saturated with water</li> </ul>

### **DTC Confirmation Procedure**

INFOID:0000000004500204

#### **CAUTION:**

### Always drive vehicle at a safe speed.

#### 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.

- 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.
- Repeat next procedures three times.

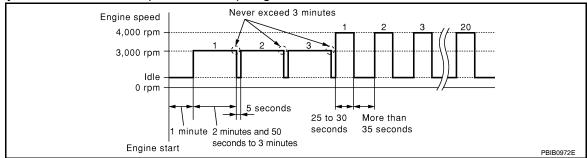
## < SERVICE INFOMATION >

[MR TYPE 2]

a. Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.

### Never exceed 3 minutes.

- b. Fully released accelerator pedal and keep engine idle for about 5 seconds.
- 5. Check 1st trip DTC.
- 6. If 1st trip DTC is detected, go to <u>EC-1345</u>, "<u>Diagnosis Procedure</u>". If 1st trip DTC is not detected, go to the next step.
- 7. Repeat next procedure 20 times.
- a. Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.
- b. Fully released accelerator pedal and keep engine idle for at least 35 seconds.



- 8. Check 1st trip DTC.
- 9. If 1st trip DTC is detected, go to EC-1345, "Diagnosis Procedure".

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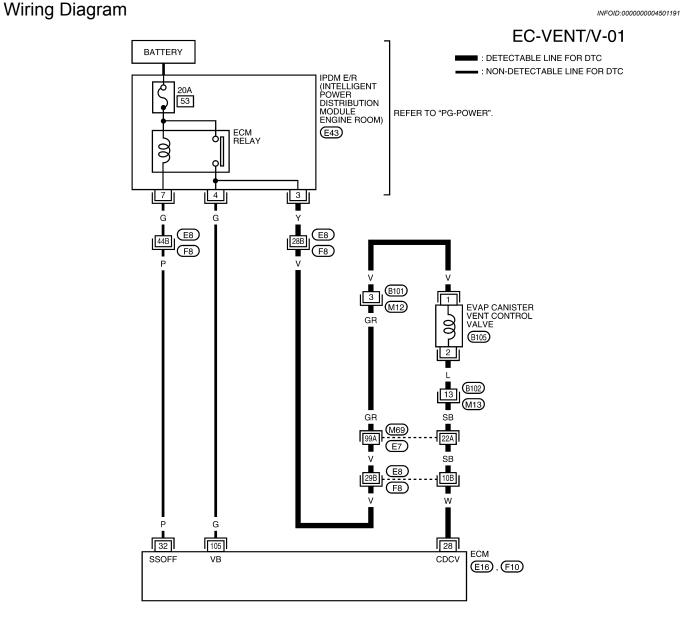
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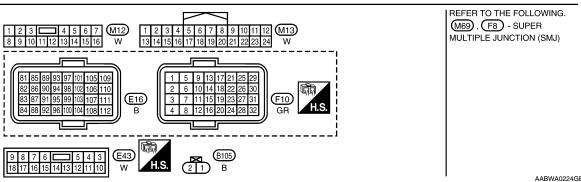
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[MR TYPE 2] < SERVICE INFOMATION >





Specification data are reference values and are measured between each terminal and ground.

## **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

< SERVICE INFOMATION >

[MR TYPE 2]

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TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
28	W	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Ŀ
32	Р	ECM relay	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V	
	' (Self shut-off)	[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)		
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	

# Diagnosis Procedure

# 1. CHECK RUBBER TUBE

1. Turn ignition switch OFF.

2. Disconnect rubber tube connected to EVAP canister vent control valve (3).

3. Check the rubber tube for clogging.

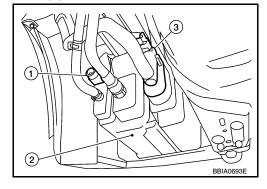
- EVAP control system pressure sensor (1)

- EVAP canister (2)

### OK or NG

OK >> GO TO 2.

NG >> Clean rubber tube using an air blower.



# 2. CHECK DRAIN FILTER

Refer to EC-1314, "Component Inspection".

### OK or NG

OK >> GO TO 3.

NG >> Replace drain filter.

# 3.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1340, "Component Inspection".

### OK or NG

OK >> GO TO 4.

NG >> Replace EVAP canister vent control valve.

# 4.CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.

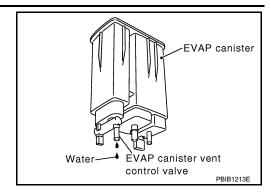
### < SERVICE INFOMATION >

[MR TYPE 2]

2. Does water drain from the EVAP canister.

### Yes or No

Yes >> GO TO 5. No >> GO TO 7.



# 5. 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 1.9 kg (4.2 lb).

### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

## 6. DETECT MALFUNCTIONING PART

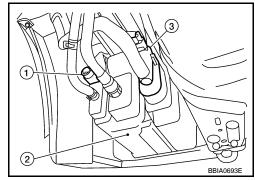
Check the following.

- · EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection
  - >> Repair hose or replace EVAP canister.

## 7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 2. Check connectors for water.

Water should not exist.



### OK or NG

OK >> GO TO 8.

NG >> Replace EVAP control system pressure sensor.

8.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1350, "Component Inspection".

### OK or NG

OK >> GO TO 9.

NG >> Replace EVAP control system pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

# Component Inspection

INFOID:0000000004501192

EVAP CANISTER VENT CONTROL VALVE

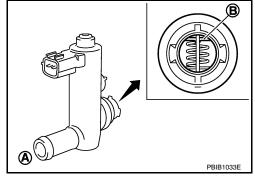
< SERVICE INFOMATION > [MR TYPE 2]

### With CONSULT-III

- 1. Remove EVAP canister vent control valve from EVAP canister.
- Check portion **B** of EVAP canister vent control valve for being rusted.

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.

Make sure new O-ring is installed properly.

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

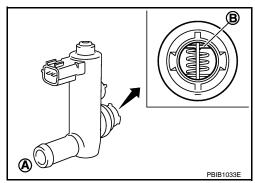
Operation takes less than 1 second.

If NG, go to next step.

- 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

- Remove EVAP canister vent control valve from EVAP canister.
- 2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

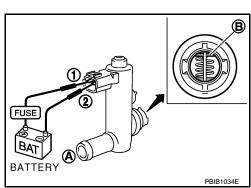
Make sure new O-ring is installed properly.

Condition	Air passage continuity between A and B
12V 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.
- Perform step 3 again.If NG, replace EVAP canister vent control valve.



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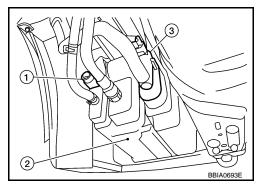
# < SERVICE INFOMATION >

## DTC P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

## Component Description

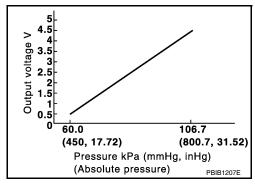
The EVAP control system pressure sensor (1) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- EVAP canister (2)
- EVAP canister vent control valve (3)



[MR TYPE 2]

INFOID:0000000004500208



## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	Ignition switch: ON	Approx. 1.8 - 4.8V

# On Board Diagnosis Logic

INFOID:0000000004500210

INFOID:0000000004500209

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 [Crankshaft position sensor (POS) circuit is shorted.] (Accelerator pedal position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.)      EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor

## **DTC Confirmation Procedure**

INFOID:0000000004500211

#### 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.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and wait at least 40 seconds. NOTE:

< SERVICE INFOMATION > [MR TYPE 2]

Do not depress accelerator pedal even slightly.

- 3. Check 1st trip DTC.
- 4. If 1st trip DTC is detected, go to EC-1349, "Diagnosis Procedure".

## Diagnosis Procedure

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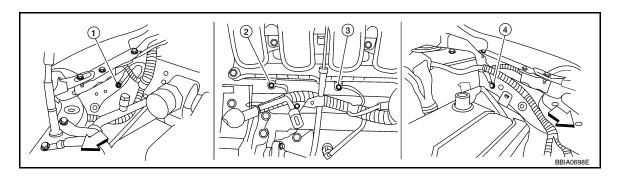
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# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screws on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. engine ground F16

Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK EVPA CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 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 COMPONENTS POWER SUPPLY

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1528, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-1294, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-1353, "Wiring Diagram"
102	APP sensor terminal 5	EC-1471, "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

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Check the following.

< SERVICE INFOMATION >

[MR TYPE 2]

- Refrigerant pressure sensor (Refer to MTC-37.)
- Crankshaft position sensor (POS) (Refer to <u>EC-1298, "Component Inspection"</u>.)

#### OK or NG

OK >> GO TO 5.

NG >> Replace malfunctioning components.

## 5. CHECK APP SENSOR

Refer to EC-1468, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

## 6.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- Perform <u>EC-1084</u>, "Accelerator <u>Pedal Released Position Learning"</u>.
   Perform <u>EC-1084</u>, "Throttle <u>Valve Closed Position Learning"</u>.
- 4. Perform EC-1084, "Idle Air Volume Learning".

### >> INSPECTION END

# 7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1350, "Component Inspection".

### OK or NG

OK >> GO TO 8.

NG >> Replace EVAP control system pressure sensor.

# 8. CHECK INTERMITTENT INCIDENT

#### Refer to EC-1138.

For wiring diagram, refer to EC-1353, "Wiring Diagram".

### >> INSPECTION END

# Component Inspection

INFOID:0000000004500213

### EVAP CONTROL SYSTEM PRESSURE SENSOR

- Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Always replace O-ring with a new one.
- 2. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM terminal 42 (EVAP control system pressure sensor signal) and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value

# Ю EVAP control system pressure sensor PRIB3314F

#### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
- 4. If NG, replace EVAP control system pressure sensor.

[MR TYPE 2]

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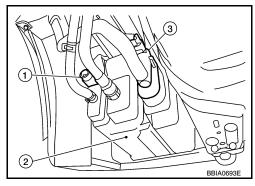
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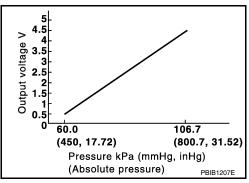
## DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

# **Component Description**

The EVAP control system pressure sensor (1) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- EVAP canister (2)
- EVAP canister vent control valve (3)





## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	Ignition switch: ON	Approx. 1.8 - 4.8V

# On Board Diagnosis Logic

INFOID:0000000004500216

INFOID:0000000004501194

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     (EVAP control system pressure sensor circuit is open or shorted.)     [Crankshaft position sensor (POS) circuit is shorted.)     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor

## **DTC Confirmation Procedure**

INFOID:0000000004500217

### 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.

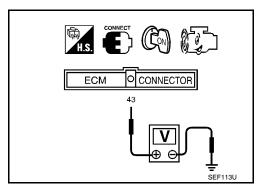
< SERVICE INFOMATION > [MR TYPE 2]

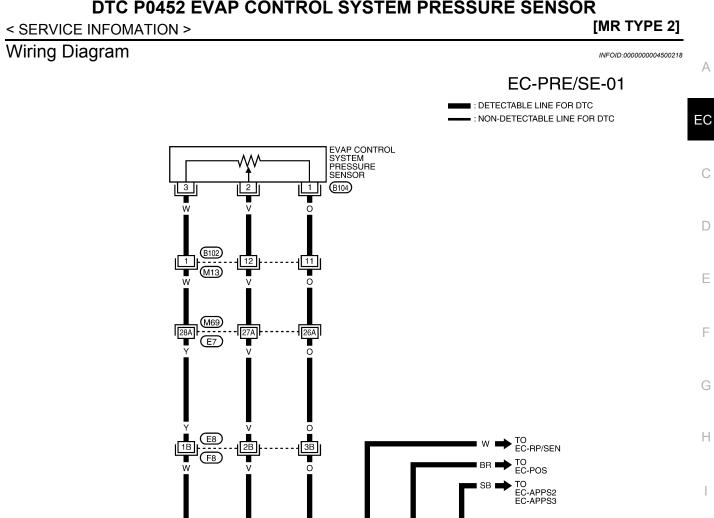
### WITH CONSULT-III

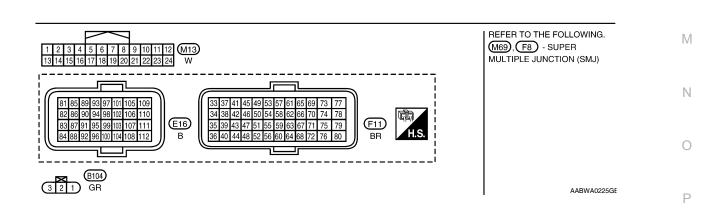
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Select "DATA MONITOR" mode with CONSULT-III.
- 5. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- 6. Start engine and wait at least 20 seconds.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is detected, go to EC-1354, "Diagnosis Procedure".

## WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check that voltage between ECM terminal 43 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and wait at least 20 seconds.
- Select Service \$07 with GST.
   If 1st trip DTC is detected, go to <u>EC-1354. "Diagnosis Procedure"</u>.







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AVCC-POS

74

AVCE-PDPRES

SB

102

AVCC-APS2

E16, F11

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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

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**FTPRES** 

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AVCC-FTPRES

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.

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	V	EVAP control system pres- sure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V
51	0	Sensor ground (EVAP control system pressure sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5V

# Diagnosis Procedure

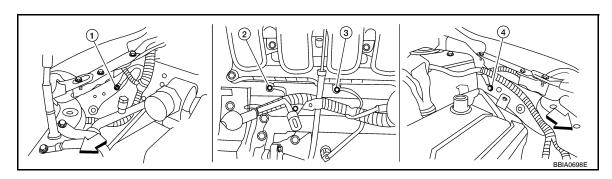
< SERVICE INFOMATION >

INFOID:0000000004500219

[MR TYPE 2]

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

< SERVICE INFOMATION >

[MR TYPE 2]

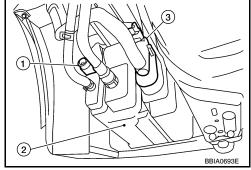
- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- Check sensor harness connector for water.

#### Water should not exist.

### OK or NG

OK >> GO TO 3.

NG >> Repair or replace harness connector.



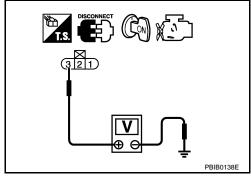
# $3. \mathrm{check}$ evap control system pressure sensor power supply circuit-i

- 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. >> GO TO 4. NG



# 4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8. F8
- Harness connectors M69. E7
- Harness connectors B102, M13
- 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 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between EVAP control system pressure sensor terminal 3 and ECM terminal 76.

### Continuity should exist.

### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

6.DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- 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 COMPONENTS POWER SUPPLY

Check harness for short to power and short to ground, between the following terminals.

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[MR TYPE 2]

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1528, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-1294, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-1353, "Wiring Diagram"
102	APP sensor terminal 5	EC-1471, "Wiring Diagram"

### OK or NG

OK >> GO TO 8.

NG >> Repair short to ground or short to power in harness or connectors.

# 8. CHECK COMPONENTS

< SERVICE INFOMATION >

### Check the following.

- Refrigerant pressure sensor (Refer to MTC-37.)
- Crankshaft position sensor (POS) (Refer to EC-1298, "Component Inspection".)

### OK or NG

OK >> GO TO 9.

NG >> Replace malfunctioning components.

## 9. CHECK APP SENSOR

## Refer to EC-1468, "Component Inspection".

### OK or NG

OK >> GO TO 11.

NG >> GO TO 10.

# 10.REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- Perform EC-1084, "Accelerator Pedal Released Position Learning".
- Perform EC-1084, "Throttle Valve Closed Position Learning".
- 4. Perform EC-1084, "Idle Air Volume Learning".

### >> INSPECTION END

# 11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 51. 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 13.

NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- 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.
- 13.check evap control system pressure sensor input signal circuit for open and **SHORT**

< SERVICE INFOMATION >

[MR TYPE 2]

1. Check harness continuity between ECM terminal 42 and EVAP control system pressure sensor terminal 2. Refer to Wiring Diagram.

### Continuity should exist.

Also check harness for short to ground and short to power.

### OK or NG

OK >> GO TO 15. NG >> GO TO 14.

14.DETECT MALFUNCTIONING PART

## Check the following.

- Harness connectors E8, F8
- Harness connectors M69, E7
- Harness connectors B102, M13
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

# 15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1350, "Component Inspection".

### OK or NG

OK >> GO TO 16.

NG >> Replace EVAP control system pressure sensor.

# 16. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

# Component Inspection

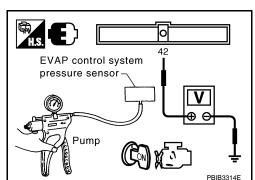
### EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Always replace O-ring with a new one.
- 2. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM terminal 42 (EVAP control system pressure sensor signal) and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value

### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
- 4. If NG, replace EVAP control system pressure sensor.



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[MR TYPE 2]

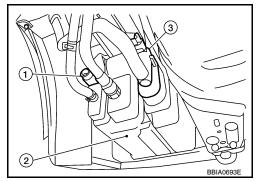
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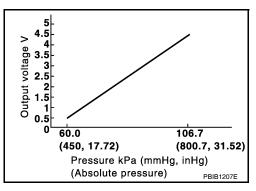
# DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

# **Component Description**

The EVAP control system pressure sensor (1) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- EVAP canister (2)
- EVAP canister vent control valve (3)





## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	Ignition switch: ON	Approx. 1.8 - 4.8V

# On Board Diagnosis Logic

INFOID:0000000004500223

INFOID:0000000004501196

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     (EVAP control system pressure sensor circuit is open or shorted.)     [Crankshaft position sensor (POS) circuit is shorted.)     (Accelerator pedal position sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor     EVAP canister vent control valve     EVAP canister     Drain filter     Rubber hose to EVAP canister vent control valve

< SERVICE INFOMATION > [MR TYPE 2]

## **DTC Confirmation Procedure**

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#### 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:**

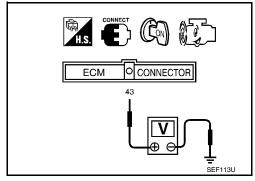
Always perform test at a temperature of 5°C (41°F) or more.

## 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 "DATA MONITOR" mode with CONSULT-III.
- 5. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- Wait at least 10 seconds.
- 7. Check 1st trip DTC.
- 8. If 1st trip DTC is detected, go to EC-1361, "Diagnosis Procedure".

### WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check that voltage between ECM terminal 43 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Wait at least 10 seconds.
- Select Service \$07 with GST.
   If 1st trip DTC is detected, go to <u>EC-1361, "Diagnosis Procedure"</u>.



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Wiring Diagram

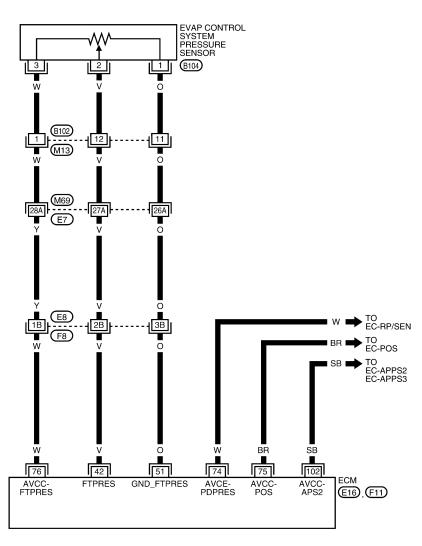
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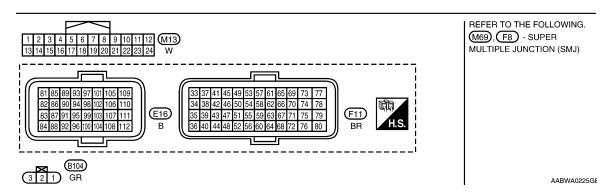
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[MR TYPE 2]

## EC-PRE/SE-01

■ : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC





Specification data are reference values and are measured between each terminal and ground.

## **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

< SERVICE INFOMATION >

[MR TYPE 2]

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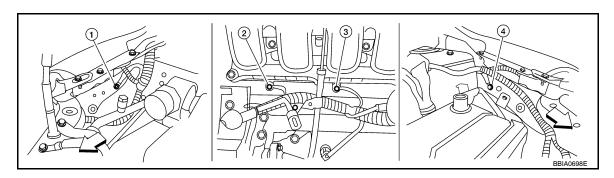
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	V	EVAP control system pres- sure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V
51	0	Sensor ground (EVAP control system pressure sensor)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approximately 0V
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (Accelerator pedal position sensor 2)	[Ignition switch: ON]	Approximately 5V

# Diagnosis Procedure

1.check ground connections

1. Turn ignition switch OFF.

2. Loosen and retighten ground screws on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Engine ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

< SERVICE INFOMATION >

[MR TYPE 2]

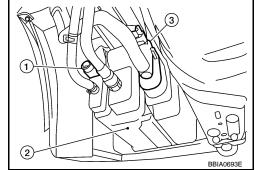
- Disconnect EVAP control system pressure sensor (1) harness connector.
- EVAP canister (2)
- EVAP canister vent control valve (3)
- 2. Check sensor harness connector for water.

#### Water should not exist.

### OK or NG

OK >> GO TO 3.

NG >> Repair or replace harness connector.



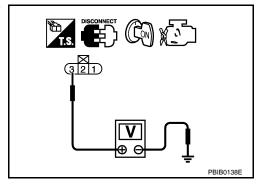
# $3. \mathrm{check}$ evap control system pressure sensor power supply circuit-i

- 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 E8, F8
- Harness connectors M69. E7
- Harness connectors B102, M13
- 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 power supply circuit-ii

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between EVAP control system pressure sensor terminal 3 and ECM terminal 76.

### Continuity should exist.

### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

# 6.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- · Harness connectors M69, E7
- · Harness connectors B102, M13
- 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 COMPONENTS POWER SUPPLY

Check harness for short to power and short to ground, between the following terminals.

< SERVICE INFOMATION >

**SHORT** 

[MR TYPE 2]

	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1528, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-1294, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-1353, "Wiring Diagram"
102	APP sensor terminal 5	EC-1471, "Wiring Diagram"
OK or NG		
OK >> GO TO 8. NG >> Repair shor  3.CHECK COMPONEN	t to ground or short to power in harness or	connectors.
<ul> <li>Crankshaft position se OK or NG OK &gt;&gt; GO TO 9.</li> </ul>	ensor (Refer to <u>MTC-37</u> .) ensor (POS) (Refer to <u>EC-1298, "Compone</u>	nt Inspection".)
NG >> Replace ma 9.CHECK APP SENSO	lfunctioning components. PR	
Refer to <u>EC-1468, "Com</u> OK or NG	ponent Inspection".	
OK >> GO TO 11. NG >> GO TO 10. 10.REPLACE ACCEL	ERATOR PEDAL ASSEMBLY	
<ol> <li>Perform <u>EC-1084, "</u></li> </ol>	r pedal assembly. Accelerator Pedal Released Position Learr Throttle Valve Closed Position Learning". Idle Air Volume Learning".	ning".
>> INSPECTIO		
11.CHECK EVAP CON	ITROL SYSTEM PRESSURE SENSOR GF	ROUND CIRCUIT FOR OPEN AND SHORT
<ol><li>Disconnect ECM ha</li></ol>	tinuity between EVAP control system pres	ssure sensor terminal 1 and ECM terminal
<ol> <li>Disconnect ECM ha</li> <li>Check harness con</li> </ol>	tinuity between EVAP control system pres Diagram.	ssure sensor terminal 1 and ECM terminal
<ol> <li>Disconnect ECM hat Check harness con 51. Refer to Wiring Continuity shout.</li> <li>Also check harness</li> </ol>	tinuity between EVAP control system pres Diagram.	ssure sensor terminal 1 and ECM terminal
<ol> <li>Disconnect ECM hat a Check harness con 51. Refer to Wiring   Continuity shouts a Check harness   Check harness  </li></ol>	tinuity between EVAP control system pres Diagram.  Ild exist.  for short to ground and short to power.	ssure sensor terminal 1 and ECM terminal
<ol> <li>Disconnect ECM hat a Check harness con 51. Refer to Wiring I Continuity shouts.</li> <li>Also check harness OK or NG OK &gt;&gt; GO TO 13.</li> </ol>	tinuity between EVAP control system pres Diagram.  Ild exist.  for short to ground and short to power.	ssure sensor terminal 1 and ECM terminal

### < SERVICE INFOMATION >

[MR TYPE 2]

1. Check harness continuity between ECM terminal 42 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 15. NG >> GO TO 14.

# 14. DETECT MALFUNCTIONING PART

## Check the following.

- Harness connectors E8, F8
- Harness connectors M69. E7
- Harness connectors B102, M13
- · Harness for open or short between ECM and EVAP control system pressure sensor
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 15. CHECK RUBBER TUBE

- 1. Disconnect rubber tube connected to EVAP canister vent control valve.
- 2. Check the rubber tube for clogging, vent and kinked.

### OK or NG

OK >> GO TO 16.

NG >> Clean the rubber tube using an air blower, repair or replace rubber tube.

# 16. CHECK EVAP CANISTER VENT CONTROL VALVE

### Refer to EC-1340, "Component Inspection".

### OK or NG

OK >> GO TO 17.

NG >> Replace EVAP canister vent control valve.

# 17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

## Refer to EC-1350, "Component Inspection".

### OK or NG

OK >> GO TO 18.

NG >> Replace EVAP control system pressure sensor.

# 18. CHECK DRAIN FILTER

### Refer to EC-1314, "Component Inspection".

### OK or NG

OK >> GO TO 19.

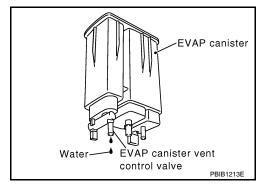
NG >> Replace drain filter.

# 19. CHECK IF EVAP CANISTER SATURATED WITH WATER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- 2. Does water drain from the EVAP canister?

### Yes or No

Yes >> GO TO 20. No >> GO TO 22.



< SERVICE INFOMATION >

[MR TYPE 2]

# $\overline{20}$ . CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensorattached.

The weight should be less than 1.9 kg (4.2 lb).

### OK or NG

OK >> GO TO 22. NG >> GO TO 21.

# 21. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose connected to EVAP canister for clogging or poor connection

>> Repair hose or replace EVAP canister.

# 22. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

# Component Inspection

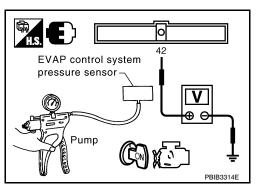
EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. **Always replace O-ring with a new one.**
- 2. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM terminal 42 (EVAP control system pressure sensor signal) and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V	
Not applied	1.8 - 4.8	
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value	

### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
- If NG, replace EVAP control system pressure sensor.



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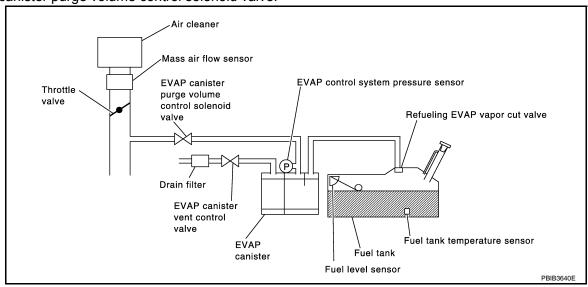
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## DTC P0455 EVAP CONTROL SYSTEM

## On Board Diagnosis 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 0455	EVAP control system gross leak detected	<ul> <li>EVAP control system has a very large leak such as fuel filler cap fell off.</li> <li>EVAP control system does not operate properly.</li> </ul>	Fuel filler cap remains open or fails to 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 Drain filter 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 come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

## **DTC Confirmation Procedure**

INFOID:0000000004500229

#### **CAUTION:**

Never remove fuel filler cap during the DTC Confirmation Procedure.

[MR TYPE 2]

### NOTE:

- Make sure that EVAP hose are connected to EVAP canister purge volume control solenoid valve properly.
- 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:**

< SERVICE INFOMATION >

- 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 reteaching sound is heard.
- Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Make sure 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)

Select "EVAP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

#### NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-1078, "Basic Inspection".

7. Make sure that "OK" is displayed. If "NG" is displayed, select "SELF-DIAG RESULTS" mode with CONSULT-III and make sure that "EVAP GROSS LEAK [P0455]" is displayed. If it is displayed, refer to <a href="EC-1367">EC-1367</a>, "Diagnosis Procedure". If P0442 is displayed, perform Diagnostic Procedure for DTC P0442, EC-1316, "Diagnosis Procedure".

### WITH GST

### NOTE:

Be sure to read the explanation of Driving Pattern on EC-1052, "Emission-related Diagnostic Information" before driving vehicle.

- Start engine.
- Drive vehicle according to Driving Pattern, <u>EC-1052</u>, "Emission-related <u>Diagnostic Information"</u>.
- Stop vehicle.
- 4. Turn ignition switch OFF, wait at least 10 seconds and then turn ignition switch ON.
- Select Service \$07 with GST.
- If P0441 is displayed on the screen, go to <u>EC-1311, "Diagnosis Procedure"</u> for DTC P0441.
- If P0442 is displayed on the screen, go to EC-1316, "Diagnosis Procedure" for DTC P0442.
- If P0455 is displayed on the screen, go to EC-1367, "Diagnosis Procedure".

## Diagnosis Procedure

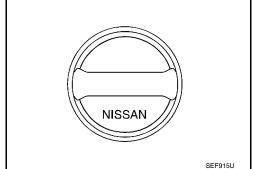
# 1. CHECK FUEL FILLER CAP DESIGN

- Turn ignition switch OFF.
- 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

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### [MR TYPE 2]

### < SERVICE INFOMATION >

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 reteaching 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-1038, "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-1036.

### OK or NG

OK >> GO TO 6.

NG >> Repair or reconnect the hose.

## CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

# 7. CHECK DRAIN FILTER

Refer to EC-1372, "Component Inspection".

### OK or NG

OK >> GO TO 8.

NG >> Replace drain filter.

# 8.CHECK EVAP CANISTER VENT CONTROL VALVE

### Check the following.

EVAP canister vent control is installed properly.

Refer to EC-1040, "Removal and Installation".

· EVAP canister vent control valve.

Refer to EC-1340, "Component Inspection".

### OK or NG

OK >> GO TO 9.

NG >> Repair or replace EVAP canister vent control valve and O-ring.

# 9. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely. For the location of EVAP service port (2), refer to <a href="EC-1036"><u>EC-1036</u></a>, "Description"</a>.

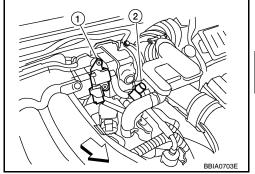
• EVAP canister purge volume control solenoid valve (1)

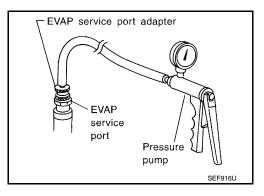
< SERVICE INFOMATION > [MR TYPE 2]

• : Vehicle front

#### NOTE:

Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





With CONSULT-III>>GO TO 10. Without CONSULT-III>>GO TO 11.

## 10. CHECK FOR EVAP LEAK

#### With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-III.
- Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

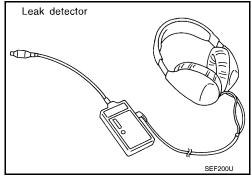
#### **CAUTION:**

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to <a href="EC-1036">EC-1036</a>, "Description".

#### OK or NG

OK >> GO TO 12.

NG >> Repair or replace.



# 11. CHECK FOR EVAP LEAK

#### Without CONSULT-III

1. Turn ignition switch OFF.

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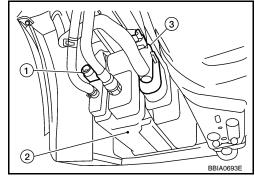
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#### < SERVICE INFOMATION >

- Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
- EVAP control system pressure sensor (1)
- EVAP canister (2)

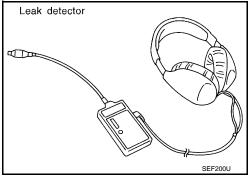


- Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.
   CAUTION:
  - Never use compressed air or a high pressure pump.
  - Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to <a href="EC-1036">EC-1036</a>, "Description".

#### OK or NG

OK >> GO TO 13.

NG >> Repair or replace.



# 12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

### With CONSULT-III

- 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at 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" opening to 100%.
- 5. Check vacuum hose for vacuum.

#### Vacuum should exist.

#### 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 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.

#### OK or NG

OK >> GO TO 16.

NG >> GO TO 14.

14. CHECK VACUUM HOSE

#### DTC P0455 EVAP CONTROL SYSTEM

[MR TYPE 2] < SERVICE INFOMATION > Check vacuum hoses for clogging or disconnection. Refer to EC-1106, "Vacuum Hose Drawing". Α OK or NG OK (With CONSULT-III)>>GO TO 15. OK (Without CONSULT-III)>>GO TO 16. NG >> Repair or reconnect the hose. EC 15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE With CONSULT-III 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. D OK or NG OK >> GO TO 17. NG >> GO TO 16. Е 16. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE Refer to EC-1329, "Component Inspection". F OK or NG OK >> GO TO 17. NG >> Replace EVAP canister purge volume control solenoid valve. 17. CHECK FUEL TANK TEMPERATURE SENSOR Refer to EC-1273, "Component Inspection". OK or NG Н OK >> GO TO 18. NG >> Replace fuel level sensor unit. 18. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR Refer to EC-1350, "Component Inspection". OK or NG OK >> GO TO 19. NG >> Replace EVAP control system pressure sensor. 19. CHECK EVAP/ORVR LINE K Check refueling EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1042. OK or NG L OK >> GO TO 20. >> Repair or replace hoses and tubes. M 20 . CHECK RECIRCULATION LINE Check recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection. N OK or NG OK >> GO TO 21. >> Repair or replace hoses, tubes or filler neck tube. 21.CHECK REFUELING EVAP VAPOR CUT VALVE Refer to EC-1045, "Component Inspection". Р OK or NG OK >> GO TO 22. >> Replace refueling EVAP vapor cut valve with fuel tank. 22. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

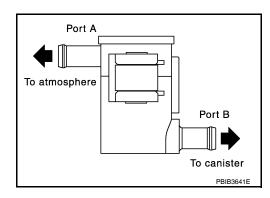
#### >> INSPECTION END

### Component Inspection

#### INFOID:0000000004535234

#### DRAIN FILTER

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.
- 7. If NG, replace drain filter.



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## DTC P0456 EVAP CONTROL SYSTEM

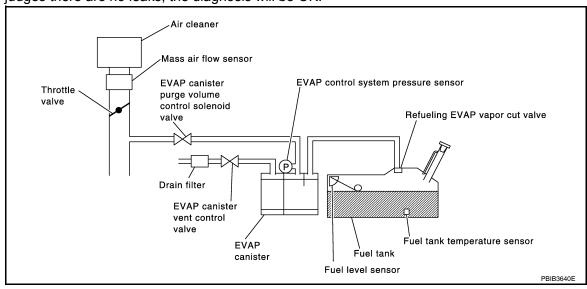
### On Board Diagnosis Logic

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 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 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)	<ul> <li>EVAP system has a very small leak.</li> <li>EVAP system does not operate properly.</li> </ul>	<ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister purge volume control solenoid valve and the circuit</li> <li>Fuel tank temperature sensor</li> <li>Drain filter</li> <li>O-ring of EVAP canister vent control valve is missing or damaged</li> <li>EVAP canister is saturated with water</li> <li>EVAP control system pressure sensor</li> <li>Refueling EVAP vapor cut valve</li> <li>ORVR system leaks</li> <li>Fuel level sensor and the circuit</li> <li>Foreign matter caught in EVAP canister purge volume control solenoid valve</li> </ul>

#### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

### **DTC Confirmation Procedure**

INFOID:0000000004500232

#### NOTE:

- If DTC P0456 is displayed with P0442, first perform trouble diagnosis for DTC P0456.
- · After repair, make sure that the hoses and clips are installed properly.
- 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:**

- Open engine hood before conducting 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.
- Refilled or drained the fuel.
- EVAP component parts is/are removed.
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

#### WITH CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Make sure the following conditions are met.

**FUEL LEVEL SE: 0.25 - 1.4V** 

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 refilling/draining fuel until the output voltage condition 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" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.

Follow the instruction displayed.

6. Make sure that "OK" is displayed.

If "NG" is displayed, refer to EC-1375, "Diagnosis Procedure".

#### NOTE:

- If the engine speed cannot be maintained within the range displayed on CONSULT-III screen, go to EC-1078, "Basic Inspection".
- Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

#### Overall Function Check

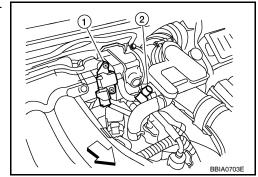
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#### WITH GST

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.
- Do not start engine.
- Do not exceeded 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi).
- 1. Attach the EVAP service port adapter securely to the EVAP service port (2).
- EVAP canister purge volume control solenoid valve (1)
- Vehicle front



#### **DTC P0456 EVAP CONTROL SYSTEM**

### < SERVICE INFOMATION >

[MR TYPE 2]

- 2. Set the pressure pump and a hose.
- 3. Also set the pressure pump with pressure gauge to the EVAP service port adapter.
- Turn ignition switch ON.
- 5. Connect GST and select Service \$08.
- Using Service \$08 control the EVAP canister vent control valve (close).
- Apply pressure and make sure the following conditions are satisfied.

Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg) 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 (3 mmHg, 0.12 inHg).

If NG, go to EC-1375, "Diagnosis Procedure".

If OK, go to next step.

- 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

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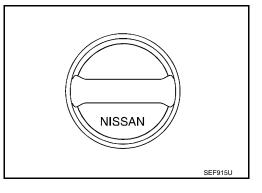
### 1. CHECK FUEL FILLER CAP DESIGN

- 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 reteaching 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-1038, "Component Inspection".

### OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

Adapter for EVAP service port

EVAP service port

Pressure pump

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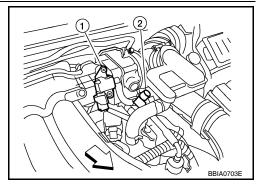
# 5.INSTALL THE PRESSURE PUMP

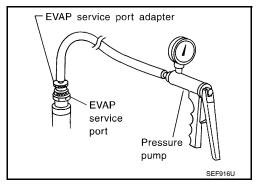
To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely. For the location of EVAP service port (2), refer to <u>EC-1036</u>, "<u>Description</u>".

- EVAP canister purge volume control solenoid valve (1)
- : Vehicle front

#### NOTE:

Improper installation of the EVAP service port adapter 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.
- Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

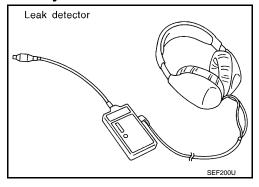
#### **CAUTION:**

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1036, "Description".

#### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



### 7. CHECK FOR EVAP LEAK

#### Without CONSULT-III

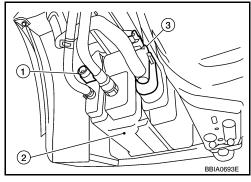
1. Turn ignition switch OFF.

### **DTC P0456 EVAP CONTROL SYSTEM**

#### [MR TYPE 2] < SERVICE INFOMATION >

Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)

- EVAP control system pressure sensor (1)
- EVAP canister (2)



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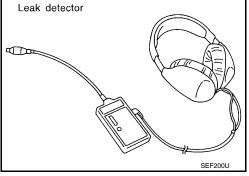
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter. **CAUTION:** 

- · Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1036, "Description".

#### OK or NG

OK >> GO TO 8.

NG >> Repair or replace.



### 8.CHECK DRAIN FILTER

Refer to EC-1380, "Component Inspection".

#### OK or NG

OK >> GO TO 9.

NG >> Replace drain filter.

### $\mathbf{9}.$ CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

 EVAP canister vent control valve is installed properly. Refer to EC-1040, "Removal and Installation".

· EVAP canister vent control valve. Refer to EC-1340, "Component Inspection".

#### OK or NG

OK >> GO TO 10.

NG >> Repair or replace EVAP canister vent control valve and O-ring.

### 10.CHECK IF EVAP CANISTER SATURATED WITH WATER

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

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### [MR TYPE 2]

#### < SERVICE INFOMATION >

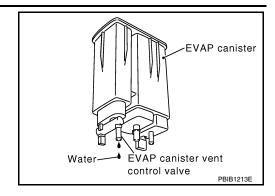
2. Does water drain from the EVAP canister?

#### Yes or No

Yes >> GO TO 11.

No (With CONSULT-III)>>GO TO 13.

No (Without CONSULT-III)>>GO TO 14.



### 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 1.9 kg (4.2 lb).

#### OK or NG

OK (With CONSULT-III)>>GO TO 13.

OK (Without CONSULT-III)>>GO TO 14.

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 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### With CONSULT-III

- 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at 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" opening to 100%.
- 5. Check vacuum hose for vacuum.

#### Vacuum should exist.

#### OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

# 14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Stop engine.
- 3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

#### Vacuum should exist.

#### OK or NG

OK >> GO TO 17.

NG >> GO TO 15.

# 15. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to <a href="EC-1106">EC-1106</a>, "Vacuum Hose Drawing". OK or NG

### **DTC P0456 EVAP CONTROL SYSTEM**

DIC P0456 EVAP CONTROL SYSTEM	
< SERVICE INFOMATION >	[MR TYPE 2]
OK >> GO TO 16. NG >> Repair or reconnect the hose.	
6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to EC-1329, "Component Inspection".	
K or NG	
OK >> GO TO 17.  NG >> Replace EVAP canister purge volume control solenoid valve.	
7. CHECK FUEL TANK TEMPERATURE SENSOR	
efer to EC-1273, "Component Inspection".	
K or NG	
OK >> GO TO 18.  NG >> Replace fuel level sensor unit.	
8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR	
efer to EC-1350, "Component Inspection".	
K or NG	
OK >> GO TO 19.  NG >> Replace EVAP control system pressure sensor.	
9. CHECK EVAP PURGE LINE	
heck EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or im	proper connection.
efer to EC-1036, "Description".	, .,
<u>K or NG</u> OK >> GO TO 20.	
NG >> Repair or reconnect the hose.	
20.clean evap purge line	
Clean EVAP purge line (pipe and rubber tube) using air blower.	
>> GO TO 21.	
21. CHECK EVAP/ORVR LINE	
Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, loosene	ss and improper con-
ection. For location, refer to <u>EC-1042</u> .	
<u>OK or NG</u> OK >> GO TO 22.	
NG >> Repair or replace hoses and tubes.	
2.CHECK RECIRCULATION LINE	
heck recirculation line between filler neck tube and fuel tank for clogging, kink, cr	acks, looseness and
nproper connection. K or NG	
OK >> GO TO 23.	
NG >> Repair or replace hose, tube or filler neck tube.	
3. CHECK REFUELING EVAP VAPOR CUT VALVE	
efer to <u>EC-1045, "Component Inspection"</u> . <u>K or NG</u>	
OK >> GO TO 24.	
NG >> Replace refueling EVAP vapor cut valve with fuel tank.	
24.CHECK FUEL LEVEL SENSOR	
efer to DI-19.	
K or NG	

OK >> GO TO 25.

NG >> Replace fuel level sensor unit.

# 25. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

### Component Inspection

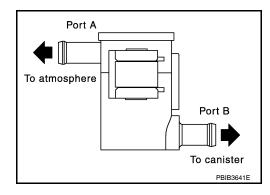
< SERVICE INFOMATION >

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[MR TYPE 2]

#### **DRAIN FILTER**

- 1. Check visually for insect nests in the drain filter air inlet.
- 2. Check visually for cracks or flaws in the appearance.
- 3. Check visually for cracks or flaws in the hose.
- 4. Blow air into port A and check that it flows freely out of port B.
- 5. Block port B.
- 6. Blow air into port A and check that there is no leakage.
- 7. If NG, replace drain filter.



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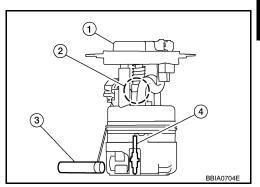
### DTC P0460 FUEL LEVEL SENSOR

### Component Description

The fuel level sensor (3) is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM 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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (4)



### On Board Diagnosis 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-1395.

When the vehicle is parked, naturally the fuel level in the fuel tank is 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 (CAN communication line is open or shorted) Harness or connectors (Fuel level sensor circuit is open or shorted) Combination meter Fuel level sensor

### **DTC Confirmation Procedure**

#### 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.

- Start engine and wait maximum of 2 consecutive minutes.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1381, "Diagnosis Procedure".

# Diagnosis Procedure

1.CHECK FUEL GAUGE OPERATION

Refer to DI-10, "Self-Diagnosis Mode of Combination Meter".

OK or NG

OK >> GO TO 2.

NG >> Follow the instruction of DI-10. "Self-Diagnosis Mode of Combination Meter".

2 .CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-16, "Fuel Level Sensor Signal Inspection".

#### OK or NG

OK >> GO TO 3.

>> Repair or replace malfunctioning parts. NG

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### **DTC P0460 FUEL LEVEL SENSOR**

< SERVICE INFOMATION > [MR TYPE 2]

# 3.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

Removal and Installation

FUEL LEVEL SENSOR Refer to FL-5.

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INFOID:0000000004501200

INFOID:0000000004500241

INFOID:0000000004500242

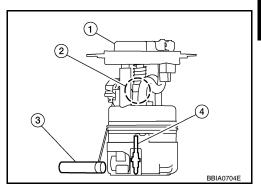
### DTC P0461 FUEL LEVEL SENSOR

### Component Description

The fuel level sensor (3) is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM 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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (4)



### On Board Diagnosis 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-1395.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven. Driving long distances naturally affect fuel gauge level.

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 (CAN communication line is open or shorted) Harness or connectors (Fuel level sensor circuit is open or shorted) Combination meter Fuel level sensor

#### Overall Function Check

Use this procedure to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

#### **WARNING:**

When performing following procedure, be sure to observe the handling of the fuel.

Refer to FL-4.

**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 (7-7/8 US gal, 6-5/ 8 Imp gal) in advance.

- 1. Prepare a fuel container and a spare hose.
- Release fuel pressure from fuel line, refer to EC-1086, "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.
- Turn ignition switch OFF and wait at least 10 seconds then turn ON.
- Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT-III.
- 7. Check "FUEL LEVEL SE" output voltage and note it.
- Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT-III.
- Touch "ON" and drain fuel approximately 30 (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 (7-7/8 US gal, 6-5/8 Imp gal).

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#### < SERVICE INFOMATION >

- 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 <u>EC-1384</u>, "<u>Diagnosis Procedure</u>".

#### WITH GST

#### NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 (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-1086, "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 (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 (7-7/8 US gal, 6-5/8 Imp gal).
- 9. Confirm that the fuel gauge indication varies.
- 10. If NG, go to EC-1384, "Diagnosis Procedure".

### Diagnosis Procedure

INFOID:0000000004501202

### 1. CHECK FUEL GAUGE OPERATION

Refer to DI-10, "Self-Diagnosis Mode of Combination Meter".

#### OK or NG

OK >> GO TO 2.

NG >> Follow the instruction of DI-10, "Self-Diagnosis Mode of Combination Meter".

## 2.CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-16, "Fuel Level Sensor Signal Inspection".

#### OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning parts.

# 3.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

#### Removal and Installation

INFOID:0000000004501203

FUEL LEVEL SENSOR

Refer to FL-5.

[MR TYPE 2]

INFOID:0000000004501201

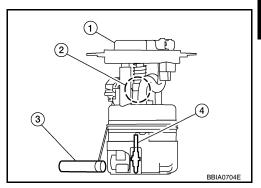
### DTC P0462, P0463 FUEL LEVEL SENSOR

### Component Description

The fuel level sensor (3) is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM 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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (4)



### On Board Diagnosis Logic

INFOID:0000000004500246

#### 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-1395.

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     (CAN communication line is open or
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	<ul> <li>shorted)</li> <li>Harness or connectors (Fuel level sensor circuit is open or shorted)</li> <li>Combination meter</li> <li>Fuel level sensor</li> </ul>

#### **DTC Confirmation Procedure**

INFOID:0000000004500247

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch ON.

- Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1385, "Diagnosis Procedure".

### Diagnosis Procedure

INFOID:0000000004501204

### CHECK FUEL GAUGE OPERATION

Refer to DI-10, "Self-Diagnosis Mode of Combination Meter".

#### OK or NG

OK >> GO TO 2.

NG >> Follow the instruction of DI-10, "Self-Diagnosis Mode of Combination Meter".

### 2 .CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-16, "Fuel Level Sensor Signal Inspection".

### OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning parts.

EC-1385

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## DTC P0462, P0463 FUEL LEVEL SENSOR

[MR TYPE 2] < SERVICE INFOMATION >

# 3.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

Removal and Installation

INFOID:0000000004501205

**FUEL LEVEL SENSOR** Refer to <u>FL-5</u>.

### DTC P0500 VSS

Description INFOID:0000000004500250

#### 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

The vehicle speed signal is sent from "ABS actuator and electric unit (control unit)" or combination meter through CAN communication line

### On Board Diagnosis Logic

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The vehicle speed signal sent to ECM is almost km/h (0 MPH) even when vehicle is being driven.	<ul> <li>Harness or connectors         (CAN communication line is open or shorted.)</li> <li>Harness or connectors         (Vehicle speed signal circuit is open or shorted)</li> <li>ABS actuator and electric unit (control unit)</li> <li>Combination meter</li> </ul>

#### FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode.

Detected item	Engine operating condition in fail-safe mode
Vehicle speed sensor	The cooling fan operates (High) while engine is running.

### **DTC Confirmation Procedure**

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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:**

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

- Start engine.
- Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. The vehicle speed on CON-SULT-III should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

If NG, go to EC-1388, "Diagnosis Procedure".

If OK, go to following step.

- Select "DATA MONITOR" mode with CONSULT-III.
- Warm engine up to normal operating temperature.
- Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	More than 1,600 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	5.5 - 31.8 msec
Shift lever	Suitable position
PW/ST SIGNAL	OFF

- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1388, "Diagnosis Procedure".

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[MR TYPE 2]

### **Overall Function Check**

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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.
- 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-1388, "Diagnosis Procedure".

### Diagnosis Procedure

INFOID:0000000004500254

 $1.\mathsf{CHECK}\ \mathsf{DTC}\ \mathsf{WITH}\ \mathsf{``abs}\ \mathsf{ACTUATOR}\ \mathsf{AND}\ \mathsf{ELECTRIC}\ \mathsf{UNIT}\ \mathsf{(CONTROL\ UNIT)''}$ 

Refer to BRC-8.

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2. CHECK COMBINATION METER

Refer to DI-3.

>> INSPECTION END

< SERVICE INFOMATION > [MR TYPE 2]

### DTC P0506 ISC SYSTEM

Description INFOID:000000004500255

#### 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 ECM calculates the actual engine speed from signals of crankshaft position sensor (POS) and camshaft position sensor (PHASE).

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

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 leak

#### **DTC Confirmation Procedure**

#### 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.
- If the target idle speed is out of the specified value, perform <u>EC-1084</u>, "Idle Air Volume Learning", before conducting DTC Confirmation Procedure. For the target idle speed, refer to the <u>EC-1534</u>.
   TESTING CONDITION:
- Before performing the following procedure, confirm that battery voltage is more than 11V 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.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1389</u>, "<u>Diagnosis Procedure</u>".

### Diagnosis Procedure

### 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.

#### OK or NG

OK >> GO TO 2.

NG >> Discover air leak location and repair.

# 2.REPLACE ECM

- 1. Stop engine.
- Replace ECM.
- 3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249, "ECM Re-communicating Function".
- 4. Perform EC-1084, "VIN Registration".
- 5. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-1084. "Throttle Valve Closed Position Learning".

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7. Perform <u>EC-1084</u>, "Idle Air Volume Learning".

>> INSPECTION END

### DTC P0507 ISC SYSTEM

Description INFOID:0000000004500259

#### NOTE:

#### If DTC P0507 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 ECM calculates the actual engine speed from signals of camshaft position sensor (POS) and camshaft position sensor (PHASE).

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

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.	<ul><li> Electric throttle control actuator</li><li> Intake air leak</li><li> PCV system</li></ul>

### **DTC Confirmation Procedure**

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.
- If the target idle speed is out of the specified value, perform EC-1084, "Idle Air Volume Learning", before conducting DTC Confirmation Procedure. For the target idle speed, refer to the EC-1534. **TESTING CONDITION:**
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.
- Always perform the test at a temperature above –10°C (14°F).
- Open engine hood.
- 2. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1391, "Diagnosis Procedure".

### Diagnosis Procedure

### 1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

## 2.CHECK INTAKE AIR LEAK

- Start engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

#### OK or NG

OK >> GO TO 3.

NG >> Discover air leak location and repair.

### 3.REPLACE ECM

Stop engine.

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### **DTC P0507 ISC SYSTEM**

#### [MR TYPE 2] < SERVICE INFOMATION >

- Replace ECM.
- Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249, "ECM Re-communicating Function".

  4. Perform EC-1084, "VIN Registration".

  5. Perform EC-1084, "Accelerator Pedal Released Position Learning".

  6. Perform EC-1084, "Throttle Valve Closed Position Learning".

- 7. Perform EC-1084, "Idle Air Volume Learning".

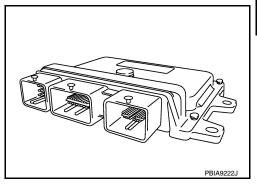
#### >> INSPECTION END

### DTC P0605 ECM

### Component Description

The ECM consists of a microcomputer and connectors for signal

input and output and for power supply. The ECM controls the engine.



### On Board Diagnosis Logic

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
	Engine control module	A)	ECM calculation function is malfunctioning.	
P0605 0605		B)	ECM EEP-ROM system is malfunctioning.	• ECM
		C)	ECM self shut-off function is malfunctioning.	

#### **FAIL-SAFE MODE**

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode		
Malfunction A	<ul> <li>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</li> <li>ECM deactivates ASCD operation.</li> </ul>		

#### **DTC Confirmation Procedure**

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.

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

- 1. Turn ignition switch ON.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1394</u>, "<u>Diagnosis Procedure</u>".

#### PROCEDURE FOR MALFUNCTION B

- 1. Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1394</u>, "<u>Diagnosis Procedure</u>".

#### PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF, wait at least 10 seconds and then turn ON. 2.
- Repeat step 2 for 32 times.

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### DTC P0605 ECM

#### [MR TYPE 2] < SERVICE INFOMATION >

- Check 1st trip DTC.
- 5. If 1st trip DTC is detected, go to <a href="EC-1394"><u>EC-1394</a>, "Diagnosis Procedure".</u></a>

### Diagnosis Procedure

INFOID:0000000004500266

# 1.INSPECTION START

- Erase DTC.
- **Perform DTC Confirmation Procedure.**

See EC-1393, "DTC Confirmation Procedure".

Is the 1st trip DTC P0605 displayed again?

#### Yes or No

Yes >> GO TO 2.

Nο >> INSPECTION END

# 2.REPLACE ECM

- 1. Replace ECM.
- Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>". Perform <u>EC-1084</u>, "<u>VIN Registration</u>".
- 4. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 5. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 6. Perform EC-1084, "Idle Air Volume Learning".

#### >> INSPECTION END

### DTC P0607 ECM

Description INFOID:0000000004501091

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

This self-diagnosis has the one trip detection logic (A/T and CVT). The MIL will not light up for this self-diagnosis (M/T).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0607 0607	CAN communication bus	When detecting error during the initial diagnosis for CAN controller of each control unit.	• ECM

#### **DTC Confirmation Procedure**

Turn ignition switch ON.

- 2. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1395</u>, "<u>Diagnosis Procedure</u>".

### Diagnosis Procedure

## 1. INSPECTION START

- Erase DTC
- Perform DTC Confirmation Procedure. See EC-1395, "DTC Confirmation Procedure".
- Is the 1st trip DTC P0607 displayed again?

#### Yes or No

Yes >> GO TO 2.

Nο >> INSPECTION END

### 2.REPLACE ECM

- Replace ECM.
- Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to BL-249, "ECM Re-communicating Function".
- 3. Perform EC-1084, "VIN Registration".
- Perform <u>EC-1084</u>, "<u>Accelerator Pedal Released Position Learning</u>".
   Perform <u>EC-1084</u>, "<u>Throttle Valve Closed Position Learning</u>".
   Perform <u>EC-1084</u>, "<u>Idle Air Volume Learning</u>".

#### >> INSPECTION END

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### DTC P0643 SENSOR POWER SUPPLY

### On Board Diagnosis Logic

INFOID:0000000004500267

#### 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 a voltage of power source for sensor is excessively low or high.	Harness or connectors (APP sensor 1 circuit is shorted.) (Throttle position sensor circuit is shorted.) [Camshaft position sensor (PHASE) circuit is shorted.] Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE)

#### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

#### 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:0000000004500268

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- 1. Start engine and let it idle for 1 second.
- 2. Check 1st trip DTC.
- If DTC is detected, go to <u>EC-1398</u>, "<u>Diagnosis Procedure</u>".

Wiring Diagram INFOID:0000000004500269

### EC-SEN/PW-01

■ : DETECTABLE LINE FOR DTC

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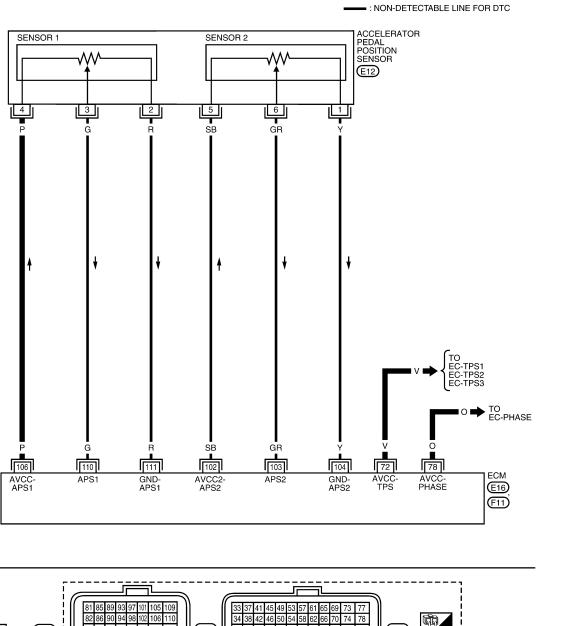
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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

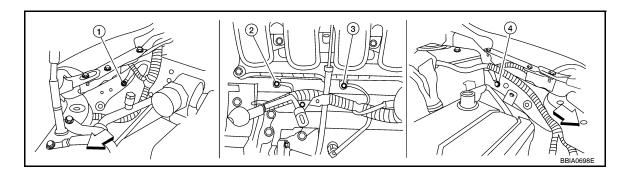
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V
78	О	Sensor power supply [Camshaft position sensor (PHASE)]	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
103		Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	GR		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Y	Sensor ground (APP sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
110	110 G	Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110			[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	R	Sensor ground (APP sensor 1)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

## Diagnosis Procedure

INFOID:0000000004500270

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screws on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

### 4. Body ground E15

#### OK or NG

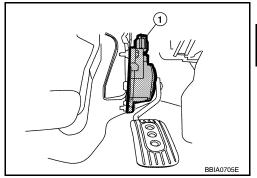
OK >> GO TO 2.

NG >> Repair or replace ground connections.

#### < SERVICE INFOMATION >

# $\overline{2}$ .check accelerator pedal position sensor 1 power supply circuit

- 1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
- 2. Turn ignition switch ON.

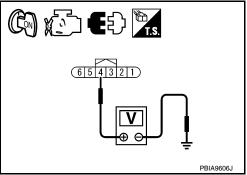


3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

### OK or NG

OK >> GO TO 8. NG >> GO TO 3.



# $\overline{3}$ .check accelerator pedal position sensor 1 power supply circuit-ii

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between APP sensor terminal 4 and ECM terminal 106. Refer to Wiring Diagram.

#### Continuity should exist.

#### 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 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
72	Throttle position sensor terminal 1	EC-1477, "Wiring Diagram"
78	Camshaft position sensor (PHASE) terminal 1	EC-1300, "Wiring Diagram"
106	APP sensor terminal 4	EC-1397, "Wiring Diagram"

#### OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

## 5. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1303, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace camshaft position sensor (PHASE).

### 6. CHECK THROTTLE POSITION SENSOR

Refer to EC-1201, "Component Inspection".

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### **DTC P0643 SENSOR POWER SUPPLY**

#### [MR TYPE 2] < SERVICE INFOMATION >

#### OK or NG

OK >> GO TO 8. NG >> GO TO 7.

# 7.replace electric throttle control actuator

- Replace the electric throttle control actuator.
- Perform <u>EC-1084</u>, "Throttle Valve Closed Position Learning". Perform <u>EC-1084</u>, "Idle Air Volume Learning".

#### >> INSPECTION END

### 8. CHECK APP SENSOR

Refer to EC-1468, "Component Inspection".

#### OK or NG

>> GO TO 10. OK NG >> GO TO 9.

### 9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly.
- 2. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 3. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 4. Perform EC-1084, "Idle Air Volume Learning".

### >> INSPECTION END

# 10. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

### DTC P0850 PNP SWITCH

### Component Description

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When the shift lever position is P or N (A/T, CVT), Neutral (M/T), park/neutral position (PNP) switch is ON. ECM detects the position because the continuity of the line (the ON signal) exists.

### INFOID:0000000004500272

### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	Ignition switch: ON	Shift lever: P or N (A/T, CVT), Neutral (M/T)	ON
		Shift lever: Except above	OFF

### On Board Diagnosis Logic

INFOID:0000000004500273

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850 0850	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	Harness or connectors [Park/neutral position (PNP) switch circuit is open or shorted.]     Park/neutral position (PNP) switch     TCM (CVT models)

### **DTC Confirmation Procedure**

INFOID:0000000004500274

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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.

#### WITH CONSULT-III

- 1. Turn ignition switch ON.
- Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. Then check the "P/N POSI SW" signal under the following conditions.

Position (Shift lever)	Known-good signal
N or P position (A/T, CVT) Neutral position (M/T)	ON
Except above	OFF

If NG, go to EC-1404, "Diagnosis Procedure".

If OK, go to following step.

3. Select "DATA MONITOR" mode with CONSULT-III.

- 4. Start engine and warm it up to normal operating temperature.
- Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	More than 1,200 rpm (CVT) More than 1,450 rpm (A/T) More than 1,900 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.4 - 31.8 msec (CVT) 1.4 - 31.8 msec (A/T) 1.7 - 31.8 msec (M/T)

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#### < SERVICE INFOMATION >

VHCL SPEED SE	More than 64km/h (29 MPH)
Shift lever	Suitable position

- 6. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1404, "Diagnosis Procedure"</u>.

#### **Overall Function Check**

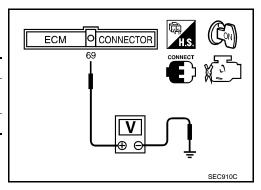
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

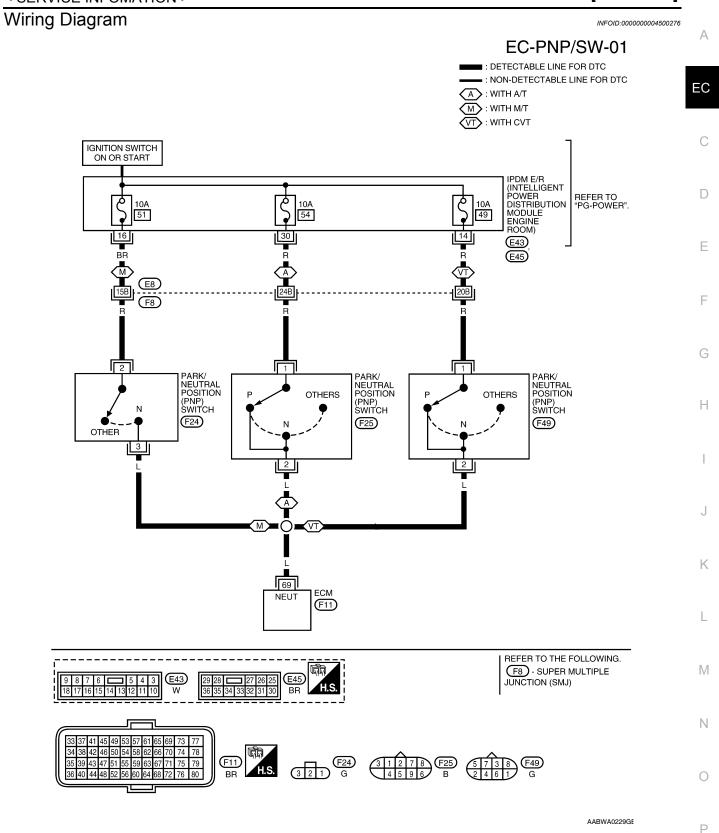
### WITH GST

- 1. Turn ignition switch ON.
- 2. Check voltage between ECM terminal 69 (PNP switch signal) and ground under the following conditions.

Condition (Shift lever)	Voltage V (Known-good data)
P or N position (A/T, CVT) Neutral position (M/T)	BATTERY VOLTAGE (11 - 14V)
Except above	Approx. 0







Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
69 L	L	Park/neutral position (PNP) switch	[Ignition switch: ON] • Shift lever: P or N (A/T, CVT), Neutral (M/T)	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch: ON] • Except above	Approximately 0V

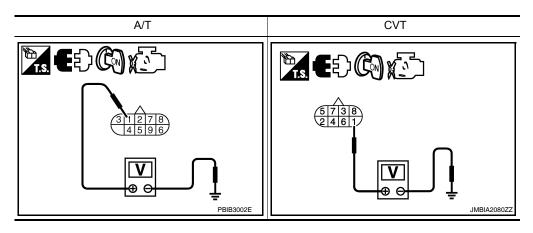
### Diagnosis Procedure

INFOID:0000000004500277

#### A/T MODELS AND CVT MODELS

# 1. CHECK PNP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect PNP switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check voltage between PNP switch 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 E8, F8
- · Harness for open or short between PNP switch and fuse
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# ${f 3.}$ CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between PNP switch terminal 2 and ECM terminal 69. 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 PNP SWITCH

Refer to AT-95, "Component Inspection" (A/T), CVT-247, "Component Inspection" (CVT).

#### OK or NG

OK >> GO TO 5.

NG >> Replace PNP switch.

### ${f 5.}$ CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

#### M/T MODELS

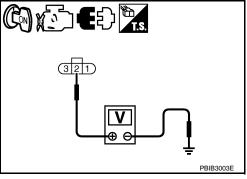
## 1. CHECK PNP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect PNP switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check voltage between PNP switch terminal 2 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

#### OK or NG

>> GO TO 3. OK NG >> GO TO 2.



## 2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- · Harness for open or short between PNP switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.check pnp switch input signal circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between PNP switch terminal 3 and ECM terminal 69. 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 PNP SWITCH

Refer to MT-54.

#### OK or NG

OK >> GO TO 5.

NG >> Replace PNP switch.

### 5.CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

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[MR TYPE 2]

>> INSPECTION END

### **DTC P1148 CLOSED LOOP CONTROL**

< SERVICE INFOMATION >

[MR TYPE 2]

## DTC P1148 CLOSED LOOP CONTROL

### On Board Diagnosis Logic

INFOID:0000000004500278

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148	Closed loop control function	The closed loop control function does not operate even when vehicle is driving in the specified condition.	<ul> <li>Harness or connectors [Air fuel ratio (A/F) sensor 1 circuit is open or shorted.]</li> <li>Air fuel ratio (A/F) sensor 1</li> <li>Air fuel ratio (A/F) sensor 1 heater</li> </ul>

#### NOTE:

DTC P1148 is displayed with another DTC for air fuel ratio (A/F) sensor 1. Perform the trouble diagnosis for the corresponding DTC.

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### DTC P1217 ENGINE OVER TEMPERATURE

### System Description

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#### SYSTEM DESCRIPTION

- 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 <u>EC-1395</u>.

#### Cooling Fan Control

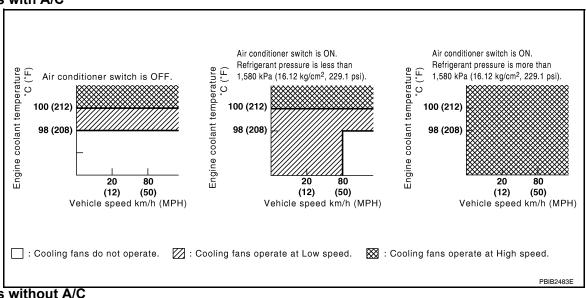
Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1			
Battery	Battery voltage*1		IPDM E/R (Cooling fan relays)	
ABS actuator and electric unit (control unit)	Val: 10 - 0 - 142	Cooling fan control		
Combination meter	Vehicle speed*2			
Engine coolant temperature sensor	Engine coolant temperature			
Air conditioner switch	Air conditioner ON signal*2			
Refrigerant pressure sensor	Refrigerant pressure			

<sup>\*1:</sup> The ECM determines the start signal status by the signals of engine speed and battery voltage.

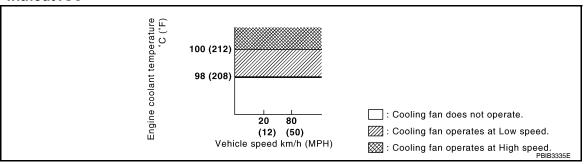
The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

#### Cooling Fan Operation

#### Models with A/C



#### Models without A/C



<sup>\*2:</sup> This signal is sent to ECM through CAN communication line.

#### **DTC P1217 ENGINE OVER TEMPERATURE**

#### DIC P1217 ENGINE OVER TEMPERATUR

Cooling Fan Relay Operation

< SERVICE INFOMATION >

The ECM controls cooling fan relays in the IPDM E/R through CAN communication line.

Cooling fan spood	Cooling fan relay			
Cooling fan speed	1	2	3	
Stop (OFF)	OFF	OFF	OFF	
Low (LOW)	ON	OFF	OFF	
High (HI)	ON	ON	ON	

### CONSULT-III Reference Value in Data Monitor Mode

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Specification data are reference values.

MONITOR ITEM	CON	SPECIFICATION		
	- Engine: After warming up idle	Air conditioner switch: OFF	OFF	•
AIR COND SIG	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates.)	ON	•
		Engine coolant temperature: 97°C (207°F) or less	OFF	-
COOLING FAN	Engine: After warming up, idle the engine     Air conditioner switch: OFF	Engine coolant temperature: Between 98°C (208°F) and 99°C (210°F)	LOW	-
		Engine coolant temperature: 100°C (212°F) or more	HIGH	•

### On Board Diagnosis Logic

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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)	<ul> <li>Cooling fan does not operate properly (Overheat).</li> <li>Cooling fan system does not operate properly (Overheat).</li> <li>Engine coolant was not added to the system using the proper filling method.</li> <li>Engine coolant is not within the specified range.</li> </ul>	Harness or connectors (Cooling fan circuit is open or shorted.) Cooling fan IPDM E/R (Cooling fan relays) Radiator hose Radiator Reservoir tank Radiator cap Water pump Thermostat Water control valve For more information, refer to EC-1415, "Main 13 Causes of Overheating".

#### **CAUTION:**

When a malfunction is indicated, be sure to replace the coolant. Refer to <u>CO-35, "Changing Engine Coolant"</u>. Also, replace the engine oil. Refer to <u>LU-17, "Changing Engine Oil"</u>.

- 1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-15, "Anti-freeze Coolant Mixture Ratio".
- 2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

#### Overall Function Check

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Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

#### **WARNING:**

EC-1409

#### < SERVICE INFOMATION >

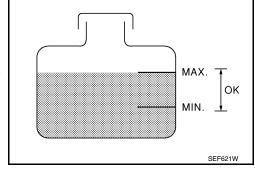
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the reservoir tank or the radiator.

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

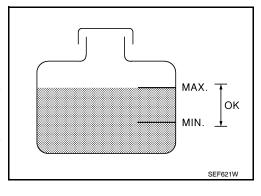
- Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to <u>EC-1412</u>, "<u>Diagnosis Procedure</u>"
- 2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to <a href="EC-1412">EC-1412</a>, "Diagnosis Procedure".
- 3. Turn ignition switch ON.
- Perform "COOLING FAN" in "ACTIVE TEST" mode with CON-SULT-III.

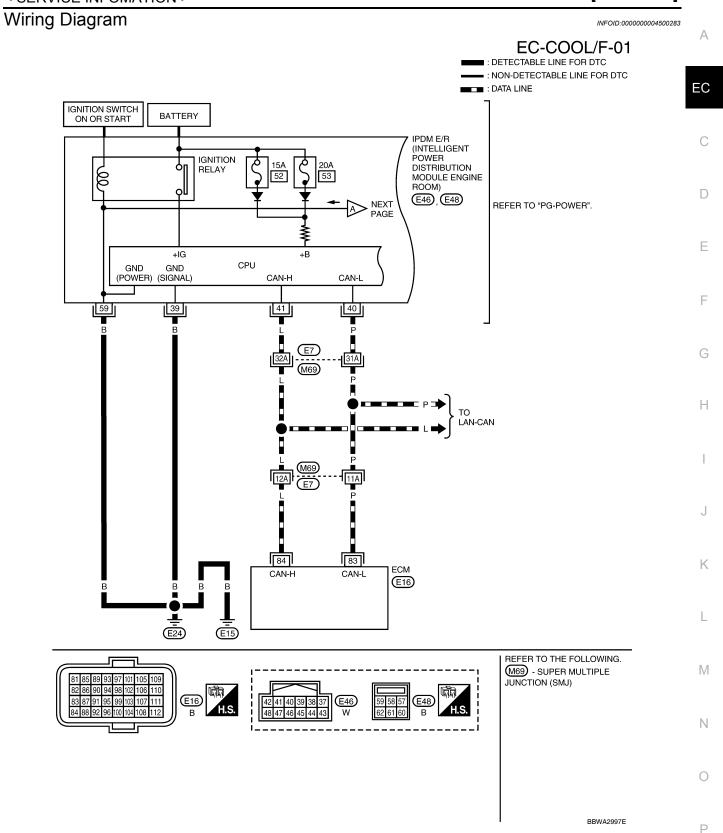


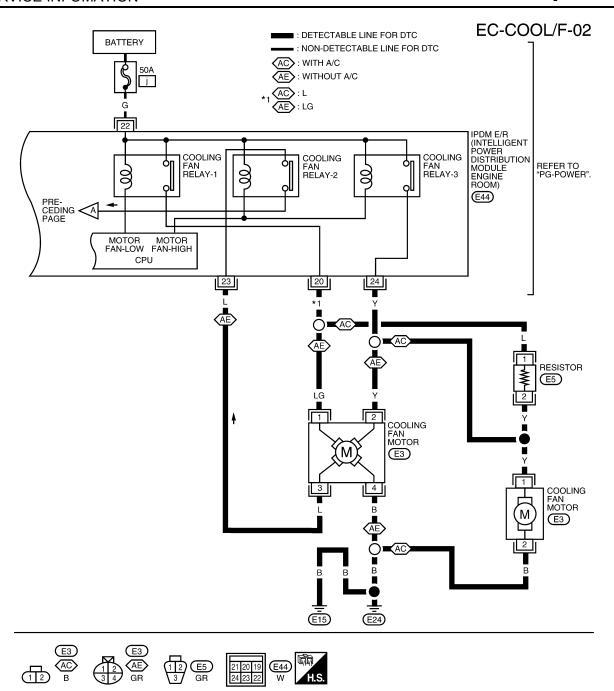


### WITH GST

- 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 <u>EC-1412</u>, "Diagnosis Procedure".
- 2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to <a href="EC-1412">EC-1412</a>, <a href=""">"Diagnosis Procedure"</a>.
- 3. Perform IPDM/ER auto active test and check cooling fan motor operation. Refer to <u>PG-19</u>, "Auto Active Test".
- If NG, go to <u>EC-1412</u>. "<u>Diagnosis Procedure</u>".







Diagnosis Procedure

1. INSPECTION START

Do you have CONSULT-III?

Yes or No

Yes >> GO TO 2. No >> GO TO 3. BBWA3001E

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### **DTC P1217 ENGINE OVER TEMPERATURE**

[MR TYPE 2] < SERVICE INFOMATION > 2.check cooling fan operation With CONSULT-III 1. Turn ignition switch ON. 2. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-III. EC Make sure that cooling fan operates at each speed. OK or NG OK >> GO TO 4. NG >> GO TO 8. 3.CHECK COOLING FAN OPERATION D Without CONSULT-III Perform IPDM E/R auto active test and check cooling fan operation. Refer to PG-19, "Auto Active Test". Е Make sure that cooling fan operates at each speed. OK or NG OK >> GO TO 4. F NG >> GO TO 8. 4. CHECK COOLING SYSTEM FOR LEAK Refer to CO-35, "Inspection". OK or NG OK >> GO TO 5. NG >> Check the following for leak. Refer to CO-35, "Inspection". Н Hose Radiator Water pump 5. CHECK RADIATOR CAP Refer to CO-40, "Checking Radiator Cap". OK or NG OK >> GO TO 6. NG >> Replace radiator cap. K O.CHECK COMPONENT PARTS Check the following. Thermostat. (Refer to <u>CO-45</u>.) Water control valve. (Refer to <u>CO-47</u>.) Engine coolant temperature sensor. (Refer to <u>EC-1190</u>.) OK or NG OK >> GO TO 7. NG >> Replace malfunctioning component. 7. CHECK MAIN 13 CAUSES Ν If the cause cannot be isolated, go to EC-1415, "Main 13 Causes of Overheating". >> INSPECTION END 0 8.CHECK IPDM E/R POWER SUPPLY CIRCUIT Turn ignition switch OFF. Р Disconnect IPDM E/R harness connector E44.

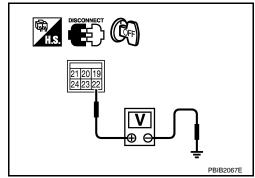
Check voltage between IPDM E/R terminal 22 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 10. NG >> GO TO 9.

< SERVICE INFOMATION >



[MR TYPE 2]

### 9. DETECT MALFUNCTIONING PART

Check the following.

- 50A fusible link
- Harness for open or short between IPDM E/R and battery

>> Repair open circuit or short to ground in harness or connectors.

## 10.CHECK IPDM E/R GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connectors E46 and E48.
- Check harness continuity between IPDM E/R terminals 59, 39 and ground. Refer to Wiring Diagram.

#### Continuity should exist.

Also check harness for short to power.

#### OK or NG

OK (Models with A/C)>>GO TO 11.

OK (Models without A/C)>>GO TO 13.

>> Repair open circuit or short to power in harness or connectors.

## 11. CHECK COOLING FAN MOTOR CIRCUIT

- Disconnect cooling fan motor harness connector.
- Check harness continuity between the followings;

Cooling fan motor terminal 1 and IPDM E/R terminals 20, 24.

Cooling fan motor terminal 2 and ground.

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 15.

NG >> GO TO 12.

## 12. DETECT MALFUNCTIONING PART

#### Check the following.

- · Harness for open or short between cooling fan motor and IPDM E/R
- · Harness for open or short between cooling fan motor and ground
- Resistor E5

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 13. CHECK COOLING FAN MOTOR CIRCUIT

- Disconnect cooling fan motor harness connector.
- Check harness continuity between the followings; Cooling fan motor terminal 1 and IPDM E/R terminal 20.

EC-1414

### DTC P1217 ENGINE OVER TEMPERATURE

## < SERVICE INFOMATION >

Cooling fan motor terminal 2 and IPDM E/R terminal 24. Cooling fan motor terminal 3 and IPDM E/R terminal 23.

Cooling fan motor terminal 4 and ground.

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 15.

NG >> GO TO 14.

## 14. DETECT MALFUNCTIONING PART

### Check the following.

- Harness for open or short between cooling fan motor and IPDM E/R
- Harness for open or short between cooling fan motor and ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 15. CHECK COOLING FAN MOTOR

Refer to EC-1416, "Component Inspection".

#### OK or NG

OK >> GO TO 16.

NG >> Replace cooling fan motor.

## 16. CHECK INTERMITTENT INCIDENT

Perform EC-1138.

#### 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 connector.

### Main 13 Causes of Overheating

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Engine	Step	Inspection item	Equipment	Standard	Reference
OFF	1	Blocked radiator     Blocked condenser     Blocked radiator grille     Blocked bumper	Visual	No blocking	_
	2	Coolant mixture	Coolant tester	See MA-15, "Anti-freeze C	oolant Mixture Ratio".
	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See CO-35, "Inspection".
	4	Radiator cap	Pressure tester	See CO-40, "Checking Ra	diator Cap".
ON* <sup>2</sup>	5	Coolant leaks	Visual	No leaks	See CO-35, "Inspection".
ON* <sup>2</sup>	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	See <u>CO-45</u> , and <u>CO-47</u>
ON* <sup>1</sup>	7	Cooling fan	CONSULT-III	Operating	See trouble diagnosis for DTC P1217 (EC-1412. "Diagnosis Procedure").
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON* <sup>3</sup>	9	Coolant temperature gauge	Visual	Gauge less than 3/4 when driving	_
		Coolant overflow to reservoir tank	Visual	No overflow during driving and idling	See CO-35, "Changing Engine Coolant".

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### **DTC P1217 ENGINE OVER TEMPERATURE**

### < SERVICE INFOMATION >

[MR TYPE 2]

Engine	Step	Inspection item	Equipment	Standard	Reference
OFF* <sup>4</sup>	10	Coolant return from reservoir tank to radiator	Visual	Should be initial level in reservoir tank	See CO-35, "Inspection".
OFF	11	Water control valve	Remove and inspect the valve	Within the specified value	See CO-47, "Removal and Installation"
OFF	12	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See <u>EM-185</u> .
	13	Cylinder block and pistons	Visual	No scuffing on cylinder walls or piston	See <u>EM-199</u> .

<sup>\*1:</sup> Turn the ignition switch ON.

For more information, refer to CO-32.

### Component Inspection

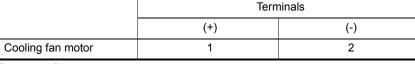
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## **COOLING FAN MOTOR**

#### Model with A/C

- 1. Disconnect cooling fan motor harness connectors.
- Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals (-)		
Cooling fan motor	1	2	



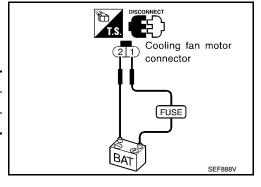
#### Cooling fan motor should operate.

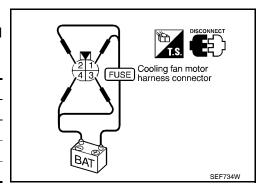
If NG, replace cooling fan motor.

#### Models without A/C

- Disconnect cooling fan motor harness connectors.
- Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	terminals	
	Opecu	(+)	(–)
	Low	1	4
Cooling fan motor		2	3
	High	1 and 2	3 and 4





#### Cooling fan motor should operate.

If NG, replace cooling fan motor.

<sup>\*2:</sup> Engine running at 3,000 rpm for 10 minutes.

<sup>\*3:</sup> Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

<sup>\*4:</sup> After 60 minutes of cool down time.

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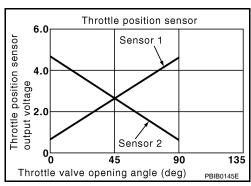
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### DTC P1225 TP SENSOR

### Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



### On Board Diagnosis Logic

The MIL will not light up 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**

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

- Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Check 1st trip DTC.
- 5. If 1st trip DTC is detected, go to EC-1417, "Diagnosis Procedure".

## Diagnosis Procedure

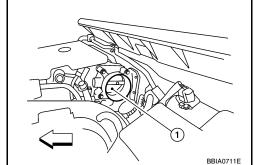
# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.
- : Vehicle front

#### 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-1084, "Throttle Valve Closed Position Learning".
- 3. Perform EC-1084, "Idle Air Volume Learning".

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### **DTC P1225 TP SENSOR**

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#### >> INSPECTION END

Removal and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to <u>EM-141</u>.

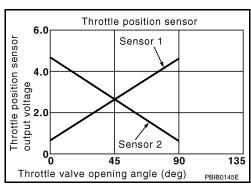
INFOID:0000000004501208

### DTC P1226 TP SENSOR

### Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



### On Board Diagnosis Logic

The MIL will not light up 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**

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

- Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Repeat steps 3 and 4 for 32 times.
- 5. Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1419, "Diagnosis Procedure".

### Diagnosis Procedure

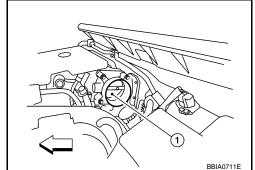
## 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- Remove the intake air duct. 2.
- Check if foreign matter is caught between the throttle valve (1) and the housing.
- : Vehicle front

#### 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

- Replace the electric throttle control actuator.
- Perform EC-1084, "Throttle Valve Closed Position Learning".

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### **DTC P1226 TP SENSOR**

< SERVICE INFOMATION > [MR TYPE 2]

3. Perform EC-1084, "Idle Air Volume Learning".

#### >> INSPECTION END

Removal and Installation

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ELECTRIC THROTTLE CONTROL ACTUATOR Refer to <u>EM-141</u>.

**IMR TYPE 21** < SERVICE INFOMATION >

### DTC P1421 COLD START CONTROL

Description INFOID:0000000004500297

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

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**

#### 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.
- If DTC P1421 is displayed with other DTC, first perform the trouble diagnosis for other DTC. **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

#### WITH CONSULT-III

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON. 2.
- Select "DATA MONITOR" mode with CONSULT-III. 3.
- Check that the "COOLAN TEMP/S" indication is between 4°C (39°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.
- Start engine and let it idle for 5 minutes.
- Check 1st trip DTC.
- 7. If 1st trip DTC is detected, go to <a href="EC-1421">EC-1421</a>, "Diagnosis Procedure".

### Diagnosis Procedure

### 1.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-1084, "Idle Air Volume Learning".

#### Is Idle Air Volume Learning carried out successfully?

#### Yes or No

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

### OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning part

### 3.CHECK FUEL INJECTION SYSTEM FUNCTION

Perform EC-1258, "DTC Confirmation Procedure" for DTC P0171.

#### OK or NG

OK >> GO TO 4. EC

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#### DTC P1421 COLD START CONTROL

[MR TYPE 2]

## < SERVICE INFOMATION >

>> Go to EC-1261, "Diagnosis Procedure" for DTC P0171.

## 4. PERFORM DTC CONFIRMATION PROCEDURE

1. Erase DTC.

2. Perform DTC Confirmation Procedure.

See EC-1421, "DTC Confirmation Procedure".

Is the 1st trip DTC P1421 displayed again?

#### Yes or No

Yes >> GO TO 5.

No >> INSPECTION END

## 5.REPLACE ECM

- Replace ECM.
- 2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>BL-249</u>, "<u>ECM Re-communicating Function</u>".

  3. Perform <u>EC-1084</u>, "<u>VIN Registration</u>".
- 4. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 5. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 6. Perform EC-1084, "Idle Air Volume Learning".

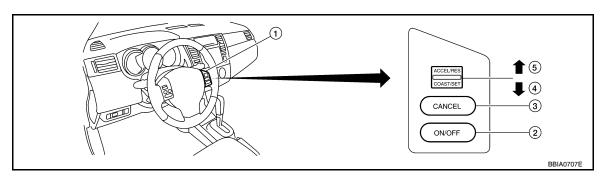
#### >> INSPECTION END

INFOID:0000000004500301

### DTC P1564 ASCD STEERING SWITCH

### **Component Description**

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.



- 1. ASCD steering switch
- MAIN switch
- SET/COAST switch
- RESUME/ACCELERATE switch

Refer to EC-1033 for the ASCD function.

### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM		CONDITION	SPECIFICATION
MAIN SW	Ignition switch: ON	MAIN switch: Pressed	ON
IVIAIN SVV	• Igrillion switch. ON	MAIN switch: Released	OFF
CANCEL SW	laudition avoitable ON	CANCEL switch: Pressed	ON
CANCEL 3W	Ignition switch: ON	CANCEL switch: Released	OFF
PEOUNE (A CO OW)	landiking assituh. ON	RESUME/ACCELERATE switch: Pressed	ON
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Released	OFF
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
	Ignition switch: ON	SET/COAST switch: Released	OFF

### On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

The MIL will not light up for this diagnosis.

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1393.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564 1564	ASCD steering switch	<ul> <li>An excessively high voltage signal from the ASCD steering switch is sent to ECM.</li> <li>ECM detects that input signal from the ASCD steering switch is out of the specified range.</li> <li>ECM detects that the ASCD steering switch is stuck ON.</li> </ul>	<ul> <li>Harness or connectors (ASCD switch circuit is open or shorted.)</li> <li>ASCD steering switch</li> <li>ECM</li> </ul>

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**CANCEL** switch

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### **DTC P1564 ASCD STEERING SWITCH**

< SERVICE INFOMATION >

[MR TYPE 2]

### **DTC Confirmation Procedure**

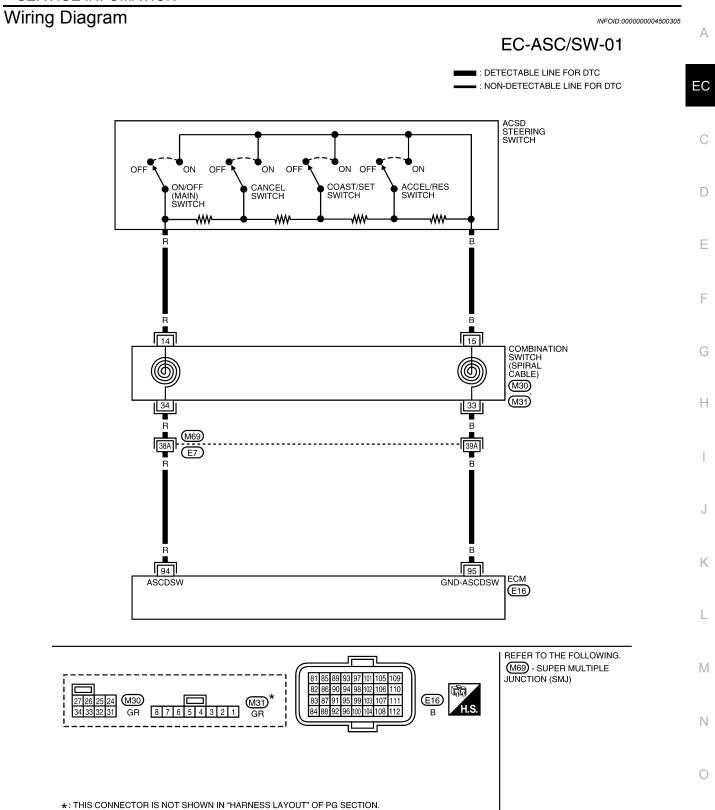
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#### NOTE

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

- 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.
- 7. If DTC is detected, go to EC-1426, "Diagnosis Procedure".

[MR TYPE 2] < SERVICE INFOMATION >



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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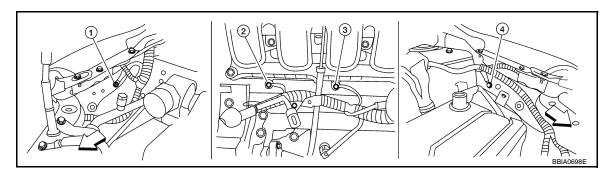
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
			[Ignition switch: ON]  • ASCD steering switch: OFF	Approximately 4V
94 R	ASCD steering switch	[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0V	
		[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1V	
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 2V
95	В	Sensor ground	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

### Diagnosis Procedure

INFOID:0000000004500306

## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

### 4. Body ground E15

#### 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", "RESUME/ACC SW", "SET SW and "CANCEL 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
WAIN SWILCH	IVIAIN SVV	Released	OFF
CANCEL switch	CANCEL SW	Pressed	ON
CANCEL SWILLI		Released	OFF

[MR TYPE 2]

#### < SERVICE INFOMATION >

Switch	Monitor item	Condition	Indication
RESUME/AC-	DECLINE (A CC CIA)	Pressed	ON
CELERATE switch	RESUME/ACC SW	Released	OFF
SET/COAST	ET/COAST SET SW		ON
switch	SET SW	Released	OFF

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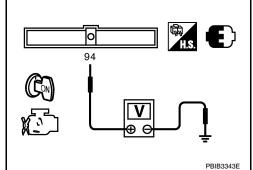
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#### ■ Without CONSULT-III

- 1. Turn ignition switch ON.
- 2. Check voltage between ECM terminal 94 and ground with pressing each button.

Switch	Condition	Voltage [V]
MAIN switch	Pressed	Approx. 0
MAIN SWILCH	Released	Approx. 4.0
CANCEL switch	Pressed	Approx. 1.0
CANCLE SWILLI	Released	Approx. 4.0
RESUME/ACCELER-	Pressed	Approx. 3.0
ATE switch	Released	Approx. 4.0
SET/COAST switch	Pressed	Approx. 2.0
SET/COAST SWILCH	Released	Approx. 4.0



#### OK or NG

OK >> GO TO 8. NG >> GO TO 3.

## 3.check ascd steering switch ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect combination switch harness connector M31.
- 3. Disconnect ECM harness connector.
- Check harness continuity between combination switch terminal 15 and ECM terminal 95. Refer to Wiring Diagram.

#### Continuity should exist.

5. Also check harness for short to ground or short to power.

#### OK or NG

OK >> GO TO 5. NG >> GO TO 4.

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### 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M69, E7
- 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.

## $5.\mathsf{check}$ ascd steering switch input signal circuit for open and short

1. Check harness continuity between ECM terminal 94 and combination switch terminal 14. Refer to Wiring Diagram.

#### Continuity should exist.

2. Also check harness for short to ground and short to power.

#### OK or NG

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### **DTC P1564 ASCD STEERING SWITCH**

< SERVICE INFOMATION > [MR TYPE 2]

OK >> GO TO 7. NG >> GO TO 6.

### 6. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- · 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-1428, "Component Inspection".

#### OK or NG

OK >> GO TO 8.

NG >> Replace ASCD steering switch.

## 8. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

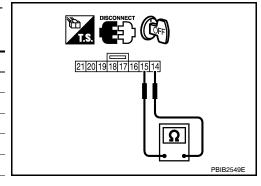
### Component Inspection

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#### ASCD STEERING SWITCH

- 1. Disconnect combination switch (spiral cable) harness connector M31.
- 2. Check continuity between combination switch (spiral cable) terminals 14 and 15 with pushing each switch.

Switch	Condition	Resistance [ $\Omega$ ]
MAIN switch	Pressed	Approx. 0
WAIN SWILCH	Released	Approx. 4,000
CANCEL switch	Pressed	Approx. 250
CANCLE SWILLI	Released	Approx. 4,000
RESUME/ACCELERATE	Pressed	Approx. 1,480
switch	Released	Approx. 4,000
SET/COAST switch	Pressed	Approx. 660
OL 1700A01 SWIICH	Released	Approx. 4,000



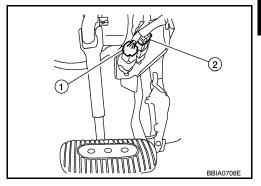
If NG, replace ASCD steering switch.

### DTC P1572 ASCD BRAKE SWITCH

### Component Description

< SERVICE INFOMATION >

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 this input of two kinds (ON/OFF signal). Refer to EC-1033 for the ASCD function.



### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM		CONDITION	
BRAKE SW1 (ASCD brake switch)		Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	
	Ignition switch: ON	Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	OFF
BRAKE SW2	Ignition switch: ON	Brake pedal: Fully released	OFF
(Stop lamp switch)	- Igrillion Switch. ON	Brake pedal: Slightly depressed	ON

### On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

The MIL will not light up for this diagnosis.

#### NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1393.
- · This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause	NI
		A)	When the vehicle speed is above 30km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	Harness or connectors     (Stop lamp switch circuit is shorted.)     Harness or connectors     (ASCD brake switch circuit is shorted.)     Harness or connectors	- N O
P1572 1572	ASCD brake switch	В)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving	(ASCD clutch switch circuit is shorted.) (M/T) Stop lamp switch ASCD brake switch ASCD clutch switch (M/T) Incorrect stop lamp switch installation Incorrect ASCD brake switch installation Incorrect ASCD clutch switch installation (M/T) ECM	Ρ

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### **DTC Confirmation Procedure**

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#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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 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.

#### **TESTING CONDITION:**

Steps 3 and 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.

#### WITH CONSULT-III

- 1. Start engine.
- 2. Press MAIN switch and make sure that CRUISE indicator lights up.
- 3. Drive the vehicle for at least 5 consecutive seconds under the following condition.

Vehicle speed	More than 30 km/h (19 MPH)
Shift lever	Suitable position

- 4. Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1432</u>, "<u>Diagnosis Procedure</u>".
   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 condition.

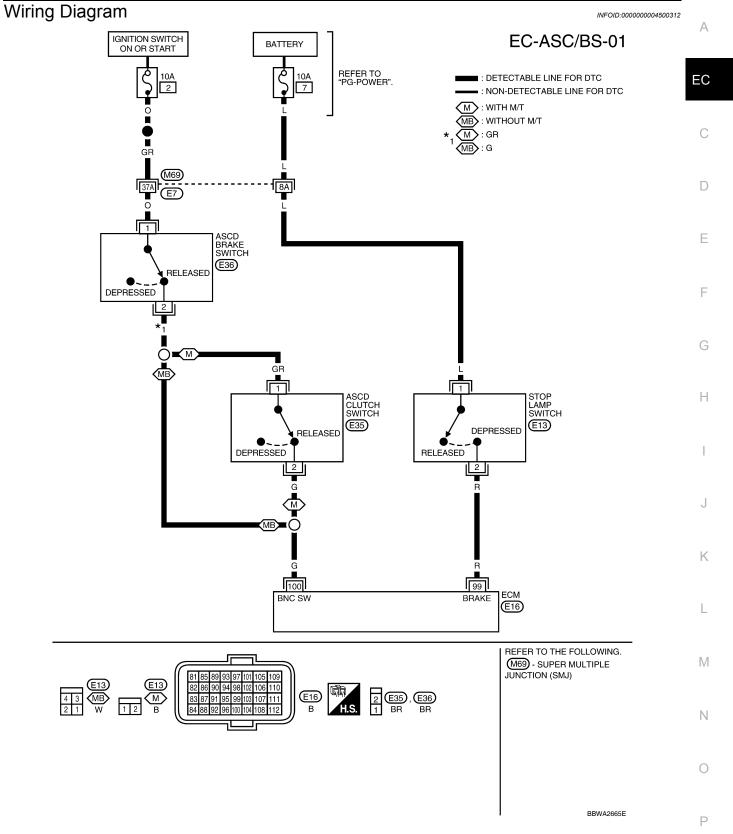
Vehicle speed	More than 30 km/h (19 MPH)
Shift lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

- Check 1st trip DTC.
- If 1st trip DTC is detected, go to <u>EC-1432</u>, "<u>Diagnosis Procedure</u>".

#### WITH GST

Follow the procedure "WITH CONSULT-III" above.





Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

#### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
99	D. Ctan lawn quitab		[Ignition switch: ON] • Brake pedal: Fully released	Approximately 0V
99 R	Stop lamp switch	[Ignition switch: ON] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)	
100 G	ASCD brake switch	Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	Approximately 0V	
		Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully released (M/T)	BATTERY VOLTAGE (11 - 14V)	

### Diagnosis Procedure

INFOID:0000000004500313

## 1. CHECK OVERALL FUNCTION-I

#### With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.
   M/T models

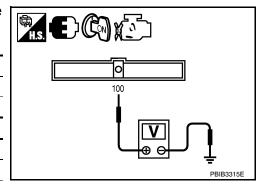
CONDITION	INDICATION		
Clutch pedal and/or brake pedal: Slightly depressed	OFF		
Clutch pedal and brake pedal: Fully released	ON		
A/T and CVT models			
CONDITION	INDICATION		
Brake pedal: Slightly depressed	OFF		
Brake pedal: Fully released	ON		

#### Without CONSULT-III

- 1. Turn ignition switch ON.
- Check voltage between ECM terminal 100 and ground under the following conditions.

#### M/T models

CONDITION	VOLTAGE
Clutch pedal and/or brake pedal: Slightly depressed	Approximately 0V
Clutch pedal and brake pedal: Fully released	Battery voltage
A/T and CVT models	
CONDITION	VOLTAGE
Brake pedal: Slightly depressed	Approximately 0V
Brake pedal: Fully released	Battery voltage



#### OK or NG

OK >> GO TO 2.

NG (M/T models) >>GO TO 3.

NG (A/T and CVT models) >>GO TO 4.

## 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

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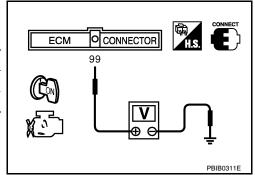
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#### Without CONSULT-III

Check voltage between ECM terminal 99 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0V
Brake pedal: Slightly depressed	Battery voltage

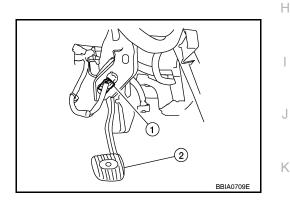


#### OK or NG

OK >> GO TO 15. NG >> GO TO 11.

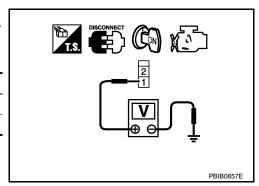
# 3.check ascd clutch switch power supply circuit

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch (1) harness connector.
- Clutch pedal (2)
- 3. Turn ignition switch ON.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-III or tester.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approx. 0V



#### OK or NG

OK >> GO TO 9. NG >> GO TO 4.

## 4. CHECK ASCD BRAKE SWITCH POWER SUPPLY

1. Turn ignition switch OFF.

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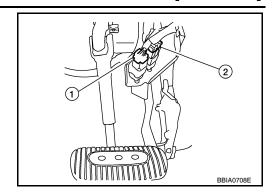
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#### < SERVICE INFOMATION >

- 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.

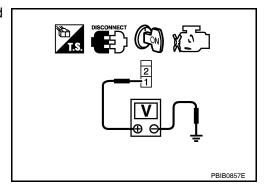
#### Voltage: Battery voltage

#### OK or NG

OK (M/T models) >>GO TO 6.

OK (A/T and CVT models) >>GO TO 7.

>> GO TO 5.



## 5. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- 10A 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.

## 6.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch 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 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

### 7.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 100 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 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

### 8.CHECK ASCD BRAKE SWITCH

Refer to EC-1436, "Component Inspection".

### DTC P1572 ASCD BRAKE SWITCH

[MR TYPE 2] < SERVICE INFOMATION >

#### OK or NG

OK >> GO TO 15.

NG >> Replace ASCD brake switch.

## 9.check ascd clutch switch input signal circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 100 and ASCD clutch 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 10.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

### 10.check ascd clutch switch

Refer to EC-1436, "Component Inspection"

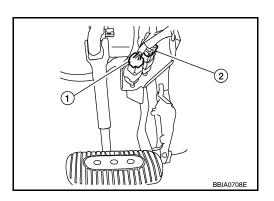
#### OK or NG

OK >> GO TO 15.

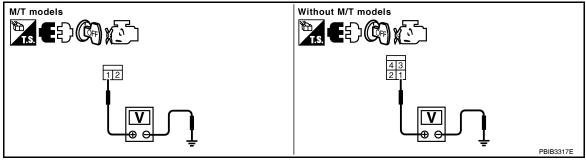
NG >> Replace ASCD clutch switch.

## 11. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 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 13.

NG >> GO TO 12.

## 12. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors M69, E7
- 10A fuse

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#### < SERVICE INFOMATION >

· 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.

# 13.check stop lamp switch input signal circuit for open and short

- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 99 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 14.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 14. CHECK STOP LAMP SWITCH

Refer to EC-1436, "Component Inspection"

#### OK or NG

OK >> GO TO 15.

NG >> Replace stop lamp switch.

## 15. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

### Component Inspection

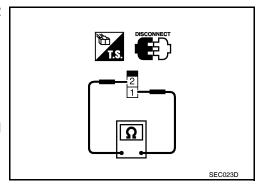
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#### ASCD BRAKE SWITCH

- 1. Turn ignition switch OFF.
- 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.

If NG, adjust ASCD brake switch installation, refer to  $\underline{\mathsf{BR-6}}$ , and perform step 3 again.



#### ASCD CLUTCH SWITCH

- Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch harness connector.

### **DTC P1572 ASCD BRAKE SWITCH**

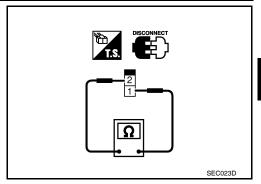
### < SERVICE INFOMATION >

[MR TYPE 2]

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

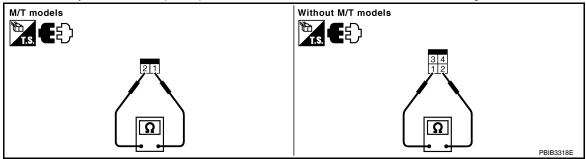
Condition	Continuity
Clutch pedal: Fully released.	Should exist.
Clutch pedal: Slightly depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to <u>CL-5</u>, and perform step 3 again.



#### STOP LAMP SWITCH

- 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.

If NG, adjust stop lamp switch installation, refer to BR-6, and perform step 3 again.

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### DTC P1574 ASCD VEHICLE SPEED SENSOR

### **Component Description**

The ECM receives two vehicle speed signals via CAN communication line. One is sent from "ABS actuator and electric unit (control unit)" or combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to <u>EC-1033</u> for ASCD functions.

### On Board Diagnosis Logic

#### INFOID:0000000004500316

INFOID:0000000004500315

#### 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-1387.
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1393.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-1395.

This self-diagnosis has the one trip detection logic.

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574 1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	Harness or connectors     (CAN communication line is open or shorted.)     Harness or connectors     (Combination meter circuit is open or shorted.)     TCM     ABS actuator and electric unit (control unit)     Combination meter     ECM

### **DTC Confirmation Procedure**

INFOID:0000000004500317

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### 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:**

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.
- 2. Drive the vehicle at more than 40 km/h (25MPH).
- Check DTC.
- If DTC is detected, go to <u>EC-1438</u>, "<u>Diagnosis Procedure</u>".

### Diagnosis Procedure

INFOID:0000000004500318

### 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-39 (A/T) or CVT-209 (CVT).

#### OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

### 2.CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT"

Refer to BRC-8.

#### OK or NG

OK >> GO TO 3.

### **DTC P1574 ASCD VEHICLE SPEED SENSOR**

[MR TYPE 2] < SERVICE INFOMATION > >> Repair or replace. NG 3. CHECK COMBINATION METER Α Check combination meter function. Refer to DI-3. EC >> INSPECTION END С  $\mathsf{D}$ Е F G Н J Κ L M Ν 0

## **DTC P1715 INPUT SPEED SENSOR (TURBINE REVOLUTION SENSOR)**

< SERVICE INFOMATION >

[MR TYPE 2]

## DTC P1715 INPUT SPEED SENSOR (TURBINE REVOLUTION SENSOR)

Description INFOID:000000004500319

ECM receives turbine revolution sensor signal from TCM through CAN communication line. ECM uses this signal for engine control.

#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004500320

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
I/P PULLY SPD	Vehicle speed: More than 20 km/h (12MPH)	Almost the same speed as the tachometer indication

### On Board Diagnosis Logic

INFOID:0000000004500321

#### 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-1293.
- If DTC P1715 is displayed with DTC P0340 first perform the trouble diagnosis for DTC P0340.
   Refer to EC-1299.
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1393.
- If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-1395</u>.

The MIL will not lights up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715 1715	Input speed sensor (Turbine revolution sen- sor) (TCM output)	Turbine revolution sensor signal is different from the theoretical value calculated by ECM from revolution sensor signal and engine rpm signal.	Harness or connectors (CAN communication line is open or shorted) Harness or connectors (Turbine revolution sensor circuit is open or shorted) TCM

### Diagnosis Procedure

INFOID:0000000004500322

### 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-39.

#### OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

#### 2.REPLACE TCM

Replace TCM. Refer to AT-42.

#### >> INSPECTION END

# DTC P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

[MR TYPE 2] < SERVICE INFOMATION >

# DTC P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

Description INFOID:0000000004500323

ECM receives primary speed sensor signal from TCM through CAN communication line.

### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

INFOID:0000000004500324

INFOID:0000000004500325

MONITOR ITEM	CONDITION	SPECIFICATION
I/P PULLY SPD	Vehicle speed: More than 20 km/h (12MPH)	Almost the same speed as the tachometer indication

# On Board Diagnosis 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 <u>EC-1293</u>.
- If DTC P1715 is displayed with DTC P0340 first perform the trouble diagnosis for DTC P0340. Refer to EC-1299.
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1393.
- If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-1395</u>.

The MIL will not lights up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715 1715	Input speed sensor (Primary speed sensor) (TCM output)	Primary speed sensor signal is different from the theoretical value calculated by ECM from secondary speed sensor signal and engine rpm signal.	Harness or connectors     (CAN communication line is open or shorted)     Harness or connectors     (Primary speed sensor circuit is open or shorted)     TCM

#### **DTC Confirmation Procedure**

#### INFOID:0000000004500326

#### **CAUTION:**

#### Always drive vehicle at a safe speed.

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

- Start engine.
- Drive vehicle at a speed of more than 50 km/h (31 MPH) for at least 5 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to EC-1441, "Diagnosis Procedure".

# Diagnosis Procedure

#### INFOID:0000000004500327

# CHECK DTC WITH TCM

Check DTC with TCM. Refer to CVT-209.

### OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

# 2.REPLACE TCM

Replace TCM. Refer to CVT-340, "Removal and Installation".

EC-1441

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# DTC P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

< SERVICE INFOMATION > [MR TYPE 2]

>> INSPECTION END

< SERVICE INFOMATION > [MR TYPE 2]

# DTC P1805 BRAKE SWITCH

Description INFOID:000000004500328

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

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### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	Ignition switch: ON	Brake pedal: Fully released	OFF
	9 Igrition switch. ON	Brake pedal: Slightly depressed	ON

# On Board Diagnosis Logic

INFOID:0000000004500330

INFOID:0000000004500329

The MIL will not light up for this self-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 driving.	Harness or connectors     (Stop lamp switch circuit is open or shorted.)     Stop lamp switch

#### **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters in fail-safe mode.

Engine operation condi	tion in fail-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	
Engine: Idling	Normal	
Accelerating	Poor acceleration	

### **DTC Confirmation Procedure**

INFOID:0000000004500331

- 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.
- If 1st trip DTC is detected, go to <u>EC-1445</u>, "<u>Diagnosis Procedure</u>".

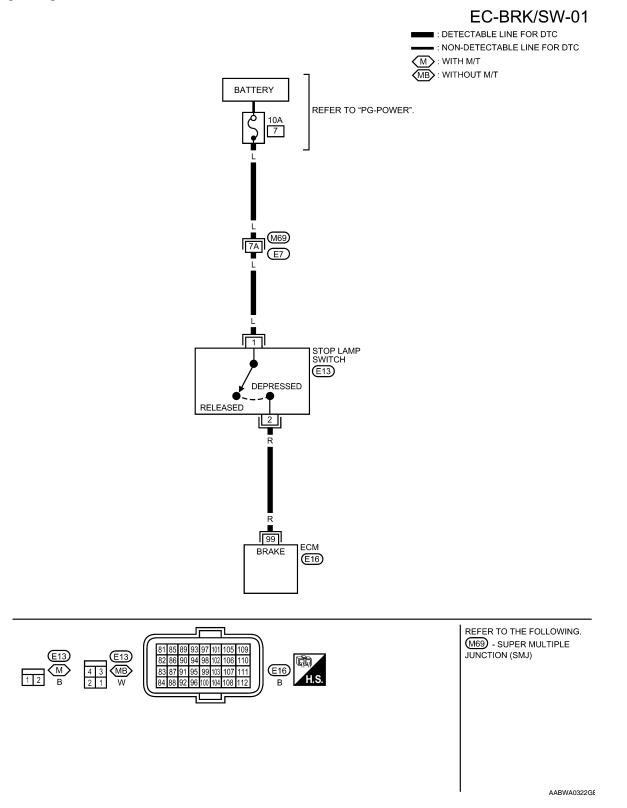
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Wiring Diagram INFOID:0000000004500332



Specification data are reference values and are measured between each terminal and ground.

### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

[MR TYPE 2]

#### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
99 R	Stop lamp switch	[Ignition switch: OFF]  • Brake pedal: Fully released	Approximately 0V	
		[Ignition switch: OFF]  • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)	

# **Diagnosis Procedure**

INFOID:0000000004500333

# 1. CHECK STOP LAMP SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check the stop lamp when depressing and releasing the brake pedal.

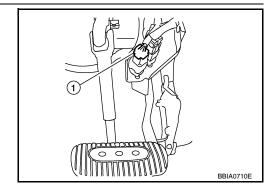
Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

#### OK or NG

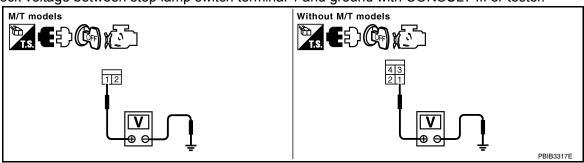
OK >> GO TO 4. NG >> GO TO 2.

# 2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Disconnect stop lamp switch (1) harness connector.
- Brake pedal (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.

- · Harness connectors M69, E7
- 10A fuse
- · Harness for open and short between stop lamp switch and battery

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>> Repair open circuit or short to ground or short to power in harness or connectors.

# 4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect stop lamp switch (1) harness connector.
- 2. Disconnect ECM harness connector.
- Check harness continuity between stop lamp switch terminal 2 and ECM terminal 99. 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 connectors.

# 5. CHECK STOP LAMP SWITCH

Refer to EC-1446, "Component Inspection".

#### OK or NG

OK >> GO TO 6.

NG >> Replace stop lamp switch.

# 6. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

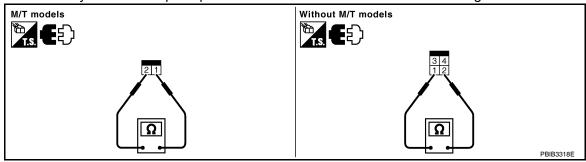
#### >> INSPECTION END

# Component Inspection

INFOID:0000000004500334

## 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.

If NG, adjust stop lamp switch installation, refer to BR-6, and perform step 3 again.

### DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< SERVICE INFOMATION >

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

# Component Description

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.

# CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	Ignition switch: ON	ON

## On Board Diagnosis Logic

These self-diagnoses have one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100 2100	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	Harness or connectors     (Throttle control motor relay circuit is open)     Throttle control motor relay
P2103 2103	Throttle control motor relay circuit short	ECM detects 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 lights up.

### 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

#### 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 DTC P2100

- Turn ignition switch ON and wait at least 2 seconds.
- Start engine and let it idle for 5 seconds.
- Check 1st trip DTC.
- If DTC is detected, go to EC-1449, "Diagnosis Procedure".

#### PROCEDURE FOR DTC P2103

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

- Turn ignition switch ON and wait at least 1 second.
- Check DTC.
- If DTC is detected, go to EC-1449, "Diagnosis Procedure".

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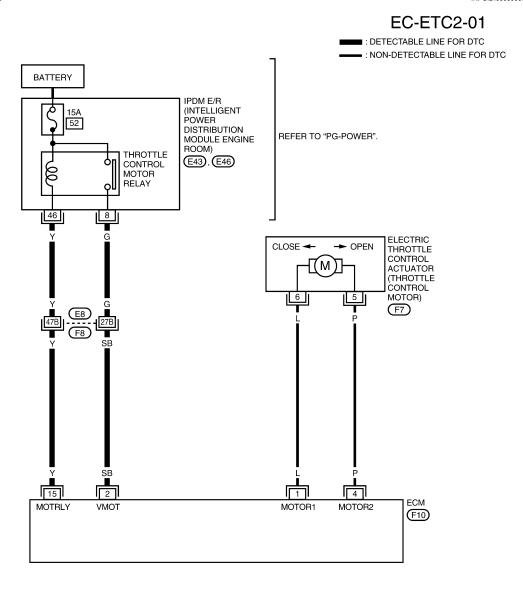
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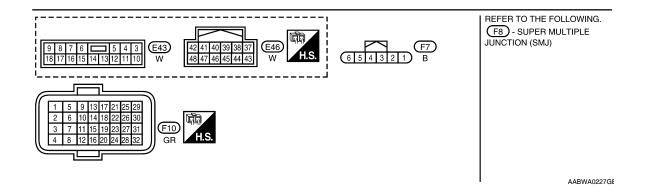
Wiring Diagram

< SERVICE INFOMATION >

INFOID:0000000004500339

[MR TYPE 2]





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< SERVICE INFOMATION >

[MR TYPE 2]

INFOID:0000000004500340

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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.

TERMI-					
NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	EC
1	L	Throttle control motor (Open)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully depressed	Approximately 3.2V	C
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Е
4	Р	Throttle control motor (Close)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully released	Approximately 1.8V  → SV/Div 1ms/Div T  PBIA8149J	F
-				BATTERY VOLTAGE	Н
15	Υ	Throttle control motor relay	[Ignition switch: OFF]	(11 - 14V)	
			[Ignition switch: ON]	0 - 1.0V	

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

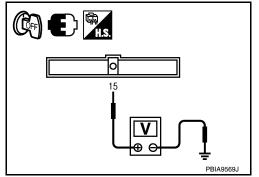
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Check voltage between ECM terminal 15 and ground with CON-SULT-III or tester.

#### **Voltage: Battery voltage**

#### OK or NG

OK >> GO TO 5. NG >> GO TO 2.



# 2.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E46.
- Check continuity between ECM terminal 15 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 4.

NG >> GO TO 3.

EC-1449

# DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< SERVICE INFOMATION >

[MR TYPE 2]

# 3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- · 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 15A fuse.
- 2. Check 15A fuse for blown.

#### OK or NG

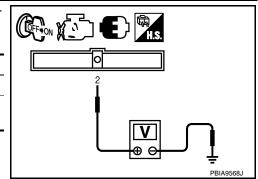
OK >> GO TO 8.

NG >> Replace 15A fuse.

# 5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check voltage between ECM terminal 2 and ground under the following conditions with CONSULT-III or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)



#### 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.
- Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector E43.
- Check continuity between ECM terminal 2 and IPDM E/R terminal 8. 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.

#### .DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- 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-1138.

### 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.

< SERVICE INFOMATION > [MR TYPE 2]

# DTC P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description INFOID:000000004500341

#### NOTE:

If DTC P2101 is displayed with DTC P2100 or P2119, first perform the trouble diagnosis for DTC P2100 or P2119. Refer to <u>EC-1447</u>or <u>EC-1462</u>.

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

# On Board Diagnosis Logic

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, the ECM enters fail-safe mode and the MIL lights up.

#### 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**

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 11V when engine is running.

- 1. Turn ignition switch ON and wait at least 2 seconds.
- Start engine and let it idle for 5 seconds.
- 3. Check DTC.
- 4. If DTC is detected, go to <a href="EC-1453">EC-1453</a>, "Diagnosis Procedure".

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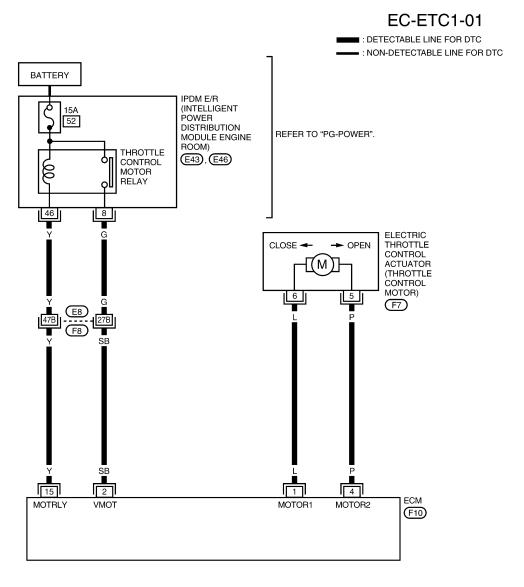
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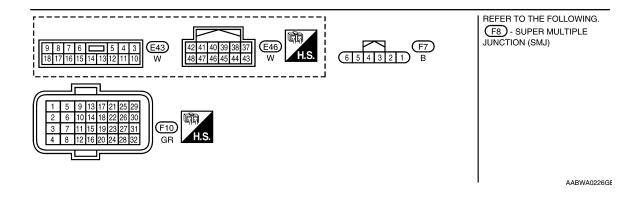
Wiring Diagram

< SERVICE INFOMATION >

INFOID:0000000004500344

[MR TYPE 2]





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

< SERVICE INFOMATION >

[MR TYPE 2]

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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.

TERMI-					
NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	EC
1	L	Throttle control motor (Open)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	Approximately 3.2V  >> 5V/Div 1ms/Div T  PBIA8150J	C
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Е
4	Р	Throttle control motor (Close)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully released	Approximately 1.8V	F G
-				PBIA8149J	
15	Υ	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)	Н
		[Ignition switch: ON]	0 - 1.0V		

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

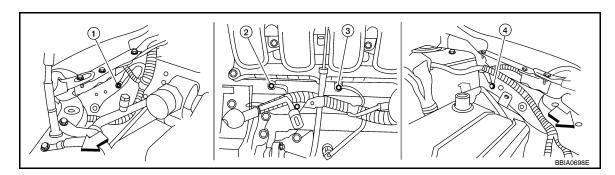
# Diagnosis Procedure

INFOID:0000000004500345

# 1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

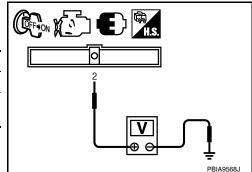
2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

#### < SERVICE INFOMATION >

[MR TYPE 2]

Check voltage between ECM terminal 2 and ground under the following conditions with CONSULT-III or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)



#### 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 E43.
- 4. Check continuity between ECM terminal 2 and IPDM E/R terminal 8. 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 E8, F8
- 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.

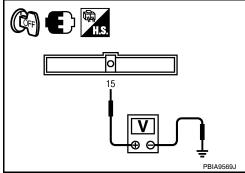
# 5. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Reconnect all harness connectors disconnected.
- Check voltage between ECM terminal 15 and ground with CON-SULT-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 E46.
- Check harness continuity between ECM terminal 15 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 8. NG >> GO TO 7.

< SERVICE INFOMATION >

[MR TYPE 2]

# 7.DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- 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 15A fuse.
- 2. Check 15A fuse for blown.

#### OK or NG

OK >> GO TO 9.

NG >> Replace 15A fuse.

# 9. CHECK INTERMITTENT INCIDENT

#### Refer to EC-1138.

#### OK or NG

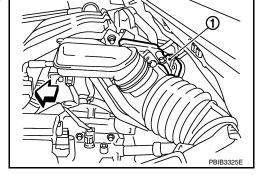
OK >> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R".

NG >> Repair or replace harness or connectors.

# 10.check throttle control motor output signal circuit for open or short

- 1. Turn ignition switch OFF.
- Disconnect electric throttle control actuator (1) harness connector.
- : Vehicle front
- 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	1	Should not exist.
	4	Should exist.
6	1	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.

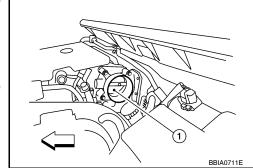
# 11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Remove the intake air duct.
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.
- : Vehicle front

#### 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

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### < SERVICE INFOMATION >

Refer to EC-1456, "Component Inspection".

#### OK or NG

OK >> GO TO 13.

>> GO TO 14. NG

# 13. CHECK INTERMITTENT INCIDENT

#### Refer to EC-1138.

#### OK or NG

OK >> GO TO 14.

NG >> Repair or replace harness or connectors.

# 14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- Perform <u>EC-1084</u>, "<u>Throttle Valve Closed Position Learning</u>". Perform <u>EC-1084</u>, "<u>Idle Air Volume Learning</u>".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004500346

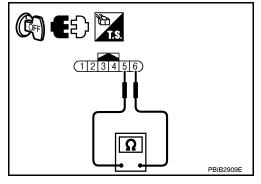
[MR TYPE 2]

#### THROTTLE CONTROL MOTOR

- Disconnect electric throttle control actuator harness connector.
- Check resistance between terminals 5 and 6.

# Resistance: Approximately 1 - 15 $\Omega$ [at 25 °C (77°F)]

- If NG, replace electric throttle control actuator and go to next step.
- 4. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 5. Perform EC-1084, "Idle Air Volume Learning".



### Removal and Installation

INFOID:0000000004500347

ELECTRIC THROTTLE CONTROL ACTUATOR Refer to EM-141.

### **DTC P2118 THROTTLE CONTROL MOTOR**

< SERVICE INFOMATION >

[MR TYPE 2]

# DTC P2118 THROTTLE CONTROL MOTOR

# **Component Description**

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The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

# On Board Diagnosis Logic

INFOID:0000000004500349

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 lights up.

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:0000000004500350

#### 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.

- 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-1459, "Diagnosis Procedure".

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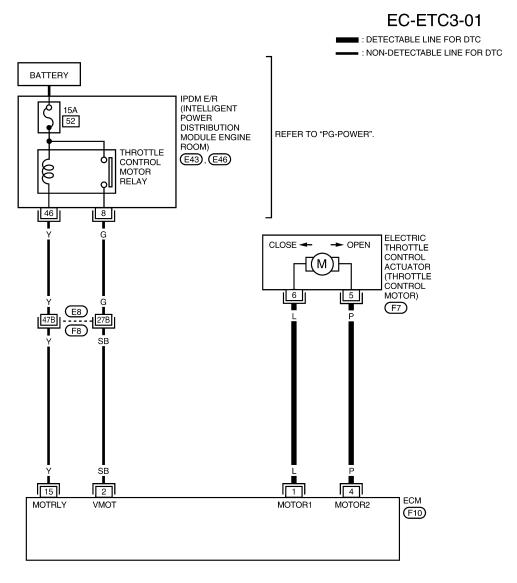
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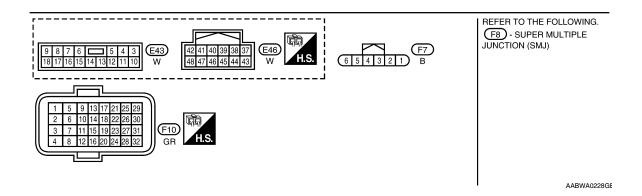
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Wiring Diagram

INFOID:0000000004500351





Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III.

CAUTION:

[MR TYPE 2]

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	Ε
1	L	Throttle control motor (Open)	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	Approximately 3.2V  SV/Div 1ms/Div T  PBIA8150J	
2	SB	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	
4	Р	Throttle control motor (Close)	[Ignition switch: ON]  • Engine stopped  • Shift lever: D (A/T, CVT), 1st (M/T)  • Accelerator pedal: Fully released	Approximately 1.8V	(
15	Y	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)	
		[Ignition switch: ON]	0 - 1.0V		

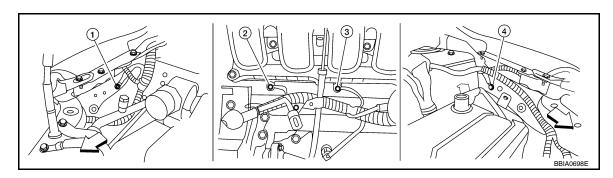
<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

Turn ignition switch OFF.

2. Loosen and retighten engine screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24

Body ground E15

- Engine ground F9
- Engine ground F16

OK or NG

4.

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

EC-1459

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INFOID:0000000004500352

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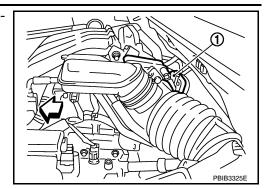
### **DTC P2118 THROTTLE CONTROL MOTOR**

#### < SERVICE INFOMATION >

[MR TYPE 2]

- Disconnect electric throttle control actuator (1) harness connector.
- : Vehicle front
- 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	1	Should not exist.
	4	Should exist.
6	1	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 open circuit or short to ground or short to power in harness or connectors.

# 3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1460, "Component Inspection".

#### OK or NG

OK >> GO TO 4. NG >> GO TO 5.

### 4. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### 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-1084, "Throttle Valve Closed Position Learning".
- 3. Perform EC-1084, "Idle Air Volume Learning".

#### >> INSPECTION END

# Component Inspection

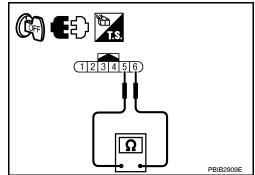
INFOID:0000000004501214

# THROTTLE CONTROL MOTOR

- 1. Disconnect electric throttle control actuator harness connector.
- 2. Check resistance between terminals 5 and 6.

# Resistance: Approximately 1 - 15 $\Omega$ [at 25 °C (77°F)]

- 3. If NG, replace electric throttle control actuator and go to next step.
- 4. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 5. Perform EC-1084, "Idle Air Volume Learning".



Removal and Installation

INFOID:0000000004501215

# **DTC P2118 THROTTLE CONTROL MOTOR**

< SERVICE INFOMATION > [MR TYPE 2]

Refer to EM-141.

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#### DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< SERVICE INFOMATION >

[MR TYPE 2]

# DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

# Component Description

INFOID:0000000004500355

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## On Board Diagnosis Logic

INFOID:0000000004500356

#### This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P2119	Electric throttle control	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	
2119	actuator	B)	Throttle valve opening angle in fail-safe mode is not in specified range.	Electric throttle control actuator
		C)	ECM detects the throttle valve is stuck open.	

#### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode		
Malfunction A	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 N or P position (A/T, CVT), neutral (M/T), and engine speed will not exceed 1,000 rpm or more.		

### **DTC Confirmation Procedure**

INFOID:000000000450035

#### 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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

#### PROCEDURE FOR MALFUNCTION A AND B

- Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to D position (A/T, CVT) or 1st position (M/T), and wait at least 3 seconds.
- 3. Set shift lever to P position (A/T, CVT) or Neutral position (M/T).
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON and wait at least 1 second.
- 6. Set shift lever to D position (A/T, CVT) or 1st position (M/T), and wait at least 3 seconds.
- 7. Set shift lever to P position (A/T, CVT) or Neutral position (M/T).
- 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-1463, "Diagnosis Procedure".

#### PROCEDURE FOR MALFUNCTION C

- Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to D position (A/T, CVT) or 1st position (M/T) and wait at least 3 seconds.

### DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

[MR TYPE 2] < SERVICE INFOMATION >

- Set shift lever to N, P position (A/T, CVT) or Neutral (M/T) position.
- 4. Start engine and let it idle for 3 seconds.
- 5. Check DTC.
- If DTC is detected, go to <u>EC-1463</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

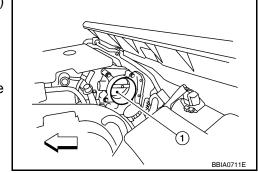
1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if a foreign matter is caught between the throttle valve (1) and the housing.
- : Vehicle front

#### 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

- Replace the electric throttle control actuator.
- 2. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 3. Perform EC-1084, "Idle Air Volume Learning".

#### >> INSPECTION END

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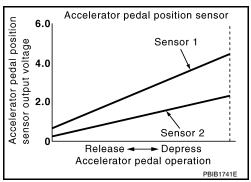
INFOID:0000000004500359

# DTC P2122, P2123 APP SENSOR

# Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM Leaves this signal for the engine operation such as fuel cut.

#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004500360

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 1	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9V
		Accelerator pedal: Fully depressed	3.9 - 4.8V
CISD THE POS   °	Ignition switch: ON	Accelerator pedal: Fully released	ON
	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF

<sup>\*:</sup> Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

# On Board Diagnosis Logic

INFOID:0000000004500361

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-1396.

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.)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	Accelerator pedal position sensor (APP sensor 1)

### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

#### Engine operating condition in fail-safe mode

# **DTC Confirmation Procedure**

INFOID:0000000004500362

#### NOTE:

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.

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

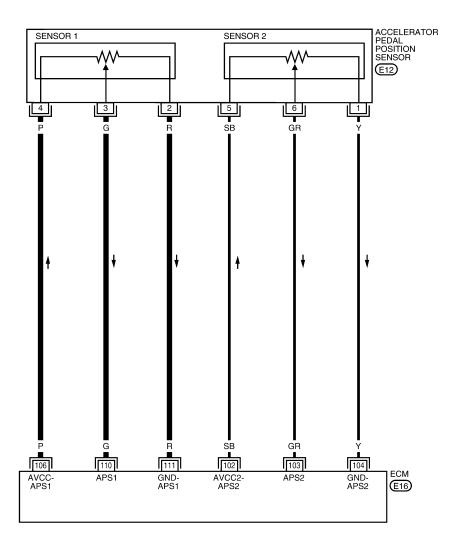
- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1466, "Diagnosis Procedure".

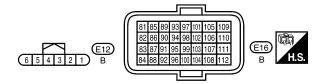
# Wiring Diagram

INFOID:000000004500363

# EC-APPS1-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

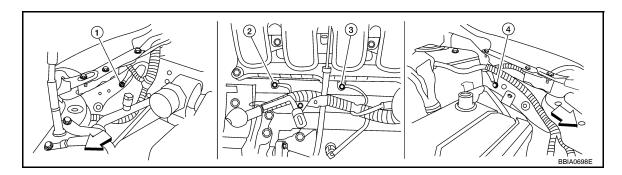
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
103	GR	Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	GIC		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Y	Sensor ground (APP sensor 2)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
110	G	Accelerator pedal position	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110	G	sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	R	Sensor ground (APP sensor 1)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V

# Diagnosis Procedure

INFOID:0000000004500364

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

### 4. Body ground E15

#### OK or NG

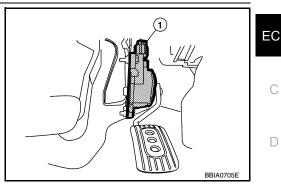
OK >> GO TO 2.

[MR TYPE 2] < SERVICE INFOMATION >

NG >> Repair or replace ground connections.

# 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect accelerator pedal position (APP) sensor (1) harness connector.
- 2. Turn ignition switch ON.



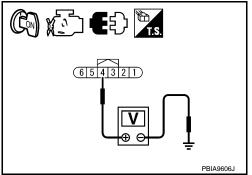
3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



# ${f 3}$ .CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 111 and APP sensor 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

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# f 4.CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 110 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

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# 5. CHECK APP SENSOR

Refer to EC-1468, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

## **O.**REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

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#### < SERVICE INFOMATION >

- Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 3. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 4. Perform EC-1084, "Idle Air Volume Learning".

#### >> INSPECTION END

# 7. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

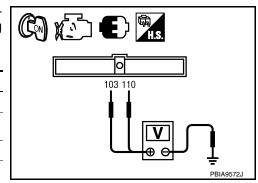
# Component Inspection

INFOID:0000000004500365

#### ACCELERATOR PEDAL POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- Check voltage between ECM terminals 110 (APP sensor 1 signal), 103 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
110	Fully released	0.6 - 0.9V
(Accelerator pedal position sensor 1)	Fully depressed	3.9 - 4.7V
103	Fully released	0.3 - 0.6V
(Accelerator pedal position sensor 2)	Fully depressed	1.95 - 2.4V



- 4. If NG, replace accelerator pedal assembly and go to next step.
- 5. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 7. Perform EC-1084, "Idle Air Volume Learning".

### Removal and Installation

INFOID:0000000004500366

ACCELERATOR PEDAL

Refer to ACC-3.

INFOID:0000000004501216

INFOID:0000000004501217

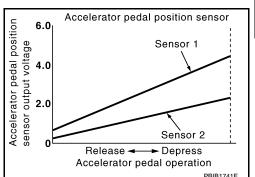
# DTC P2127, P2128 APP SENSOR

# Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



## CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCLL SEN 1	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2*	Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 2		Accelerator pedal: Fully depressed	3.9 - 4.8V
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Fully released	ON
	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF

<sup>\*:</sup> Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

# On Board Diagnosis Logic

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.)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	<ul> <li>[Crankshaft position sensor (POS) circuit is shorted.]</li> <li>(EVAP control system pressure sensor circuit is shorted.)</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>EVAP control system pressure sensor</li> <li>Accelerator pedal position sensor (APP sensor 2)</li> <li>Crankshaft position sensor (POS)</li> <li>Refrigerant pressure sensor</li> </ul>

#### **FAIL-SAFE MODE**

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

#### Engine operating condition in fail-safe mode

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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 P2127, P2128 APP SENSOR

< SERVICE INFOMATION >

[MR TYPE 2]

# **DTC Confirmation Procedure**

INFOID:0000000004500370

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1472. "Diagnosis Procedure".

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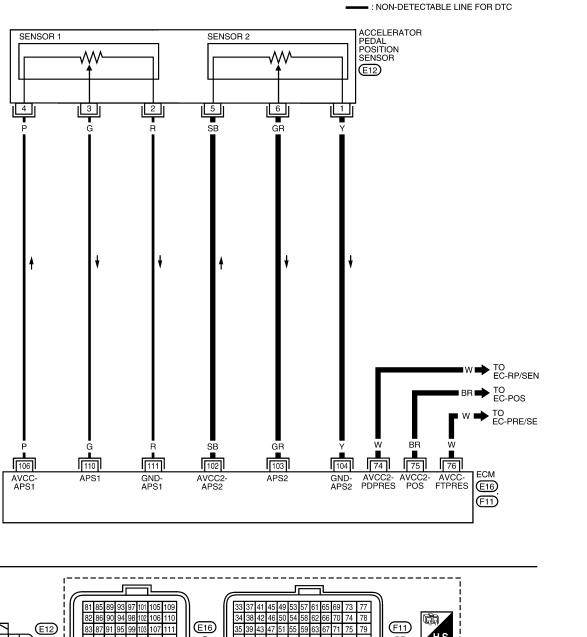
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Wiring Diagram

INFOID:0000000004500371

## EC-APPS2-01

■ : DETECTABLE LINE FOR DTC



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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

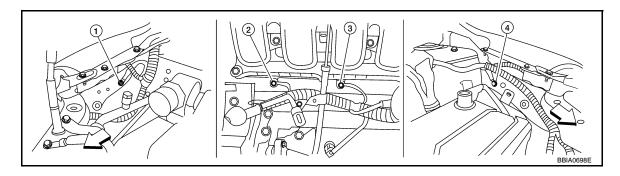
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
103	GR	Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	GK		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Υ	Sensor ground (APP sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
110		Accelerator pedal position	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110	G	sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	R	Sensor ground (APP sensor 1)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

# Diagnosis Procedure

INFOID:0000000004500372

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- 2. Loosen and retighten ground screws on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- : Vehicle front
- 1. Body ground E24
- 4. Body ground E15
- 2. Engine ground F9
- 3. Engine ground F16

< SERVICE INFOMATION > [MR TYPE 2]

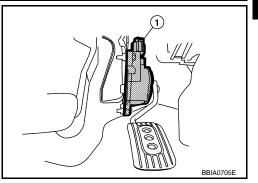
#### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

# 2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Disconnect accelerator pedal position (APP) sensor (1) harness connector.
- 2. Turn ignition switch ON.

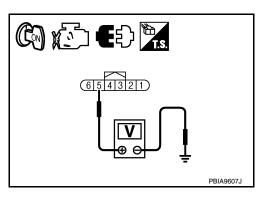


3. Check voltage between APP sensor terminal 5 and ground with CONSULT-III or tester.

### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 6. NG >> GO TO 3.



# 3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between APP sensor terminal 5 and ECM terminal 102. Refer to Wiring Diagram.

### **Continuity should exist.**

#### 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 COMPONENTS POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1528, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-1294, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-1353, "Wiring Diagram"
102	APP sensor terminal 5	EC-1471, "Wiring Diagram"

#### OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

## **5.**CHECK COMPONENTS

#### Check the following.

- Crankshaft position sensor (POS) (Refer to EC-1298, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-1350, "Component Inspection".)

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### DTC P2127, P2128 APP SENSOR

#### < SERVICE INFOMATION >

**IMR TYPE 21** 

Refrigerant pressure sensor (Refer to MTC-37.)

#### OK or NG

OK >> GO TO 10.

NG >> Replace malfunctioning component.

# 6.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 104 and APP sensor 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 7.

>> Repair open circuit or short to ground or short to power in harness or connectors. NG

# .CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between ECM terminal 103 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 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# 8.CHECK APP SENSOR

Refer to EC-1474, "Component Inspection".

#### OK or NG

OK >> GO TO 10.

NG >> GO TO 9.

# 9.replace accelerator pedal assembly

- Replace accelerator pedal assembly.
- Perform <u>EC-1084</u>, "Accelerator Pedal Released Position Learning". Perform <u>EC-1084</u>, "Throttle Valve Closed Position Learning".
- 4. Perform EC-1084, "Idle Air Volume Learning".

#### >> INSPECTION END

# 10. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

# Component Inspection

INFOID:0000000004501221

#### ACCELERATOR PEDAL POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- Turn ignition switch ON.

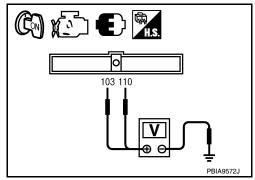
# DTC P2127, P2128 APP SENSOR

#### < SERVICE INFOMATION >

[MR TYPE 2]

Check voltage between ECM terminals 110 (APP sensor 1 signal), 103 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
110	Fully released	0.6 - 0.9V
(Accelerator pedal position sensor 1)	Fully depressed	3.9 - 4.7V
103	Fully released	0.3 - 0.6V
(Accelerator pedal position sensor 2)	Fully depressed	1.95 - 2.4V



- 4. If NG, replace accelerator pedal assembly and go to next step.
- 5. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 7. Perform EC-1084, "Idle Air Volume Learning".

#### Removal and Installation

ACCELERATOR PEDAL

Refer to ACC-3.

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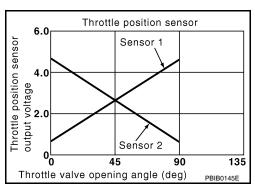
INFOID:0000000004501174

## DTC P2135 TP SENSOR

# Component Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of 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.



#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004501175

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TD CEN 4 D4	Ignition switch: ON     (Facing about 1)	Accelerator pedal: Fully released	More than 0.36V
TP SEN 1-B1 TP SEN 2-B1*	<ul><li>(Engine stopped)</li><li>Shift lever: D (A/T, CVT),</li><li>1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75V

<sup>\*:</sup> Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

INFOID:0000000004500377

This self-diagnosis has the one trip detection logic.

NOTE:

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to  $\frac{\text{EC-1396}}{\text{EC-1396}}$ .

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.)     Electric throttle control actuator     (TP sensor 1 and 2)

#### **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

#### 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:0000000004500378

#### 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.

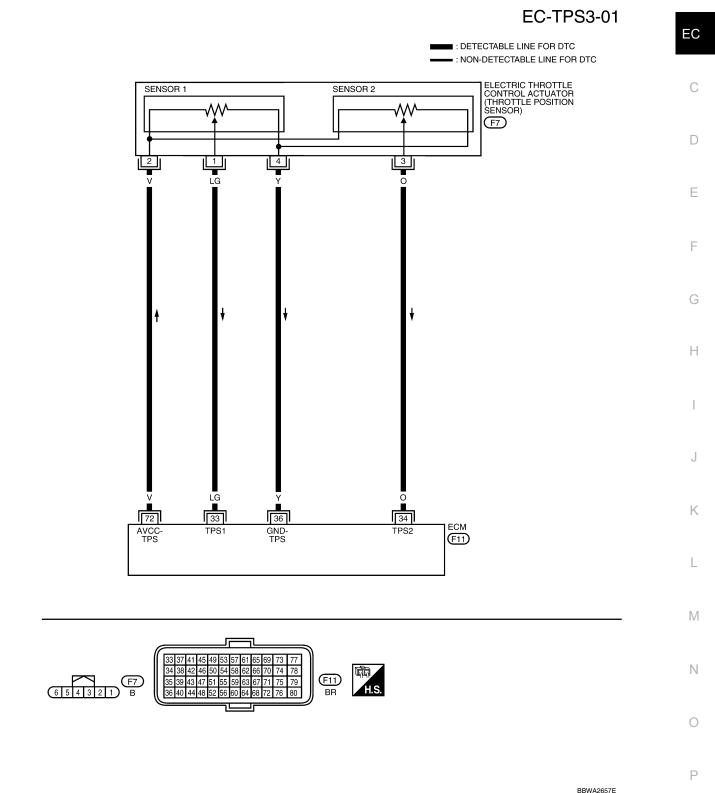
#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

3. If DTC is detected, go to EC-1478, "Diagnosis Procedure".

# Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

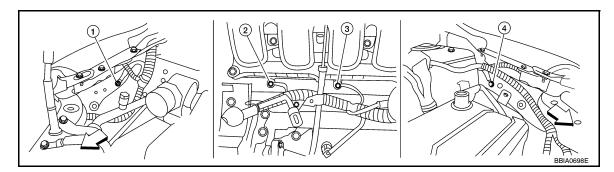
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
22	10	Throttle position concer 1	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	More than 0.36V	
33 LG	LG	Throttle position sensor 1	[Ignition switch: ON] • Engine stopped • Shift lever: D (A/T, CVT), 1st (M/T) • Accelerator pedal: Fully depressed	Less than 4.75V  Less than 4.75V	
	Accelerator pedal: Fully release		Less than 4.75V		
34	0	Throttle position sensor 2	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Shift lever: D (A/T, CVT), 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36V	
36	Y	Sensor ground (Throttle position sensor)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V	
72	V	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V	

## Diagnosis Procedure

INFOID:0000000004500380

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Loosen and retighten ground screw on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- 2. Engine ground F9
- 3. Engine ground F16

4. Body ground E15

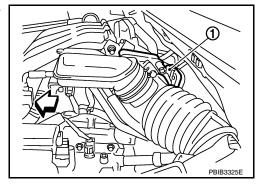
#### OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.
- 2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

[MR TYPE 2] < SERVICE INFOMATION >

Disconnect electric throttle control actuator (1) harness connec-

- : Vehicle front
- 2. Turn ignition switch ON.



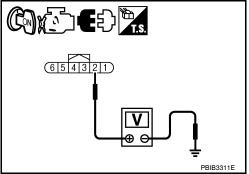
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT-III or tester.

#### Voltage: Approximately 5V

#### OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



# ${f 3.}$ CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 36. 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.

## $oldsymbol{4}.$ CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between the following; electric throttle control actuator terminal 1 and ECM terminal 33, electric throttle control actuator terminal 3 and ECM terminal 34. 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 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-1480, "Component Inspection".

#### OK or NG

OK >> GO TO 7. NG >> GO TO 6.

## $\mathsf{6}.\mathsf{REPLACE}$ ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace the electric throttle control actuator.
- 2. Perform EC-1084, "Throttle Valve Closed Position Learning".

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Perform <u>EC-1084</u>, "Idle Air Volume Learning".

#### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

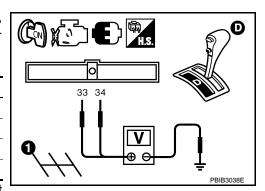
## Component Inspection

#### INFOID:0000000004501176

#### THROTTLE POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 3. Turn ignition switch ON.
- 4. Set shift lever to D position (A/T, CVT) or 1st position (M/T).
- Check voltage between ECM terminals 33 (TP sensor 1 signal), 34 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
33	Fully released	More than 0.36V
(Throttle position sensor 1)	Fully depressed	Less than 4.75V
34	Fully released	Less than 4.75V
(Throttle position sensor 2)	Fully depressed	More than 0.36V



- 6. If NG, replace electric throttle control actuator and go to the next step.
- 7. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 8. Perform EC-1084, "Idle Air Volume Learning".

#### Removal and Installation

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#### ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-141, "Removal and Installation".

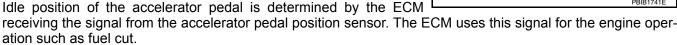
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#### DTC P2138 APP SENSOR

## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Accelerator pedal position sensor Sensor 1 Sensor 2 → Depress Release -Accelerator pedal operation

#### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN I	(Engine stopped)		
ACCEL SEN 2*	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V
CLSD THL POS	(Facine at a seed)	Accelerator pedal: Fully released	ON
CLSD THE FOS		Accelerator pedal: Slightly depressed	OFF

<sup>\*:</sup> Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

## On Board Diagnosis Logic

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-1396.

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 and 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.)  Accelerator pedal position sensor (APP sensor 1 and 2) Crankshaft position sensor (POS) EVAP control system pressure sensor Refrigerant pressure sensor

#### FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

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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:0000000004500386

#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.
- 3. If DTC is detected, go to EC-1484, "Diagnosis Procedure".

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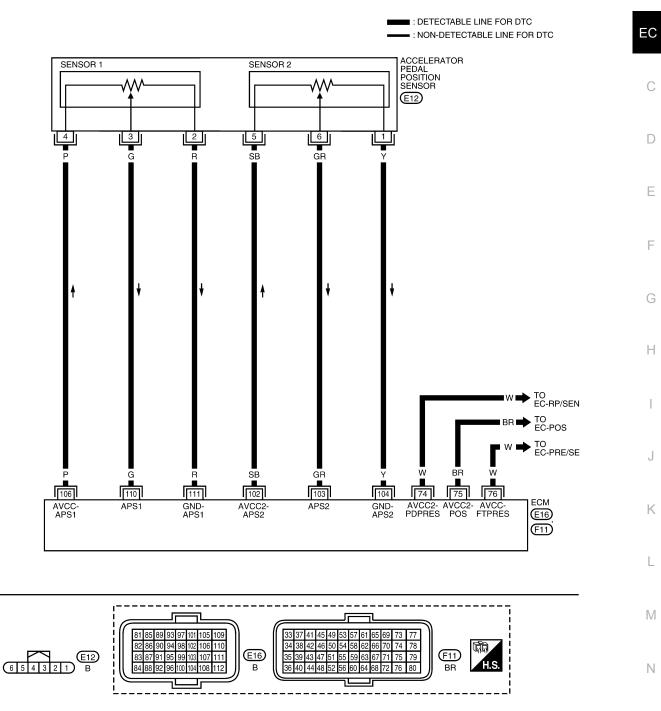
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Wiring Diagram

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## EC-APPS3-01



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

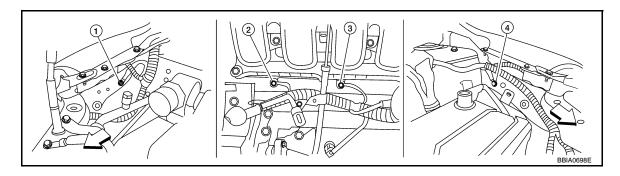
	1			
TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V
75	BR	Sensor power supply [Crankshaft position sensor (POS)]	[Ignition switch: ON]	Approximately 5V
76	W	EVAP control system pres- sure sensor power supply	[Ignition switch: ON]	Approximately 5V
102	SB	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
102	CD	Accelerator pedal position sensor 2	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
103	103 GR		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Υ	Sensor ground (APP sensor 2)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
106	Р	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
110	G	Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
110	( -		[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	R	Sensor ground (APP sensor 1)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V

# Diagnosis Procedure

INFOID:0000000004500388

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to <u>EC-1144</u>, "Ground Inspection".



- : Vehicle front
- 1. Body ground E24
- 4. Body ground E15
- 2. Engine ground F9
- 3. Engine ground F16

#### < SERVICE INFOMATION >

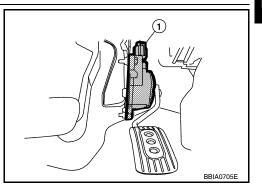
#### OK or NG

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.



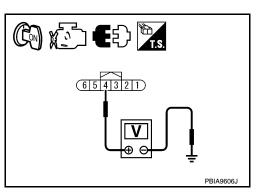
3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



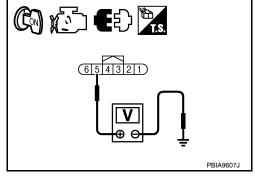
# 3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch ON.
- Check voltage between APP sensor terminal 5 and ground with CONSULT-III or tester.

#### **Voltage: Approximately 5V**

#### OK or NG

OK >> GO TO 7. NG >> GO TO 4.



## 4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between APP sensor terminal 5 and ECM terminal 102. Refer to Wiring Diagram.

#### Continuity should exist.

#### 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 COMPONENTS POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

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ECM terminal	Sensor terminal	Reference Wiring Diagram
74	Refrigerant pressure sensor terminal 3	EC-1528, "Wiring Diagram"
75	Crankshaft position sensor (POS) terminal 1	EC-1294, "Wiring Diagram"
76	EVAP control system pressure sensor terminal 3	EC-1353, "Wiring Diagram"
102	APP sensor terminal 5	EC-1483, "Wiring Diagram"

#### OK or NG

OK >> GO TO 6.

NG >> Repair short to ground or short to power in harness or connectors.

## 6. CHECK COMPONENTS

#### Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-1298, "Component Inspection"</u>.)
- EVAP control system pressure sensor (Refer to EC-1350, "Component Inspection".)
- Refrigerant pressure sensor (Refer to MTC-37.)

#### OK or NG

OK >> GO TO 11.

NG >> Replace malfunctioning component.

## 7.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between the following;

ECM terminal 111 and APP sensor terminal 2,

ECM terminal 104 and APP sensor 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 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check harness continuity between the following;

ECM terminal 110 and APP sensor terminal 3.

ECM terminal 103 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 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

#### 9.CHECK APP SENSOR

Refer to EC-1487, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> GO TO 10.

# 10. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Perform EC-1084, "Accelerator Pedal Released Position Learning".
- Perform EC-1084, "Throttle Valve Closed Position Learning".
- 4. Perform EC-1084, "Idle Air Volume Learning".

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#### >> INSPECTION END

# 11. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

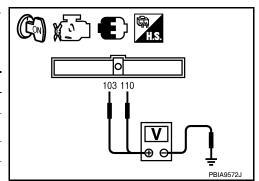
#### >> INSPECTION END

## Component Inspection

#### ACCELERATOR PEDAL POSITION SENSOR

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- Check voltage between ECM terminals 110 (APP sensor 1 signal), 103 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
110	Fully released	0.6 - 0.9V
(Accelerator pedal position sensor 1)	Fully depressed	3.9 - 4.7V
103	Fully released	0.3 - 0.6V
(Accelerator pedal position sensor 2)	Fully depressed	pased 0.6 - 0.9V ressed 3.9 - 4.7V pased 0.3 - 0.6V



- 4. If NG, replace accelerator pedal assembly and go to next step.
- 5. Perform <u>EC-1084</u>, "Accelerator Pedal Released Position Learning".
- 6. Perform EC-1084, "Throttle Valve Closed Position Learning".
- 7. Perform EC-1084, "Idle Air Volume Learning".

#### Removal and Installation

ACCELERATOR PEDAL

Refer to ACC-3.

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#### DTC P2A00 A/F SENSOR 1

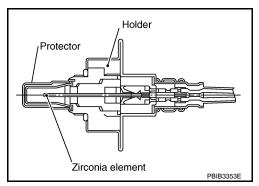
## **Component Description**

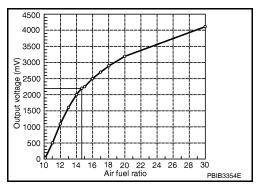
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement  $\blacksquare$  = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide  $\blacksquare$  range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).





## CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004501226

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2V

## On Board Diagnosis Logic

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To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not to be shifted to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P2A00 2A00	Air fuel ratio (A/F) sensor 1 circuit range/performance	<ul> <li>The output voltage computed by ECM from the A/F sensor 1 signal is shifted to the lean side for a specified period.</li> <li>The A/F signal computed by ECM from the A/F sensor 1 signal is shifted to the rich side for a specified period.</li> </ul>	<ul> <li>Air fuel ratio (A/F) sensor 1</li> <li>Air fuel ratio (A/F) sensor 1 heater</li> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

#### **DTC Confirmation Procedure**

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#### 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:**

Before performing the following procedure, confirm that battery voltage is more than 11V 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.

#### DTC P2A00 A/F SENSOR 1

## < SERVICE INFOMATION > [MR TYPE 2]

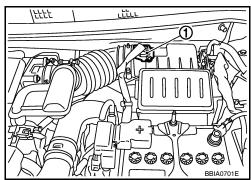
3. Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CON-SULT-III.

- Clear the self-learning coefficient by touching "CLEAR".
- 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 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- 9. Check 1st trip DTC.
- 10. If 1st trip DTC is detected, go to EC-1491, "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 harness connector.
- 4. Start engine and let it idle for at least 5 seconds.
- 5. Stop engine and reconnect mass air flow sensor (1) harness connector.
- Select Service \$03 with GST and make sure that DTC P0102 is detected.
- 7. Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
- 9. Let engine idle for 1 minute.
- 10. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- 11. Select Service \$07 with GST.

  If 1st trip DTC is detected, go to <u>EC-1491, "Diagnosis Procedure"</u>.



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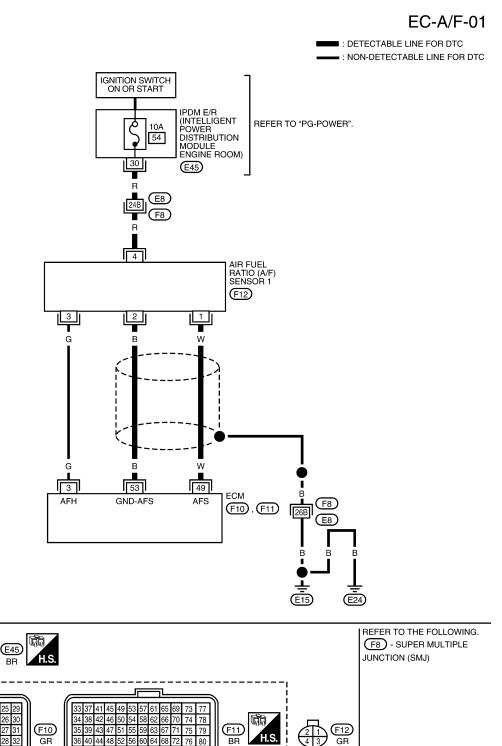
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Wiring Diagram

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Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-III. **CAUTION:** 

#### [MR TYPE 2]

< SERVICE INFOMATION >

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.

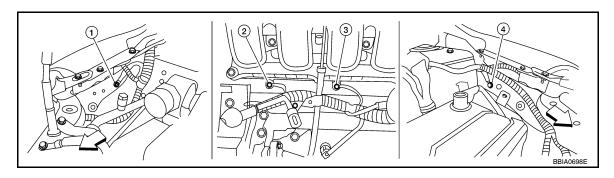
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	G	A/F sensor 1 heater	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	Approximately 2.9 - 8.8V
49	W	A/F sensor 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.
53	В	A/F sensor 1	[Ignition switch: ON]	Approximately 2.2V

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- Body ground E24

Body ground E15

- Engine ground F9
- Engine ground F16

### OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-144, "Removal and Installation".

>> GO TO 3.

# 3. CHECK FOR INTAKE AIR LEAK

- Start engine and run it at idle.
- 2. Listen for an intake air leak after the mass air flow sensor.

#### OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

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## f 4.CLEAR THE SELF-LEARNING DATA

#### With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- 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 and P0172 detected?

Is it difficult to start engine?

#### Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF.
   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. Make sure DTC P0102 is displayed.
- 7. Erase the DTC memory. Refer to EC-1052, "Emission-related Diagnostic Information".
- 8. Make sure DTC P0000 is displayed.
- 9. Run engine for at least 10 minutes at idle speed. Is the 1st trip DTC P0171 and P0172 detected? Is it difficult to start engine?



Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-1258 or EC-1264.

>> GO TO 5. No

# 5. CHECK HARNESS CONNECTOR

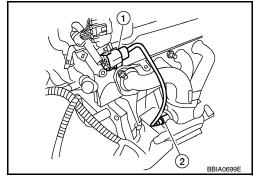
- 1. Turn ignition switch OFF.
- 2. Disconnect A/F sensor 1 harness connector (1).
- Air fuel ratio (A/F) sensor (2)
- 3. Check harness connector for water.

#### Water should no exist.

#### OK or NG

OK >> GO TO 6.

NG >> Repair or replace harness connector.



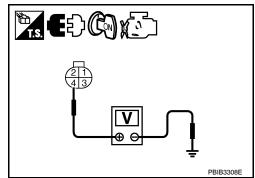
# 6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Turn ignition switch ON.
- 2. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT-III or tester.

#### **Voltage: Battery voltage**

#### OK or NG

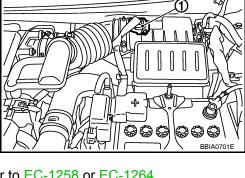
OK >> GO TO 8. >> GO TO 7. NG



## 7. DETECT MALFUNCTIONING PART

#### Check the following.

Harness connectors E8, F8



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· 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.

- Disconnect ECM harness connector.
- 3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

A/F sensor 1 terminal	ECM terminal
1	49
2	53

#### Continuity should exist.

Check harness continuity between ECM terminals 49, 53 or A/F sensor 1 terminals 1, 2 and ground. Refer to Wiring Diagram.

#### Continuity should not exist.

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-1158, "Component Inspection".

#### OK or NG

OK >> GO TO 10.

NG >> GO TO 11.

## 10. CHECK INTERMITTENT INCIDENT

#### Perform EC-1138.

#### OK or NG

OK >> GO TO 11.

NG >> Repair or replace.

# 11.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1.

#### **CAUTION:**

- Discard any air fuel ratio (A/F) sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new air fuel ratio (A/F) sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> GO TO 12.

# 12.CONFIRM A/F ADJUSTMENT DATA

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" in "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that "0.000" is displayed on CONSULT-III screen.

#### OK or NG

OK >> INSPECTION END

NG >> GO TO 13.

13. CLEAR THE SELF-LEARNGIN DATA

With CONSULT-III

#### < SERVICE INFOMATION >

- 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.
- Turn ignition switch OFF.
- 3. Disconnect mass air flow sensor harness (1) connector.
- 4. Restart engine and let it idle for at least 5 seconds.
- Stop engine and reconnect mass air flow sensor harness connector.
- 6. Make sure DTC P0102 is displayed.
- 7. Erase the DTC memory. Refer to <u>EC-1052</u>, "<u>Emission-related</u> Diagnostic Information".
- 8. Make sure 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" in "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that "0.000" is displayed on CONSULT-III screen.

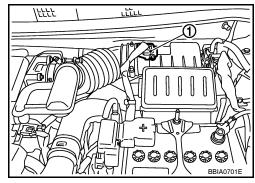
#### >> INSPECTION END

## Removal and Installation

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AIR FUEL RATIO SENSOR HEATER

Refer to EM-144, "Removal and Installation".

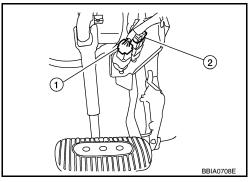


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## **ASCD BRAKE SWITCH**

## **Component Description**

When depress on the brake pedal, ASCD brake switch (2) is turned OFF and stop lamp switch (1) is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal) Refer to EC-1033 for the ASCD function.



CONSULT-III Reference Value in Data Monitor Mode

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Specification data are reference values.

MONITOR ITEM		CONDITION	SPECIFICATION
BRAKE SW1	Ignition switch: ON	Brake pedal: Fully released (A/T, CVT)     Brake pedal and clutch pedal: Fully release (M/T)  Ignition switch: ON	
(ASCD brake switch)	· Igillion switch. ON	Brake pedal: Slightly depressed (A/T, CVT)     Brake pedal and/or clutch pedal: Slightly depressed (M/T)	OFF
BRAKE SW2	- Ignition quitabi ON	Brake pedal: Fully released	OFF
(Stop lamp switch)	Ignition switch: ON	Brake pedal: Slightly depressed	ON

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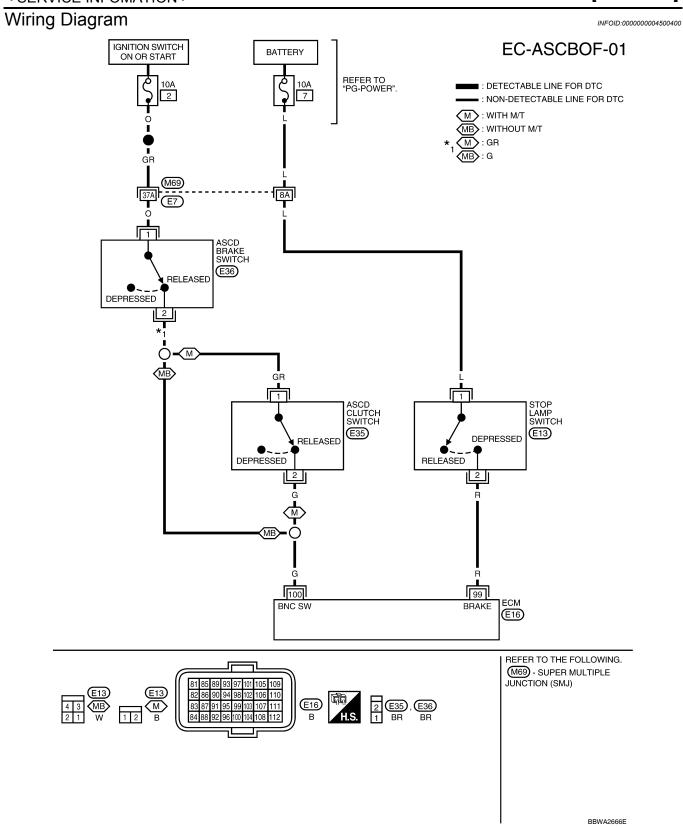
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Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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#### < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
	OO D Charless suitab		[Ignition switch: ON] • Brake pedal: Fully released	Approximately 0V
99 R Stop lamp switch		Stop famp switch	[Ignition switch: ON] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)
400		ASCD brake switch	<ul> <li>[Ignition switch: ON]</li> <li>Brake pedal: Slightly depressed (A/T, CVT)</li> <li>Brake pedal and/or clutch pedal: Slightly depressed (M/T)</li> </ul>	Approximately 0V
100	G ASCD brake switch	<ul> <li>[Ignition switch: ON]</li> <li>Brake pedal: Fully released (A/T, CVT)</li> <li>Brake pedal and clutch pedal: Fully released (M/T)</li> </ul>	BATTERY VOLTAGE (11 - 14V)	

## Diagnosis Procedure

## 1. CHECK OVERALL FUNCTION-I

#### With CONSULT-III

- Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BRAKE SW1" indication under the following conditions.

  M/T models

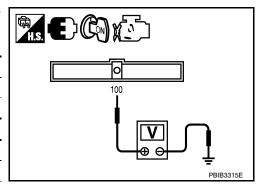
CONDITION	INDICATION
Clutch pedal and/or brake pedal: Slightly depressed	OFF
Clutch pedal and brake pedal: Fully released	ON
A/T and CVT models	
CONDITION	INDICATION
Brake pedal: Slightly depressed	OFF
Brake pedal: Fully released	ON

#### Without CONSULT-III

- 1. Turn ignition switch ON.
- 2. Check voltage between ECM terminal 100 and ground under the following conditions.

#### M/T models

CONDITION	VOLTAGE
Clutch pedal and/or brake pedal: Slightly depressed	Approximately 0V
Clutch pedal and brake pedal: Fully released	Battery voltage
A/T and CVT models	
CONDITION	VOLTAGE
Brake pedal: Slightly depressed	Approximately 0V
Brake pedal: Fully released	Battery voltage



#### OK or NG

OK >> GO TO 2.

NG (M/T models) >>GO TO 3.

NG (A/T and CVT models) >>GO TO 4.

## 2.CHECK OVERALL FUNCTION-II

#### With CONSULT-III

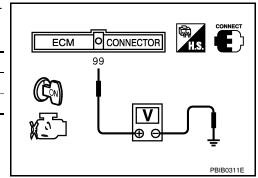
Check "BRAKE SW2" indication in "DATA MONITOR" mode.

CONDITION	INDICATION
Brake pedal: Fully released	OFF
Brake pedal: Slightly depressed	ON

#### Without CONSULT-III

Check voltage between ECM terminal 99 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0V
Brake pedal: Slightly depressed	Battery voltage



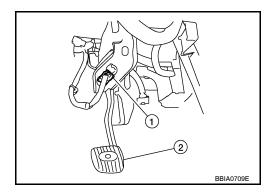
#### OK or NG

OK >> INSPECTION END.

NG >> GO TO 11.

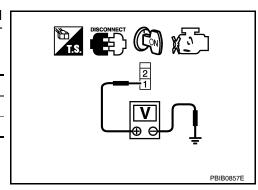
3. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch (1) harness connector.
- Clutch pedal (2)
- 3. Turn ignition switch ON.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-III or tester.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approx. 0V



#### OK or NG

OK >> GO TO 9. NG >> GO TO 4.

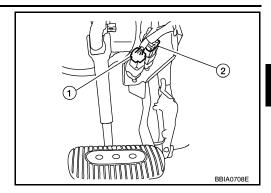
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY

1. Turn ignition switch OFF.

[MR TYPE 2] < SERVICE INFOMATION >

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.

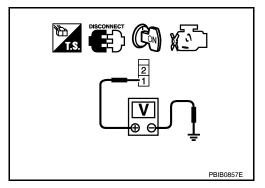
#### Voltage: Battery voltage

#### OK or NG

OK (M/T models) >>GO TO 6.

OK (A/T and CVT models) >>GO TO 7.

NG >> GO TO 5.



## 5. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- 10A 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.

## 6.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch 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 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 100 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 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8.CHECK ASCD BRAKE SWITCH

Refer to EC-1436, "Component Inspection".

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#### < SERVICE INFOMATION >

#### OK or NG

OK >> GO TO 15.

NG >> Replace ASCD brake switch.

# $9.\mathsf{CHECK}$ ASCD CLUTCH 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 100 and ASCD clutch 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 10.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

## 10. CHECK ASCD CLUTCH SWITCH

Refer to EC-1436, "Component Inspection"

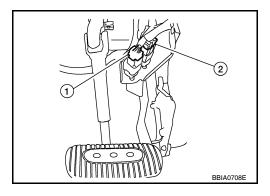
#### OK or NG

OK >> GO TO 15.

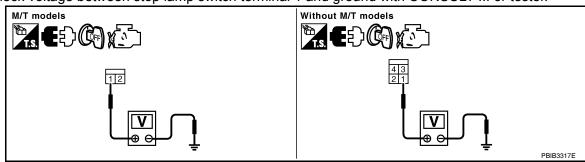
NG >> Replace ASCD clutch switch.

# 11. 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 13.

NG >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M69, E7
- 10A fuse

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#### < SERVICE INFOMATION >

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.

# 13.check stop lamp switch input signal circuit for open and short

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 99 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 14

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

# 14. CHECK STOP LAMP SWITCH

Refer to EC-1436, "Component Inspection".

#### OK or NG

OK >> GO TO 15.

NG >> Replace stop lamp switch.

# 15. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

#### >> INSPECTION END

## Component Inspection

#### ASCD BRAKE SWITCH

- 1. Turn ignition switch OFF.
- 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.

If NG, adjust ASCD brake switch installation, refer to BR-6, and perform step 3 again.

# SEC023D

#### ASCD CLUTCH SWITCH

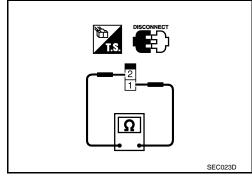
- Turn ignition switch OFF.
- Disconnect ASCD clutch switch harness connector.

#### < SERVICE INFOMATION >

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

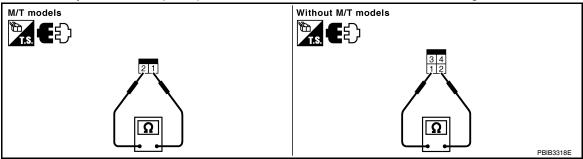
Condition	Continuity
Clutch pedal: Fully released.	Should exist.
Clutch pedal: Slightly depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to  $\underline{\text{CL-5}}$ , 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.

If NG, adjust stop lamp switch installation, refer to BR-6, and perform step 3 again.

< SERVICE INFOMATION > [MR TYPE 2]

## **ASCD INDICATOR**

## Component Description

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.

CRUISE indicator illuminates when MAIN switch on ASCD steering switch is turned ON to indicate that ASCD system is ready for operation.

SET indicator illuminates when following conditions are met.

- · CRUISE indicator is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET indicator remains lit during ASCD control.

Refer to EC-1033 for the ASCD function.

#### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference value.

MONITOR ITEM	CONDITION		SPECIFICATION
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at 1st time → 2nd	$ON \rightarrow OFF$
OFTLAND	<ul> <li>MAIN switch: ON</li> <li>Vehicle: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Operating	ON
SET LAMP		ASCD: Not operating	OFF

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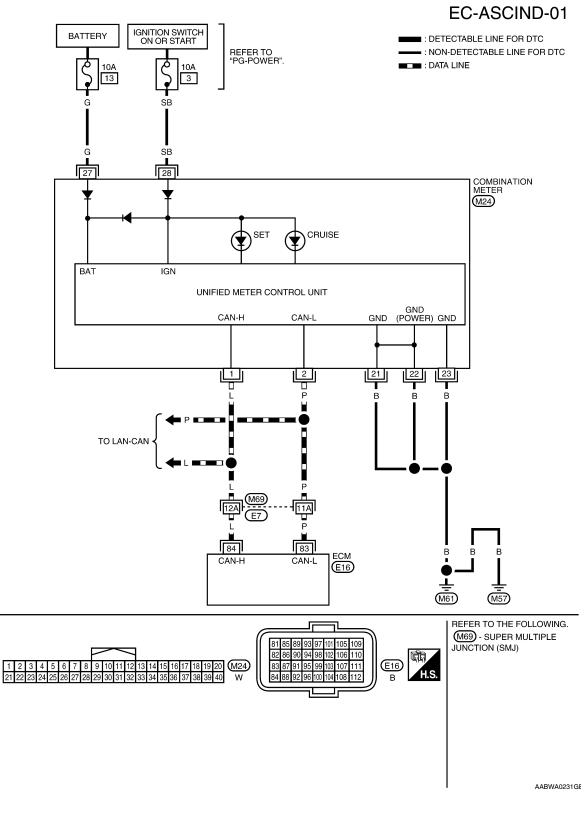
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Wiring Diagram



# Diagnosis Procedure

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# 1. CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

## **ASCD INDICATOR**

< SERVICE INFOMATION >

[MR TYPE 2]

ASCD INDICATOR CONDITION		DITION	SPECIFICATION	
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at 1st time → 2nd	$ON \rightarrow OFF$	
	MAIN switch: ON	ASCD: Operating	ON	
SET LAMP	<ul> <li>Vehicle: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Not operating	OFF	
K or NG				
OK >> INSPECTION NG >> GO TO 2.	I END			
CHECK DTC				
Check that DTC UXXXX is	e not displayed			
es or No	s not displayed.			
Yes >> Perform troub	ole diagnoses for DTC UXXX	Χ.		
No >> GO TO 3.				
CHECK COMBINATIO				
oes combination meter o <u>es or No</u>	operate normally?			
res >> GO TO 4.				
No >> Check combine	nation meter circuit. Refer to	<u>DI-3</u> .		
CHECK INTERMITTEN	NT INCIDENT			
efer to <u>EC-1138</u> .				
>> INSPECTION	LEND			
>> 1113F ECTION	LIND			

## **ELECTRICAL LOAD SIGNAL**

#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004500407

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd position.	ON
LOAD SIGNAL	- Ignition switch. ON	Rear window defogger switch is OFF and lighting switch is OFF.	OFF
HEATER FAN SW	Ignition switch: ON	Heater fan: Operating.	ON
TILATLIX FAIN SW		Heater fan: Not operating.	OFF

## Diagnosis Procedure

INFOID:0000000004500408

# 1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCITION-I

- 1. Turn ignition switch ON.
- 2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-III under the following conditions.

Condition	LOAD SIGNAL	
Lighting switch: ON at 2nd position	ON	
Lighting 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" in "DATA MONITOR" mode with CONSULT-III under the following conditions.

Condition	LOAD SIGNAL	
Rear window defogger switch: ON	ON	
Rear window defogger switch: OFF	OFF	

#### OK or NG

OK >> GO TO 3.

NG >> GO TO 5.

# 3.check heater fan signal circuit overall function

Check "HEATER FAN SW" in "DATA MONITOR" mode with CONSULT-III under the following conditions.

Condition	LOAD SIGNAL	
Heater fan control switch: ON	ON	
Heater fan control switch: OFF	OFF	

## OK or NG

OK >> INSPECTION END.

NG >> GO TO 6.

## 4. CHECK HEADLAMP SYSTEM

Refer to LT-4 or LT-25.

#### >> INSPECTION END

## 5. CHECK REAR WINDOW DEFOGGER SYSTEM

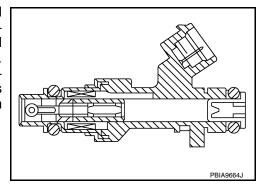
ELECTRICAL LOAD SIGNAL		
< SERVICE INFOMATION >	[MR TYPE 2]	
Refer to GW-51.	^	
>> INSPECTION END	А	
6.CHECK HEATER FAN CONTROL SYSTEM	FO	
Refer to MTC-22.	EC	
>> INSPECTION END	C	
>> INSPECTION END	C	
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## **FUEL INJECTOR**

## **Component Description**

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

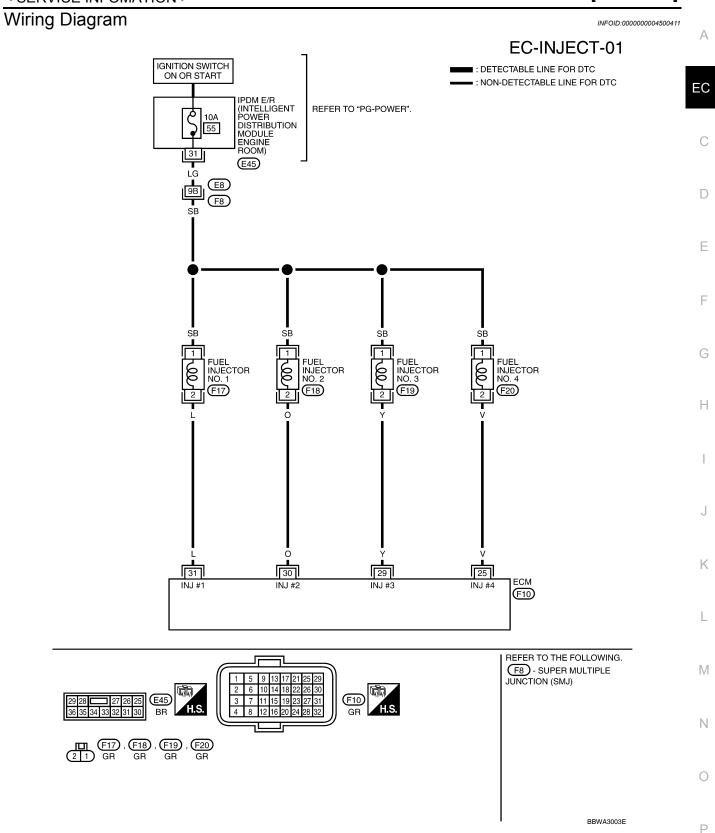


#### CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000004500410

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	See <u>EC-1130</u> .		
Air conditioner swit	Engine: After warming up	Idle	2.0 - 3.0 msec
	Shift lever: P or N (A/T, CVT), Neutral (M/T)	2,000 rpm	1.9 - 2.9 msec



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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25 29	V	Fuel injector No. 4 Fuel injector No. 3	[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14V)
30 31	O L	Fuel injector No. 2 Fuel injector No. 1	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  20 10.0 V/Div 50 ms/Div T  PBIA4943J

<sup>:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnosis Procedure

INFOID:0000000004500412

## 1. INSPECTION START

Turn ignition switch to START.

#### Is any cylinder ignited?

#### Yes or No

Yes >> GO TO 2. No >> GO TO 3.

# 2.CHECK OVERALL FUNCTION

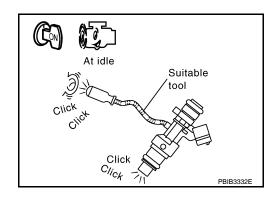
#### With CONSULT-III

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.

#### Without CONSULT-III

- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

Clicking noise should be heard.



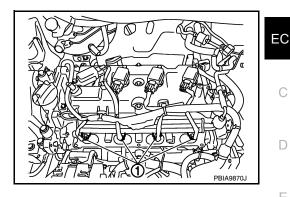
#### OK or NG

OK >> INSPECTION END

NG >> GO TO 3.

# 3. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect fuel injector (1) harness connector.
- Turn ignition switch ON.

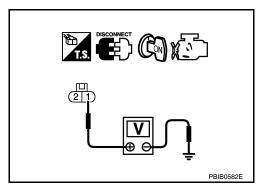


Check voltage between fuel injector terminal 1 and ground with CONSULT-III or tester.

#### Voltage: Battery voltage

#### OK or NG

OK >> GO TO 5. NG >> GO TO 4.



## 4. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- IPDM E/R harness connector E45
- 10A 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness continuity between fuel injector terminal 2 and ECM terminals 25, 29, 30, 31. 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-1512, "Component Inspection".

#### OK or NG

OK >> GO TO 7.

NG >> Replace fuel injector.

## .CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

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#### >> INSPECTION END

## **Component Inspection**

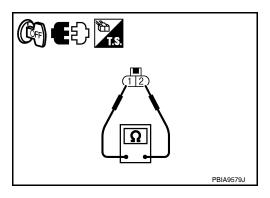
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#### **FUEL INJECTOR**

- 1. Disconnect fuel injector harness connector.
- 2. Check resistance between terminals as shown in the figure.

Resistance:  $11.1 - 14.5\Omega$  [at  $10 - 60^{\circ}$ C ( $50 - 140^{\circ}$ F)]

3. If NG, replace fuel injector.



## Removal and Installation

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FUEL INJECTOR Refer to EM-156.

# **FUEL PUMP**

Description INFOID:0000000004500415

#### 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*		

<sup>\*:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

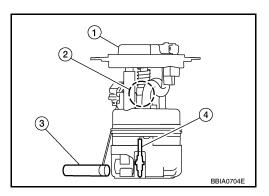
The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine start ability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation	
Ignition switch is turned to ON	Operates for 1 second	
Engine running and cranking	Operates	
Engine: 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 level sensor (3)
- Fuel tank temperature sensor (4)



### CONSULT-III Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	<ul><li>For 1 second after turning ignition switch ON</li><li>Engine running or cranking</li></ul>	ON
	Except above conditions	OFF

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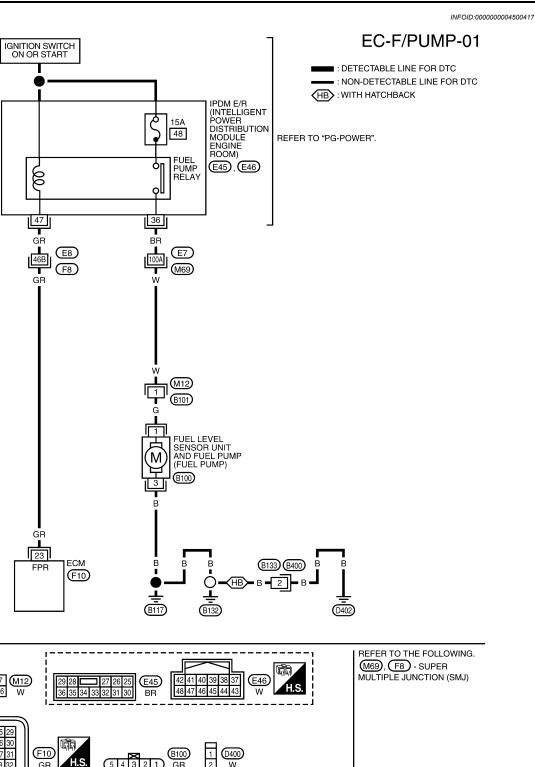
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# Wiring Diagram



Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23	OD OD Fuel summerals	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0V	
23	GR	Fuel pump relay	[Ignition switch: ON]  • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)

# Diagnosis Procedure

#### INFOID:0000000004500418

# 1. CHECK OVERALL FUNCTION

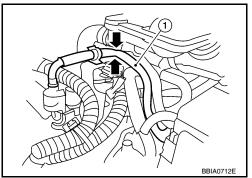
- Turn ignition switch ON.
- Pinch fuel feed hose (1) with two fingers. 2.
- Illustration shows the view with intake air duct removed.

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.



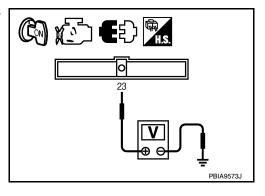
# 2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- Check voltage between ECM terminal 23 and ground with CON-SULT-III or tester.

# Voltage: Battery voltage

# OK or NG

OK >> GO TO 5. NG >> GO TO 3.



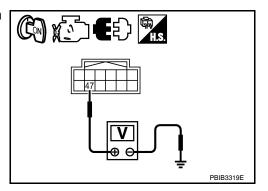
# 3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector E46.
- Turn ignition switch ON. 3.
- 4. Check voltage between IPDM E/R terminal 47 and ground with CONSULT-III or tester.

# Voltage: Battery voltage

### OK or NG

OK >> GO TO 4. NG >> GO TO 11.



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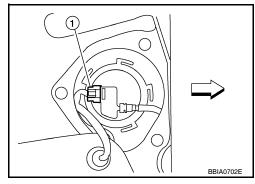
# 4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F8
- 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-III

- 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 inspection hole cover removed.
- 4. Turn ignition switch ON.

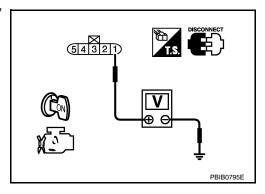


5. Check voltage between "fuel level sensor unit and fuel pump" terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage should exist for 1 second after ignition switch is turned ON.

#### OK or NG

OK >> GO TO 9. NG >> GO TO 6.



# 6. CHECK 15A FUSE

- 1. Turn ignition switch OFF.
- 2. Disconnect 15A fuse.
- 3. Check 15A fuse.

# OK or NG

OK >> GO TO 7.

NG >> Replace fuse.

# 7.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

- 1. Disconnect IPDM E/R harness connector E45.
- 2. Check harness continuity between IPDM E/R terminal 36 and "fuel level sensor unit and fuel pump" 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 11.

NG >> GO TO 8.

# 8. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors M69, E7
- · Harness connectors M12, B101

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- Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# 9. CHECK FUEL PUMP GROUND CIRCUIT

 Check harness continuity between "fuel level sensor unit and fuel pump" terminal 3 and ground. Refer to Wiring Diagram.

# Continuity should exist.

2. Also check harness for short to power.

#### OK or NG

OK >> GO TO 10.

NG >> Repair or replace harness or connectors.

# 10. CHECK FUEL PUMP

Refer to EC-1517, "Component Inspection".

#### OK or NG

OK >> GO TO 11.

NG >> Replace fuel pump.

# 11. CHECK INTERMITTENT INCIDENT

# Refer to EC-1138.

### 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.

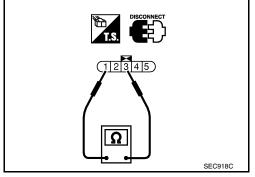
# Component Inspection

### **FUEL PUMP**

- 1. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- Check resistance between "fuel level sensor unit and fuel pump" terminals 1 and 3.

### Resistance: Approximately 0.2 - 5.0 $\Omega$ [at 25°C (77°F)]

3. If NG, replace "fuel level sensor unit and fuel pump".



## Removal and Installation

**FUEL PUMP** 

Refer to FL-5.

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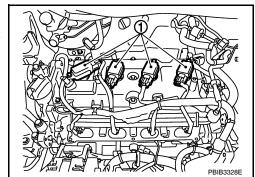
# **IGNITION SIGNAL**

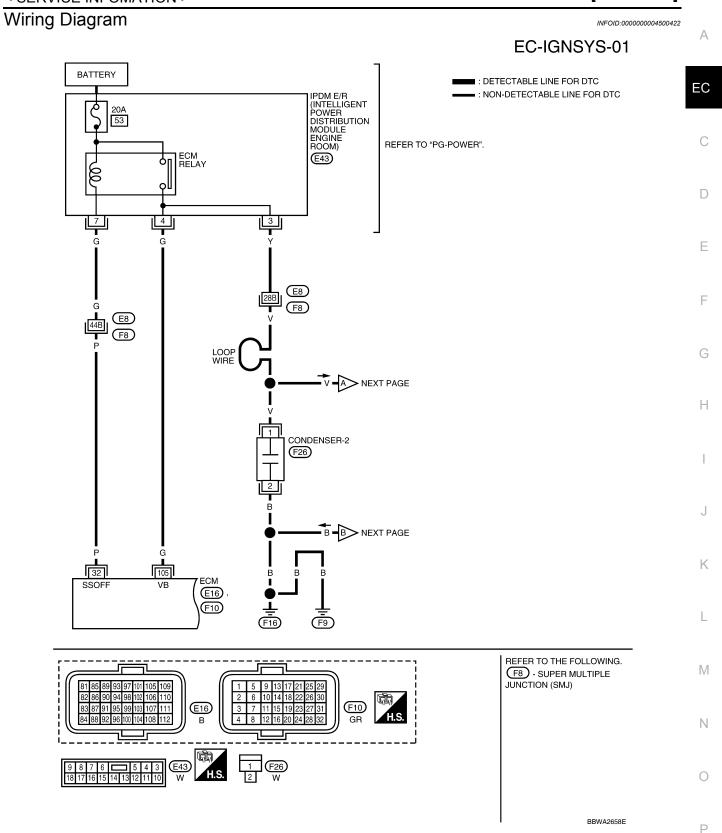
# **Component Description**

#### INFOID:0000000004500421

# **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 (1) primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.





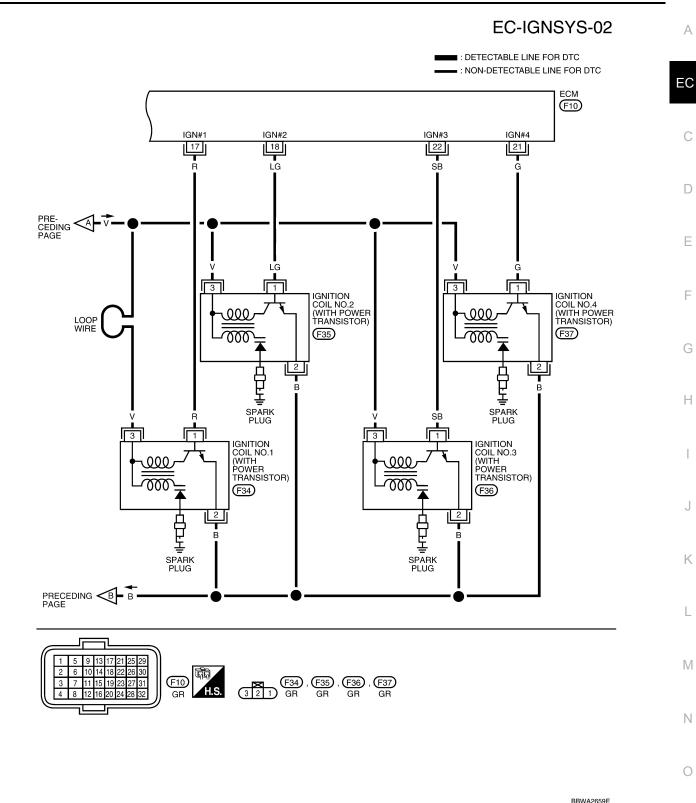
Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

# < SERVICE INFOMATION >

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	32 P ECM relay (Self shut-off)		[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.0V
			[Ignition switch: OFF]  • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
105	G	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

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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.

TER- MI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17 18	R LG	Ignition signal No. 1 Ignition signal No. 2	[Engine is running]  • Warm-up condition  • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	0 - 0.3V  ≥≥ 2.0 V/DIV 50 ms/DIV T  PBIA9265J
21 22	G SB	Ignition signal No. 4 Ignition signal No. 3	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	0.2 - 0.5V

: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# Diagnosis Procedure

INFOID:0000000004500423

# 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.
- Make sure that each circuit produces a momentary engine speed drop.

### OK or NG

OK >> INSPECTION END

NG >> GO TO 10.

# 3. CHECK OVERALL FUNCTION

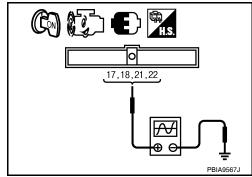
# Without CONSULT-III

- 1. Let engine idle.
- 2. Read the voltage signal between ECM terminals 17, 18, 21, 22 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.





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### < SERVICE INFOMATION >

OK >> INSPECTION END

NG >> GO TO 10.

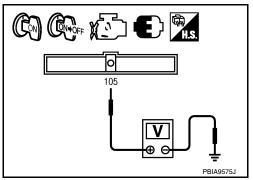
# 4.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- 2. Check voltage between ECM terminal 105 and ground with CONSULT-III or tester.

# Voltage: Battery voltage

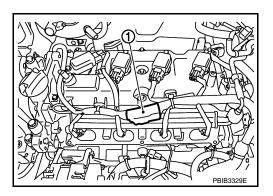
### OK or NG

OK >> GO TO 5. NG >> Go to EC-1139.



# 5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect condenser-2 (1) harness connector.
- Turn ignition switch ON.

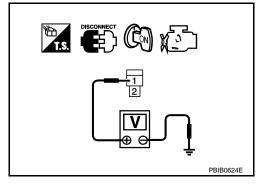


Check voltage between condenser-2 terminal 1 and ground with CONSULT-III or tester.

### Voltage: Battery voltage

## OK or NG

OK >> GO TO 8. NG >> GO TO 6.



# 6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector E43. 2.
- Check harness continuity between IPDM E/R terminal 3 and condenser-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 <u>EC-1139</u>. NG >> GO TO 7.

# .DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E8, F8

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- · Harness for open or short between IPDM E/R and condenser-2
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

# $8.\mathsf{CHECK}$ CONDENSER-2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check harness continuity between condenser-2 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-2

Refer to EC-1525, "Component Inspection"

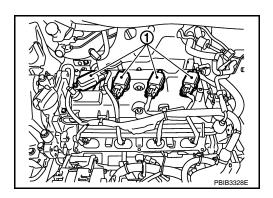
# OK or NG

OK >> GO TO 10.

NG >> Replace condenser-2.

# 10. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect ignition coil (1) harness connector.
- 4. Turn ignition switch ON.

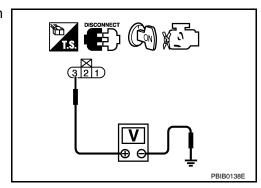


Check voltage between ignition coil terminal 3 and ground with CONSULT-III or tester.

### **Voltage: Battery voltage**

### OK or NG

OK >> GO TO 12. NG >> GO TO 11.



# 11. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connector F8
- · Harness for open or short between ignition coil and harness connector F8
  - >> Repair or replace harness or connectors.

# 12. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

#### < SERVICE INFOMATION >

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

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminals 17, 18, 21, 22 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-1525, "Component Inspection".

### OK or NG

OK >> GO TO 15.

NG >> Replace ignition coil with power transistor.

# 15. CHECK INTERMITTENT INCIDENT

Refer to EC-1138.

### >> INSPECTION END

# Component Inspection

IGNITION COIL WITH POWER TRANSISTOR

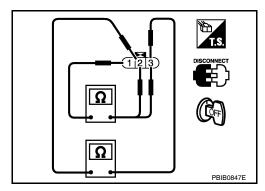
#### **CAUTION:**

Do the following procedure in the place where ventilation is good without the combustible.

- Turn ignition switch OFF.
- 2. Disconnect ignition coil harness connector.
- Check resistance between ignition coil terminals as follows.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 and 2	Except 0 or ∞
1 and 3	Except 0
2 and 3	Εχτορί σ

- If NG, replace ignition coil with power transistor. If OK, go to next step.
- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.



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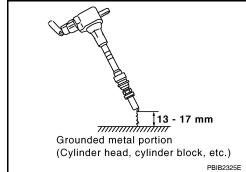
0

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.

- : Vehicle front
- 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 (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 16. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



## Spark should be generated.

#### **CAUTION:**

- Do not approach to the spark plug and the ignition coil within 50cm. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

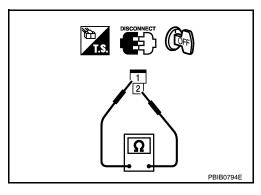
17. If NG, replace ignition coil with power transistor.

#### CONDENSER-2

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser-2 harness connector.
- 3. Check resistance between condenser-2 terminals 1 and 2.

# Resistance: Above 1 M $\Omega$ [at 25°C (77°F)]

4. If NG, replace condenser-2.



INFOID:0000000004500425

### Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR Refer to EM-153.

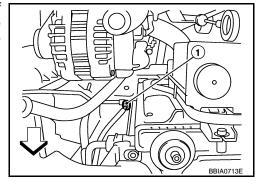
INFOID:0000000004500426

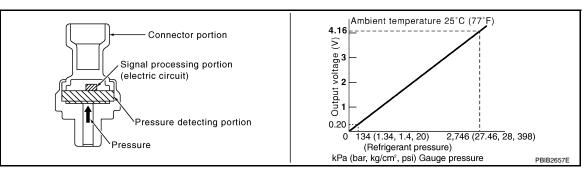
# REFRIGERANT PRESSURE SENSOR

# **Component Description**

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.

• : Vehicle front





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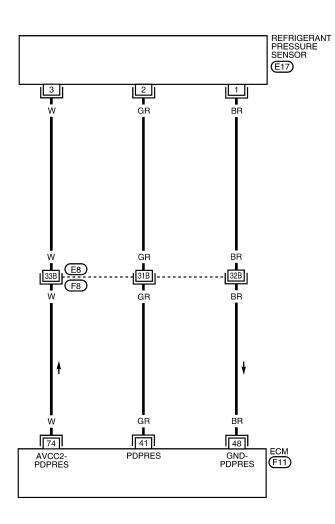
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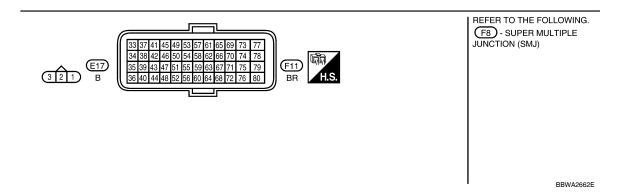
Wiring Diagram

INFOID:0000000004500427

# EC-RP/SEN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





Specification data are reference values and are measured between each terminal and ground. **CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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## < SERVICE INFOMATION >

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	GR	Refrigerant pressure sensor	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan switch: ON (Compressor operates)</li> </ul>	1.0 - 4.0V
48	BR	Sensor ground (Refrigerant pressure sensor)	[Engine is running]  • Warm-up condition  • Idle speed	Approximately 0V
74	W	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5V

# Diagnosis Procedure

INFOID:0000000004500428

# 1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

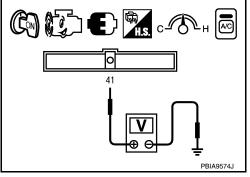
- Start engine and warm it up to normal operating temperature.
- Turn A/C switch and blower fan switch ON. 2.
- Check voltage between ECM terminal 41 and ground with CON-SULT-III or tester.

Voltage: 1.0 - 4.0V

# OK or NG

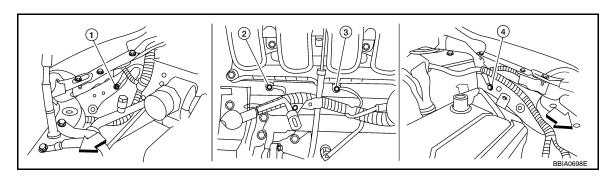
OK >> INSPECTION END

NG >> GO TO 2.



# 2. CHECK GROUND CONNECTIONS

- Turn A/C switch and blower fan switch OFF.
- Stop engine and turn ignition switch OFF.
- Loosen and retighten ground screw on the body. Refer to EC-1144, "Ground Inspection".



- Vehicle front
- 1. Body ground E24
- Engine ground F9
- Engine ground F16

4. Body ground E15

# OK or NG

OK >> GO TO 3.

NG >> Repair or replace ground connections.

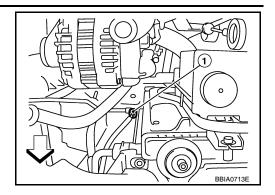
3.check refrigerant pressure sensor power supply circuit

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### < SERVICE INFOMATION >

- 1. Disconnect refrigerant pressure sensor (1) harness connector.
- : Vehicle front
- 2. Turn ignition switch ON.

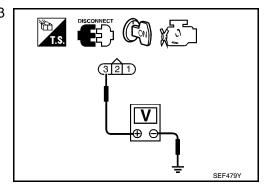


3. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-III or tester.

# **Voltage: Approximately 5V**

### OK or NG

OK >> GO TO 5. NG >> GO TO 4.



# 4. DETECT MALFUNCTIONING PART

Check the following.

- · Harness connectors E8, F8
- · Harness for open or short between refrigerant pressure sensor and ECM
  - >> 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.
- Check harness continuity between refrigerant pressure sensor terminal 1 and ECM terminal 48.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 E8, F8
- Harness for open or short between refrigerant pressure sensor and ECM
  - >> 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 refrigerant pressure sensor terminal 2 and ECM terminal 41. Refer to Wiring Diagram.

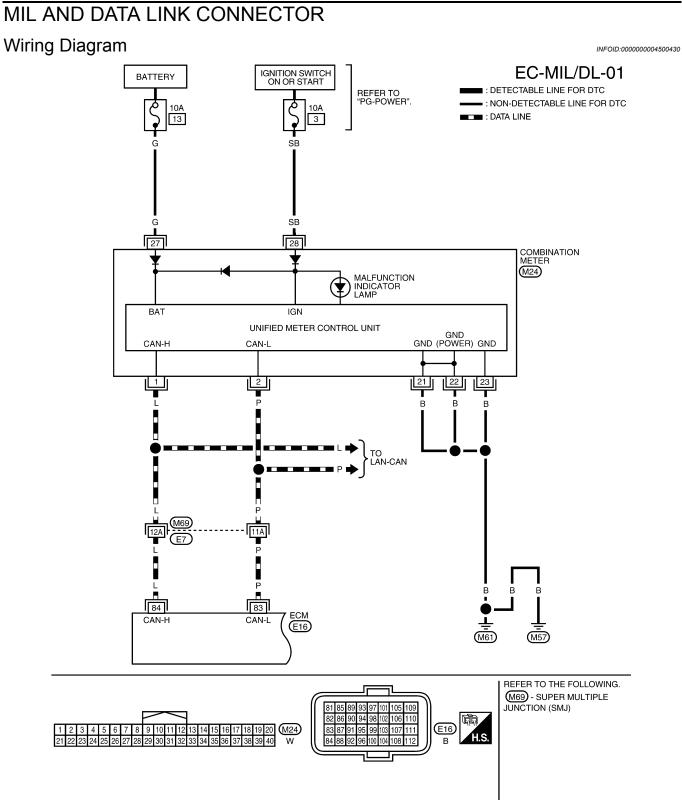
# Continuity should exist.

2. Also check harness for short to ground and short to power.

### OK or NG

REFRIGERANT PRESSURE SENSUR		
< SERVICE INFOMATION >	[MR TYPE 2]	
OK >> GO TO 9. NG >> GO TO 8.		Α
8. DETECT MALFUNCTIONING PART		
Check the following.  • Harness connectors E8, F8  • Harness for open or short between refrigerant pressure sensor and ECM		EC
>> Repair open circuit or short to ground or short to power in harness or connectors. 9. CHECK INTERMITTENT INCIDENT		С
Refer to EC-1138.  OK or NG		D
OK >> Replace refrigerant pressure sensor. NG >> Repair or replace.		Е
Removal and Installation	INFOID:0000000004500429	
REFRIGERANT PRESSURE SENSOR Refer to MTC-83, "Removal and Installation of Refrigerant Pressure Sensor".		F
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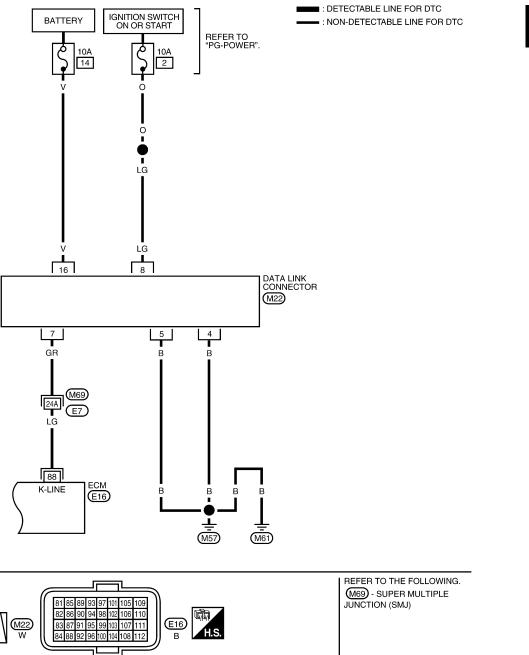
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# EC-MIL/DL-02



M69 - SUPER MULTIPLE
JUNCTION (SMJ)

M89 - SUPER MULTIPLE
JUNCTION (SMJ)

M89 - SUPER MULTIPLE
JUNCTION (SMJ)

H.S.

EC-1533

# SERVICE DATA AND SPECIFICATIONS (SDS)

Fuel Pressure

Fuel pressure at idle Approximately 350 kPa (3.57 kg/cm <sup>2</sup> , 51 psi)
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# Idle Speed and Ignition Timing

INFOID:0000000004500432

	A/T	No load* (in P or N position)		
Target idle speed	CVT	No load* (In P or N position)	$700\pm50~\mathrm{rpm}$	
	M/T	No load* (in Neutral position)		
	A/T	In P or N position		
Air conditioner: ON	CVT	In P or N position	850 rpm or more	
	M/T	In Neutral position		
	A/T	In P or N position		
Ignition timing	CVT	In P or N position	13 ± 5° BTDC	
	M/T	In Neutral position		

<sup>\*:</sup> 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:0000000004500433

	Calculated load value% (Using CONSULT-III or GST)	
At idle	10 - 35	
At 2,500 rpm	10 - 35	

# Mass Air Flow Sensor

INFOID:0000000004500434

Supply voltage	Battery voltage (11 - 14V)		
Output voltage at idle	1.0 - 1.3*V		
Mass air flow (Using CONSULT-III or GST)	1.0 - 4.0 g·m/sec at idle* 2.0 - 10.0 g·m/sec at 2,500 rpm*		

<sup>\*:</sup> Engine is warmed up to normal operating temperature and running under no load.

# Intake Air Temperature Sensor

INFOID:0000000004500435

Temperature °C (°F)	Resistance k $\Omega$
25 (77)	1.800 - 2.200

# Engine Coolant Temperature Sensor

INFOID:0000000004500436

Temperature °C (°F)	Resistance k $\Omega$
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

# SERVICE DATA AND SPECIFICATIONS (SDS)

	[MR TYPE 2]	
INFOID:00000000450043		- 7 A
1.8 - 2.44Ω		
	INFOID:0000000004500438	EC
3.4 - 4.4Ω		C
	INFOID:0000000004500439	
	INFOID:0000000004500440	
		Е
	INFOID:0000000004500441	F
Approximately 1 - 15Ω		
	INFOID:0000000004500442	C
11.4 - 14.5Ω		Н
	INFOID:0000000004500443	
Approximately 0.2 - 5.00		
	$3.4$ - $4.4\Omega$ Approximately 1 - $15\Omega$ $11.4$ - $14.5\Omega$	$1.8 - 2.44\Omega$ $1.8 - 2.44\Omega$ $1.8 - 0.44\Omega$

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EC-1535