SECTION ENGINE CONTROL SYSTEM C

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BASIC INSPECTION DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

А

EC

[VQ37VHR]

INFOID:000000008156123

OVERALL SEQUENCE Inspection start 1. Get information D 1.Get the detailed information about symptom from the customer. 2.Ask the customer about the need for I/M examination. Malfunction information. No malfunction information. I/M examination requested by the customer. 2. Check DTC^{*1} Check DTC^{*1} of "All DTC Reading" Print out DTC*1 and freeze frame data*2 (or, write it down). Symptom is Symptom is Erase only DTC of "ENGINE" described. described. Check related service bulletins. DTC^{*1} is not detected. DTC*1 is detected. Symptom is not described. DTC^{*1} is detected. Н 3. Confirm the symptom 4. Confirm the symptom Try to confirm the symptom Try to confirm the symptom described by the customer. described by the customer. Also study the normal operation and Also study the normal operation and fail-safe related to the symptom. fail-safe related to the symptom. 5. Perform DTC CONFIRMATION PROCEDURE 6. Perform BASIC INSPECTION With CONSULT Without CONSULT Κ 7. Perform "SPEC" in Within the SP value "DATA MONITOR" mode Out of the SP value 9. Detected malfunctioning system by symptom Table 13. Prepare I/M Malfunctioning Set SRT code. 8. Detect malfunctioning part by part is not detected Delete TROUBLE DIAGNOSIS Permanent SPECIFICATION VALUE DTC. M Malfunctioning part 10. Detected malfunctioning part by is detected. SRT code **Diagnosis Procedure** setting completed. Ν No Permanent 11. Repair or replace the malfunctioning part DTC. 12. Final check DTC^{*1} is detected. Symptom remains. Check that the symptom is not detected. Perform DTC CONFIRMATION PROCEDURE again, and then check that the malfunction is repaired. Ρ DTC*1 is not detected. DTC^{*1} is not detected. Symptom does not remain. Symptom does not remain. I/M examination requested by the customer. I/M examination not requested by the customer.

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Inspection end

*1: Include 1st trip DTC.

*2: Include 1st trip freeze frame data.

DETAILED FLOW

1.GET INFORMATION FOR SYMPTOM

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

Malfunction information, obtained>>GO TO 2.

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

2.CHECK DTC

1. Check DTC.

- 2. Perform the following procedure if DTC is displayed.
- Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
- Erase DTC. (Refer to EC-134, "On Board Diagnosis Function" or EC-138, "CONSULT Function".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to <u>EC-583</u>, "Symptom Table".)
- 3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

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

3.CONFIRM THE SYMPTOM

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

Also study the normal operation and fail-safe related to the symptom. Refer to <u>EC-587</u>, "<u>Description</u>" and <u>EC-555</u>, "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 <u>EC-587</u>, "<u>Description</u>" and <u>EC-555</u>, "Fail safe".

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

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

If two or more DTCs are detected, refer to <u>EC-557, "DTC Inspection Priority Chart"</u> 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?

DIAGNOSIS AND REPAIR WORKFLOW

| < BASIC INSPECTION > | [VQ37VHR] |
|---|------------------------|
| YES >> GO TO 10. NO >> Check according to <u>GI-42, "Intermittent Incident"</u> . | |
| 6.PERFORM BASIC INSPECTION | |
| Perform EC-14, "BASIC INSPECTION : Special Repair Requirement". | |
| Do you have CONSULT? | |
| YES >> GO TO 7. | |
| NO >> GO TO 9. | |
| PERFORM SPEC IN DATA MONITOR MODE | |
| With CONSULT Make sure that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA- B2" are within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode. Refendent nent Function Check". | |
| Is the measurement value within the SP value? | |
| YES >> GO TO 9. NO >> GO TO 8. | |
| 8. DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION | VALUE |
| Detect malfunctioning part according to EC-149, "Diagnosis Procedure". | |
| Is a malfunctioning part detected? | |
| YES >> GO TO 11. NO >> GO TO 9. | |
| 9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE | |
| Detect malfunctioning system according to <u>EC-583, "Symptom Table"</u> based on the c | confirmed symptom in |
| step 4, and determine the trouble diagnosis order based on possible causes and symptom | oms. |
| | |
| >> 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 s is also required for the circuit check in the Diagnosis Procedure. For details, refer to <u>(</u> tion". | |
| Is a malfunctioning part detected? | |
| YES >> GO TO 11. | |
| NO >> Monitor input data from related sensors or check voltage of related ECM | terminals using CON- |
| SULT. Refer to <u>EC-533, "Reference Value"</u> . | |
| 11 REPAIR OR REPLACE THE MALFUNCTIONING PART | |
| Repair or replace the malfunctioning part. Reconnect parts or connectors disconnected during Diagnosis Procedure again aft | er repair and replace- |
| ment. 3. Check DTC. If DTC is displayed, erase it. Refer to <u>EC-134, "On Board Diagnosis</u> | Function" or EC-138. |
| "CONSULT Function". | |
| | |
| >> GO TO 12. | |
| 12.final check | |
| When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Check again, and then make sure that the malfunction have been completely repaired. When symptom was described from the customer, refer to confirmed symptom in step 3 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. | |
| | |

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

- NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). Refer to EC-134, "On Board Diagnosis Function" or EC-138, "CONSULT Function".
- NO-2 >> I/M examination, requested from the customer: GO TO 13.

13. PREPARE FOR I/M EXAMINATION

- 1. Set SRT codes. Refer to EC-26, "SRT Set Driving Pattern".
- 2. Erase permanent DTCs. Refer to EC-31, "Description".

>> INSPECTION END.

Diagnostic Work Sheet

DESCRIPTION

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

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

Utilize a diagnostic worksheet like the WORKSHEET SAMPLE below in order to organize all the information for troubleshooting. Some conditions may cause the MIL to illuminate steady or blink and DTC to be detected. Examples:

• Vehicle ran out of fuel, which caused the engine to misfire.

 Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.



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

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

WORKSHEET SAMPLE

| Customer na | me MR/MS | Model & Year | VIN |
|---|----------------|--|---------------------------|
| Engine # | | Trans. | Mileage |
| Incident Date |) | Manuf. Date | In Service Date |
| Fuel and fue | filler cap | Vehicle ran out of fuel causing misfire Fuel filler cap was left off or incorrectly | |
| | ☐ Startability | Impossible to start | |
| Symptoms | Idling | □ No fast idle □ Unstable □ H □ Others [| High idle 🛛 Low idle] |
| - J P | Driveability | Stumble Surge Knock Intake backfire Exhaust backfi Others [| · |
| Engine stall While acceleration | | At the time of start While idling While accelerating While dece Just after stopping While load | elerating |
| Incident occurrence Incident occurrence Incident occurrence Incident occurrence | | ☐ In the daytime | |
| Frequency | | All the time Under certain conditions Sometimes | |
| Weather conditions I Not affected | | | |
| | Weather | 🗌 Fine 🗌 Raining 🗌 Snowing | Others [] |
| | Temperature | 🗌 Hot 🗌 Warm 🗌 Cool 🗌 |] Cold 🔲 Humid °F |
| | | Cold During warm-up | After warm-up |
| Engine conditions Engine speed 2,000 | | 4,000 6,000 8,000 rpm | |
| Road conditions | | ghway 🗌 Off road (up/down) | |
| Driving conditions | | While accelerating While cruis While decelerating While turni | 0 |
| | | Vehicle speed 0 10 20 | |
| Malfunction indicator lamp | | | |

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< BASIC INSPECTION >

INSPECTION AND ADJUSTMENT BASIC INSPECTION

BASIC INSPECTION : Special Repair Requirement

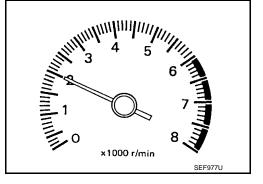
1.INSPECTION START

- 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.

TEMP £ 120 270

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

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



2.REPAIR OR REPLACE

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

>> GO TO 3

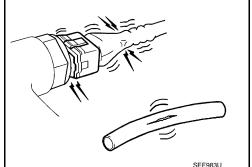
3.CHECK IDLE SPEED

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

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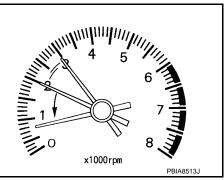
< BASIC INSPECTION >

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

3. Check idle speed. For procedure, refer to EC-18, "IDLE SPEED : Special Repair Requirement". For specification, refer to EC-598, "Idle Speed".

Is the inspection result normal?

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



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| | x1000rpm PBIA8513J |
|---|--|
| 4.PERFORM ACCELERATOR PEDAL RELEASED POSITION | |
| Stop engine. Perform <u>EC-19</u>, "ACCELERATOR PEDAL RELEASED PO ment". | SITION LEARNING : Special Repair Require- |
| >> GO TO 5. | F |
| 5. PERFORM THROTTLE VALVE CLOSED POSITION LEARN | JING |
| Perform EC-19, "THROTTLE VALVE CLOSED POSITION LEAI | |
| >> GO TO 6. 6. PERFORM IDLE AIR VOLUME LEARNING | C |
| Perform EC-20, "IDLE AIR VOLUME LEARNING : Special Repa | - |
| Is Idle Air Volume Learning carried out successfully? | |
| YES >> GO TO 7. NO >> Follow the instruction of Idle Air Volume Learning. T | Then GO TO 4. |
| 7.CHECK IDLE SPEED AGAIN | |
| Start engine and warm it up to normal operating temperatur Check idle speed. For procedure, refer to <u>EC-18</u>, "IDLE SPEED : Special Rep | air Requirement". |
| For specification, refer to <u>EC-598, "Idle Speed"</u> . | |
| <u>Is the inspection result normal?</u> YES >> GO TO 10. | |
| NO >> GO TO 8. | |
| 8. DETECT MALFUNCTIONING PART | |
| Check the Following. Check camshaft position sensor (PHASE) and circuit. Refer to Check crankshaft position sensor (POS) and circuit. Refer to | |
| Is the inspection result normal? | |
| YES >> GO TO 9. NO >> Repair or replace. Then GO TO 4. | |
| 9. CHECK ECM FUNCTION | |
| 1. Substitute with a non-malfunctioning ECM to check ECM fur | nction. (ECM may be the cause of the incident, |
| although this is rare.) Perform initialization of IVIS (NATS) system and registration EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL OF CONTROL | on of all IVIS (NATS) ignition key IDs. Refer to |

>> GO TO 4. **10.**CHECK IGNITION TIMING

1. Run engine at idle.

ment".

< BASIC INSPECTION >

[VQ37VHR]

- 2. Check ignition timing with a timing light.
 - A :Timing indicator

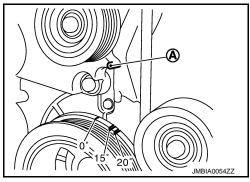
For procedure, refer to <u>EC-18</u>, "IGNITION TIMING : <u>Special</u> <u>Repair Requirement</u>".

For specification, refer to EC-598. "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 19.

NO >> GO TO 11.



11.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- Perform EC-19, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

12.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-20, "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.
- Check idle speed. For procedure, refer to <u>EC-18</u>, "IDLE SPEED : Special Repair Requirement". For specification, refer to <u>EC-598</u>, "Idle Speed".

Is the inspection result normal?

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

15. CHECK IGNITION TIMING AGAIN

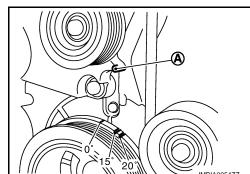
- 1. Run engine at idle.
- 2. Check ignition timing with a timing light.

A :Timing indicator

For procedure, refer to <u>EC-18. "IGNITION TIMING : Special</u> <u>Repair Requirement"</u>. For specification, refer to EC-598, "Ignition Timing".

Is the inspection result normal?

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



16.CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-50, "Removal and Installation".

Is the inspection result normal?

- YES >> GO TO 17.
- NO >> Repair the timing chain installation. Refer to <u>EM-49, "Exploded View"</u>. Then GO TO 4.

< BASIC INSPECTION >

| 17. DETECT MALFUNCTIONING PART | Λ |
|--|-------|
| Check the following. Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-299, "Component Inspection"</u>. | A |
| Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-296, "Component Inspection"</u>. | EC |
| Is the inspection result normal? | |
| YES >> GO TO 18. NO >> Repair or replace. Then GO TO 4. | |
| 18. CHECK ECM FUNCTION | С |
| | |
| Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.) | D |
| Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-8, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement". | D |
| | Ε |
| >> GO TO 4. | |
| 19.INSPECTION END | F |
| If ECM is replaced during this BASIC INSPECTION procedure, go to <u>EC-17, "ADDITIONAL SERVICE WHEN</u> <u>REPLACING CONTROL UNIT (ECM) : Special Repair Requirement</u> ". | I |
| | G |
| >> INSPECTION END ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) | |
| | |
| ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description | Η |
| INFOID:000000008156126 | |
| When replacing ECM, the following procedure must be performed. | Ι |
| ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair | |
| Requirement | |
| 1 | J |
| 1. PERFORM INITIALIZATION OF IVIS (NATS) SYSTEM AND REGISTRATION OF ALL IVIS (NATS) IGNI- | |
| | Κ |
| Refer to SEC-8, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement". | |
| >> GO TO 2. | |
| 2.PERFORM VIN REGISTRATION | L |
| | |
| Refer to EC-19. "VIN REGISTRATION : Special Repair Requirement". | Μ |
| | 1 V 1 |
| >> GO TO 3. | |
| 3.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING | Ν |
| Refer to EC-19, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement". | |
| | 0 |
| >> GO TO 4. | 0 |
| 4.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING | |
| Refer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement". | Ρ |
| | |
| >> GO TO 5. | |

5.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

< BASIC INSPECTION >

>> END ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE)

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

When replacing VVEL control module, the following procedure must be performed.

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

1.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END IDLE SPEED

IDLE SPEED : Description

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

IDLE SPEED : Special Repair Requirement

1.CHECK IDLE SPEED

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

>> INSPECTION END

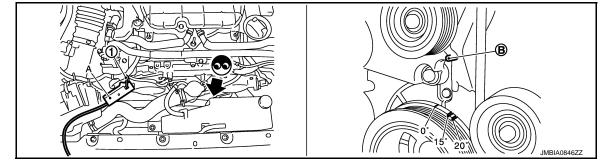
IGNITION TIMING : Description

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

IGNITION TIMING : Special Repair Requirement

1.CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



EC-18

- 1. Loop wire
- A. Timing light

B. Timing indicator



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2013 G Convertible

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INFOID:000000008156130

INFOID:000000008156131

< BASIC INSPECTION >

2. Check ignition timing.

>> INSPECTION END VIN REGISTRATION

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).

VIN REGISTRATION : Special Repair Requirement

1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to <u>GI-23, "Information About Identification or Model Code"</u>.

>> GO TO 2.

2. PERFORM VIN REGISTRATION

(B) With CONSULT

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

>> END ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description INFOLD.00000008156136

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected.

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement

1.START L 1. Make sure that accelerator pedal is fully released. Turn ignition switch ON and wait at least 2 seconds. 2. Turn ignition switch OFF and wait at least 10 seconds. 3. M 4. Turn ignition switch ON and wait at least 2 seconds. 5. Turn ignition switch OFF and wait at least 10 seconds. Ν >> END THROTTLE VALVE CLOSED POSITION LEARNING C THROTTLE VALVE CLOSED POSITION LEARNING : Description INFOID:000000008156138 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 connec-Ρ tor of electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned.

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

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< BASIC INSPECTION >

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- (P) WITH CONSULT
- Turn ignition switch ON.
- Select "CLSD THL POS LEARN" in "WORK SUPPORT" mode.
- Follow the instructions on the CONSULT display.
- 4 Turn ignition switch OFF and wait at least 10 seconds. Check that throttle valve moves during the above 10 seconds by confirming the operating sound.
- **WITHOUT CONSULT**
- Start the engine. 1
- NOTE:

Engine coolant temperature is 25°C (77°F) or less before engine starts.

- 2. Warm up the engine.
- NOTE:

Raise engine coolant temperature until it reaches 65°C (149°F) or more.

- Turn ignition switch OFF and wait at least 10 seconds. 3.
 - Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

>> END

IDLE AIR VOLUME LEARNING

IDLE AIR VOLUME LEARNING : Description

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

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

IDLE AIR VOLUME LEARNING : Special Repair Requirement

1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.

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

- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 105°C (158 221°F)
- PNP signal: ON
- · 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: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
- Without CONSULT: Drive vehicle for 10 minutes.
- M/T models
- Drive vehicle for 10 minutes.

Do you have CONSULT?

YES >> GO TO 2. NO

>> GO TO 3.

2. PERFORM IDLE AIR VOLUME LEARNING

(P)With CONSULT

- Perform Accelerator Pedal Released Position Learning. Refer to EC-19, "ACCELERATOR PEDAL 1. **RELEASED POSITION LEARNING : Special Repair Requirement".**
- Perform Throttle Valve Closed Position Learning. EC-19, "THROTTLE VALVE CLOSED POSITION 2. LEARNING : Special Repair Requirement".
- 3. Start engine and warm it up to normal operating temperature.

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| | INSPECTION AND A | | (Q37VHR] |
|---|--|--|-------------|
| < BASIC INSPECTION > 4. Select "IDLE AIR VOL LE/ | ARN" in "WORK SUPPORT" | - | |
| 5. Touch "START" and wait 2 | 0 seconds. | | |
| Is "CMPLT" displayed on CON | SULT screen? | | _ |
| YES >> GO TO 4. NO >> GO TO 5. | | | |
| 3. PERFORM IDLE AIR VOLU | JME LEARNING | | |
| | | | |
| NOTE: It is better to count the time | e accurately with a clock. | | |
| It is impossible to switch the switch the second s second second sec | | n accelerator pedal position sensor | circuit has |
| a malfunction. 1. Perform Accelerator Ped | al Released Position Learr | ning. Refer to <u>EC-19, "ACCELERATC</u> | DR PEDAL |
| RELEASED POSITION LE | EARNING : Special Repair Re | <u>equirement"</u> . | |
| LEARNING : Special Repa | | C-19, "THROTTLE VALVE CLOSED | POSITION |
| | p to normal operating tempe | ature. | |
| | nd wait at least 10 seconds. edal is fully released, turn igr | nition switch ON and wait 3 seconds. | |
| Repeat the following proce | edure quickly five times withir | | |
| Fully depress the accelera Fully release the accelerat | | | |
| Wait 7 seconds, fully depr | | or approx. 20 seconds until the MIL sto | ps blinking |
| and illuminates. 3. Fully release the accelerat | tor pedal within 3 seconds af | er the MIL illuminates. | |
| 9. Start engine and let it idle. | | | |
| 0. Wait 20 seconds. | | | |
| Engine Not run L | | Idle air volume learning star | ts |
| Ignition ON switch OFF | _ | Approx. | |
| | | 20 sec. 3 sec. n 10 sec. | |
| Fully depressed _F | | | |
| Accelerator pedal Fully released | | | |
| MIL | ON | Blinking ON OFF | |
| MIL | ON | DIIIKII ON OFF SEC897C | |
| >> GO TO 4. | | | |
| 1. CHECK IDLE SPEED AND | IGNITION TIMING | | |
| I. Start engine and warm it u | p to normal operating tempe | rature. | |
| 2. Let it idle for 20 seconds. | | | within the |
| | <u>C-598, "Idle Speed"</u> and <u>EC-5</u> | that idle speed and ignition timing are <u>98, "Ignition Timing"</u> . | |
| s the inspection result normal | ? | | |
| YES >> INSPECTION END | 0 | | |
| NO >> GO TO 5. | | | |
| D.DETECT MALFUNCTIONIN | | | |
| Check the following Check that throttle valve is fu | Illy closed. | | |
| Check PCV valve operation. | - | | |
| Check that downstream of th | | акаде. | |
| s the inspection result normal' YES >> GO TO 6. | <u>'</u> | | |
| NO >> Repair or replace | malfunctioning part. | | |
| 6. detect malfunction in | NG PART-II | | |
| | FO 64 | | |
| Revision: 2012 July | EC-21 | 2013 G | Convertible |

< BASIC INSPECTION >

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 <u>EC-148</u>, "<u>Description</u>". If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:

• Engine stalls.

Erroneous idle.

>> INSPECTION END VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description

INFOID:000000008156142

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

It must be performed each time VVEL actuator sub assembly is replaced.

CAUTION:

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

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement

1.START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 3.

2. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

With CONSULT

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

$Voltage \quad : 500 \pm 48 \ mV$

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

: 7.0 N•m (0.71 kg-m, 62 in-lb)

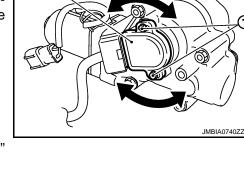
9. Reconfirm that the output voltage of "VVEL POSITION SEN- B1" or "VVEL POSITION SEN- B2" is within the standard value.

Voltage : $500 \pm 48 \text{ mV}$

NOTE:

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

- 10. Turn ignition switch OFF and wait at least 10 seconds.
- 11. Start engine and warm it up to normal operating temperature.



EC-22

< BASIC INSPECTION >

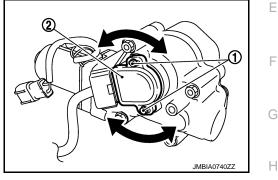
- 12. Turn ignition switch OFF and wait at least 10 seconds.
- 13. Perform idle air volume learning. Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair А Requirement".

>> INSPECTION END

3. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Without CONSULT

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



[VQ37VHR]

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| | | VVEL control module | | | |
|------|-----------|---------------------|----------|----------------------|--|
| Bank | Connector | + | - | Voltage | |
| Dank | Connector | Terminal | Terminal | | |
| 1 | E15 | 3 | 4 | $500\pm48~\text{mV}$ | |
| 2 | | 5 | 6 | 500 ± 40 mV | |

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

: 7.0 N•m (0.71 kg-m, 62 in-lb)

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

| | VVEL control module | | | | M | |
|-------|---------------------|----------|----------|---------------|---|--|
| Bank | Connector | + | - | Voltage | | |
| Dalik | Connector | Terminal | Terminal | | | |
| 1 | E15 | 3 | 4 | 500 ± 48 mV | N | |
| 2 | | 5 | 6 | - 500 ± 40 mV | | |
| NOTE | _ | | | | | |

NOTE:

0

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

11. Turn ignition switch OFF and wait at least 10 seconds.

12. Start engine and warm it up to normal operating temperature.

13. Turn ignition switch OFF and wait at least 10 seconds.

14. Perform idle air volume learning. Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> INSPECTION END MIXTURE RATIO SELF-LEARNING VALUE CLEAR

< BASIC INSPECTION >

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

[VQ37VHR]

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:000000008156145

1.START

With CONSULT

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

With GST

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

>> END

< BASIC INSPECTION >

HOW TO SET SRT CODE

Description

INFOID:000000008156146

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[VQ37VHR]

OUTLINE

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

SRT ITEM

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

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

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

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

SRT SERVICE PROCEDURE

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

Κ

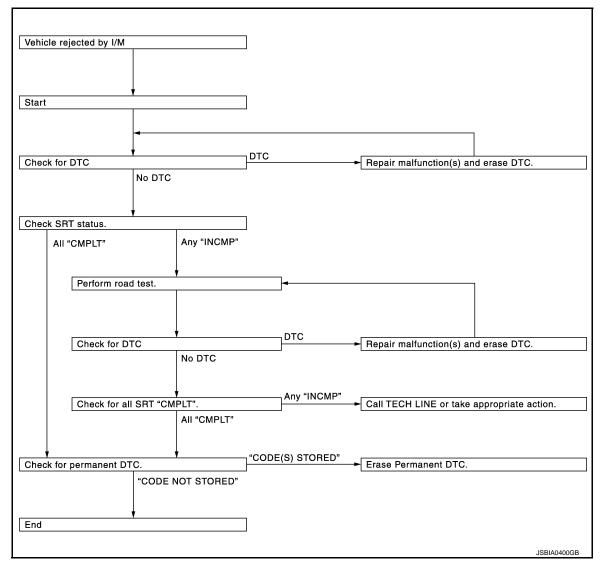
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< BASIC INSPECTION >



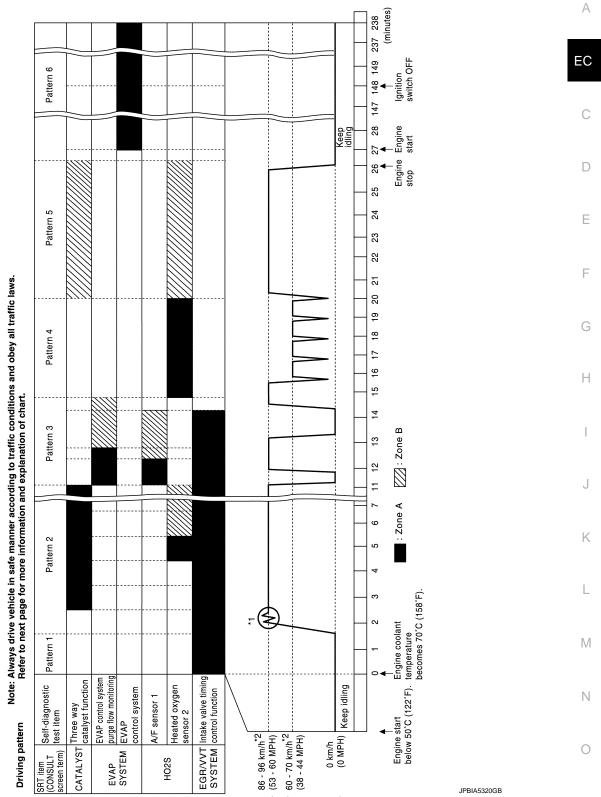
SRT Set Driving Pattern

INFOID:000000008156147

CAUTION:

< BASIC INSPECTION >

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



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

- *2: Checking the vehicle speed with GST is advised.
- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
- "Zone A" is the fastest time where required for the diagnosis under normal conditions*. If the diagnosis is not completed within "Zone A", the diagnosis can still be performed within "Zone B".

< BASIC INSPECTION >

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

NOTE:

Diagnosis is performed as quickly as possible under normal conditions. However, under other conditions, diagnosis may also be performed. [For example: ambient air temperature other than $20 - 30^{\circ}C$ ($68 - 86^{\circ}F$)]

Work Procedure

INFOID:000000008156148

1. СНЕСК DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-559, "DTC Index".

NO >> GO TO 2.

2. CHECK SRT STATUS

With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

Without CONSULT

Perform "SRT status" mode with EC-134, "On Board Diagnosis Function".

With GST

Select Service \$01 with GST.

Is SRT code(s) set?

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

3. DTC CONFIRMATION PROCEDURE

1. Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT.

- For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" according to the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-25, "Description"</u>.
- 3. Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to EC-559. "DTC Index".
- NO >> GO TO 11.

4.PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to EC-25, "Description".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to <u>EC-26</u>, "<u>SRT Set Driving</u> <u>Pattern</u>".

In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

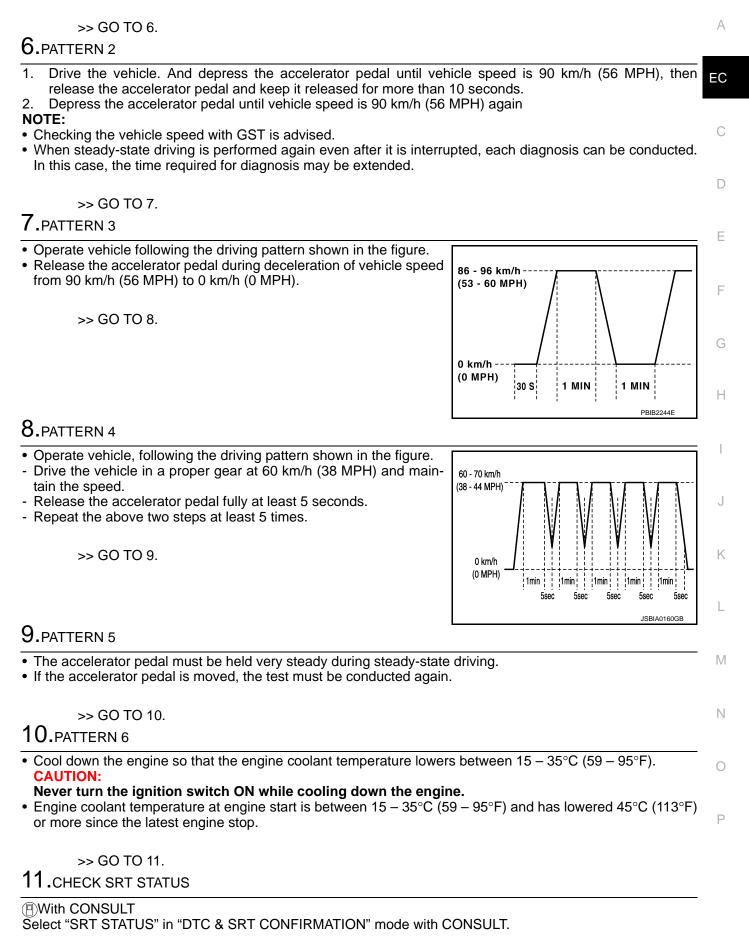
- 1. Check the vehicle condition;
- Engine coolant temperature is –10 to 35°C (14 to 95°F).
- Fuel tank temperature is more than 0°C (32°F).
- 2. Start the engine.
- 3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:

- ECM terminal voltage is follows;
- Engine coolant temperature
- −10 to 35°C (14 to 95°F): 3.0 − 4.3 V
- 70°(158°F): Less than 4.1 V
- Fuel tank temperature: Less than 1.4 V
- Refer to EC-533, "Reference Value".

< BASIC INSPECTION >

[VQ37VHR]



EC-29

< BASIC INSPECTION >

Without CONSULT
 Perform "SRT status" mode with <u>EC-134, "On Board Diagnosis Function"</u>.
 With GST
 Select Service \$01 with GST.
 <u>Is SRT(s) set?</u>
 YES >> GO TO 12.

NO >> Call TECH LINE or take appropriate action.

12.CHECK PERMANENT DTC

NOTE:

Permanent DTC cannot be checked with a tool other than CONSULT or GST. With CONSULT Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT. With GST Select Service \$0A with GST. Is permanent DTC(s) detected?

YES >> Go to EC-25, "Description".

NO >> END

< BASIC INSPECTION >

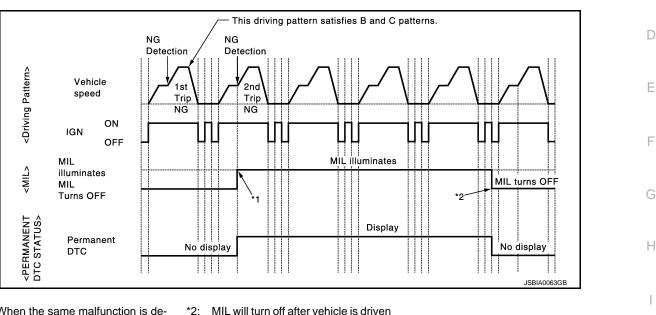
HOW TO ERASE PERMANENT DTC

Description

OUTLINE

When a DTC is stored in ECM

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



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate. MIL will turn off after vehicle is driven 3 times (driving pattern B) without any malfunctions.

When a DTC is not stored in ECM

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

If the applicable permanent DTC includes multiple groups, perform the procedure of Group B first. If the per-

| | | ×: Applica | able —: Not applicable | ; | | |
|--------|---|-----------------|------------------------|---|--|--|
| Crows* | Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs. | Driving pattern | | L | | |
| Group | renome bit confirmation procedure to applicable bits. | В | D | | | |
| A | × | _ | — | M | | |
| В | | × | × | | | |

*: For group, refer to <u>EC-559, "DTC Index"</u>.

PERMANENT DTC ITEM

For permanent DTC items, MIL turns ON. Refer to EC-559, "DTC Index".

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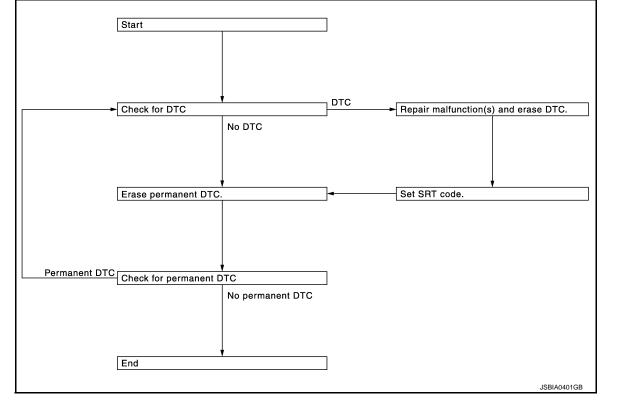
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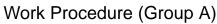
EC

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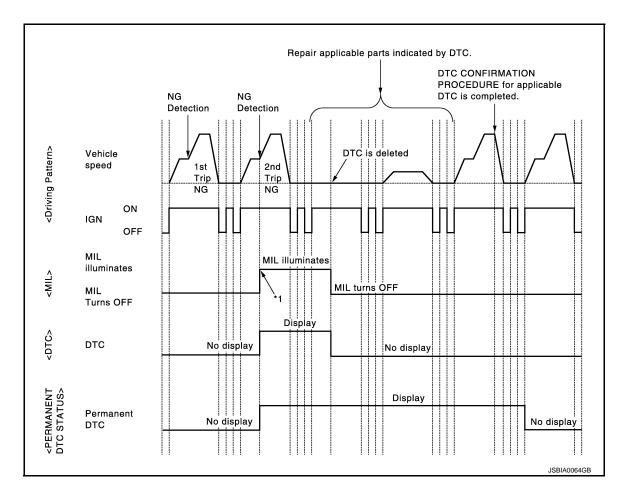
[VQ37VHR]

PERMANENT DTC SERVICE PROCEDURE





INFOID:000000008156150



< BASIC INSPECTION >

*1: When the same malfunction is de-А tected in two consecutive trips, MIL will illuminate. 1.CHECK DTC EC Check DTC. Is any DTC detected? YES >> Repair malfunction(s) and erase DTC. Refer to EC-134. "On Board Diagnosis Function", EC-138. "CONSULT Function". NO >> GO TO 2. D 2.CHECK PERMANENT DTC With CONSULT Е 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. 4. Turn ignition switch ON. F Select "PERMANENT DTC STATUS" mode with CONSULT. 5. With GST 1. Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. 2. 3. Turn ignition switch OFF and wait at least 10 seconds. 4. Turn ignition switch ON. 5. Select Service \$0A with GST. Н Is any permanent DTC detected? YES >> GO TO 3. NO >> END **3.** PERFORM DTC CONFIRMATION PROCEDURE Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in J ECM. Refer to EC-559, "DTC Index". >> GO TO 4. Κ **4.**CHECK PERMANENT DTC With CONSULT ĭ. L Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. 4. Turn ignition switch ON. Μ 5. Select "PERMANENT DTC STATUS" mode with CONSULT. With GST 1. Turn ignition switch OFF and wait at least 10 seconds. Ν 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. Turn ignition switch ON. 4. 5. Select Service \$0A with GST. Is any permanent DTC detected? YES >> GO TO 1. NO Ρ >> END

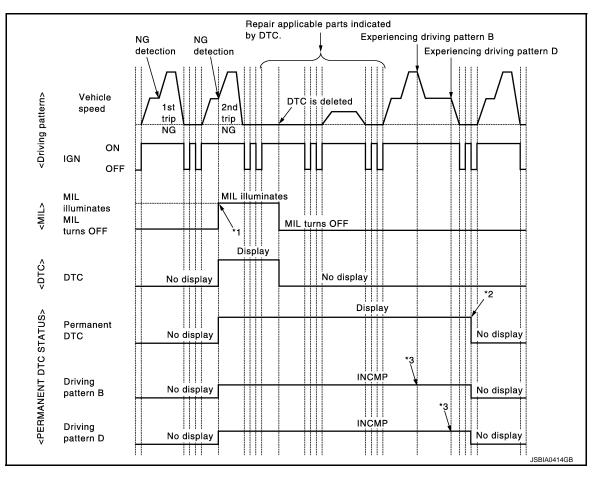
[VQ37VHR]

< BASIC INSPECTION >

Work Procedure (Group B)

INFOID:000000008156151

[VQ37VHR]



- *1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.
- *2: After experiencing driving pattern B *3: and D, permanent DTC is erased.

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

NOTE:

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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-134. "On Board Diagnosis Function"</u>, <u>EC-138.</u> <u>"CONSULT Function"</u>.

NO >> GO TO 2.

2. CHECK PERMANENT DTC

With CONSULT

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

With GST

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

| < BASIC INSPECTION > [VQ37VHR] |
|---|
| Turn ignition switch ON. Select Service \$0A with GST. |
| Is any permanent DTC detected? |
| YES >> GO TO 3. NO >> END E0 |
| 3. DRIVE DRIVING PATTERN B |
| CAUTION |
| Always drive at a safe speed. Never erase self-diagnosis results. |
| If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving |
| pattern B and D is reset. D (P)With CONSULT D |
| 1. Start engine and warm it up to normal operating temperature. |
| Use "PERMANENT DTC WORK SUPPORT" mode with CONSULT to drive the vehicle according to driv- ing pattern B. Refer to <u>EC-138</u>, "<u>CONSULT Function</u>", <u>EC-132</u>, "<u>DIAGNOSIS DESCRIPTION</u>: <u>Driving</u> |
| Battern". BigWith GST |
| 1. Start engine and warm it up to normal operating temperature. |
| Drive the vehicle according to driving pattern B. Refer to <u>EC-132</u>, "<u>DIAGNOSIS DESCRIPTION</u> : <u>Driving</u> <u>Pattern</u>". |
| G |
| >> GO TO 4. |
| 4.CHECK PERMANENT DTC |
| |
| Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. |
| 3. Turn ignition switch OFF and wait at least 10 seconds. |
| Turn ignition switch ON. Select "PERMANENT DTC STATUS" mode with CONSULT. |
| With GST |
| Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. |
| Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. |
| 4. Turn ignition switch ON. |
| 5. Select Service \$0A with GST. <u>Is any permanent DTC detected?</u> |
| YES >> GO TO 5. |
| NO >> END |
| 5. DRIVE DRIVING PATTERN D |
| CAUTION: |
| Always drive at a safe speed. Never erase self-diagnosis results. |
| • If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving |
| pattern B and D is reset. 1. Drive the vehicle according to driving pattern D. Refer to <u>EC-132</u>, "<u>DIAGNOSIS DESCRIPTION</u> : <u>Driving</u> <u>Pattern</u>". |
| >> GO TO 6. |
| 6. CHECK PERMANENT DTC |

- With CONSULT1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON. 4.

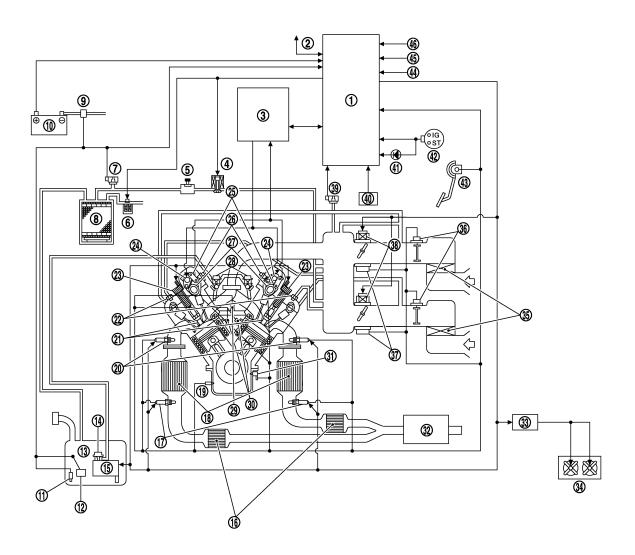
< BASIC INSPECTION >

- Select "PERMANENT DTC STATUS" mode with CONSULT. 5.
- With GST1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. 3.
- 4.
- 5. Select Service \$0A with GST.
- Is any permanent DTC detected?
- YES >> GO TO 1.
- NO >> END

< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION ENGINE CONTROL SYSTEM

System Diagram



Ν

- 1. ECM
- 4. EVAP canister purge volume control 5. solenoid valve
- 7. EVAP control system pressure sen- 8. sor
- 10. Battery
- 13. Fuel tank
- 16. Three way catalyst 2
- 19. Engine oil temperature sensor
- 22. PCV valve

- 2. Can communication
 - EVAP service port
 - EVAP canister
- 11. Fuel tank temperature sensor
- 14. Fuel pressure regulator
- 17. Heated oxygen sensor 2
- 20. A/F sensor 1
- 23. Ignition coil (with power transistor)

[VQ37VHR]

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EVAP canister vent control valve Battery current sensor

JMBIA2007ZZ

12. Fuel level sensor

VVEL control module

15. Fuel pump

3.

6.

9.

- 18. Three way catalyst 1
- 21. Spark plug
- 24. VVEL actuator motor

< SYSTEM DESCRIPTION >

- [VQ37VHR]
- 25. VVEL control shaft position sensor 26. Intake valve timing control solenoid 27. Camshaft position sensor (PHASE) valve 28. Fuel damper 29. Engine coolant temperature sensor 30. Knock sensor 31. Crankshaft position sensor (POS) Muffler 32. 33. Cooling fan control module 34. Cooling fan 35. Air cleaner 36. Mass air flow sensor [with intake air temperature sensor(bank 1)] 37. Electric throttle control actuator Throttle position sensor Manifold absolute pressure (MAP) 38. 39. sensor 41. MIL 42. Ignition switch 40. Brake booster pressure sensor 44. Power steering pressure sensor 43. Accelerator pedal position sensor 45. Refrigerant pressure sensor
- 46. PNP signal

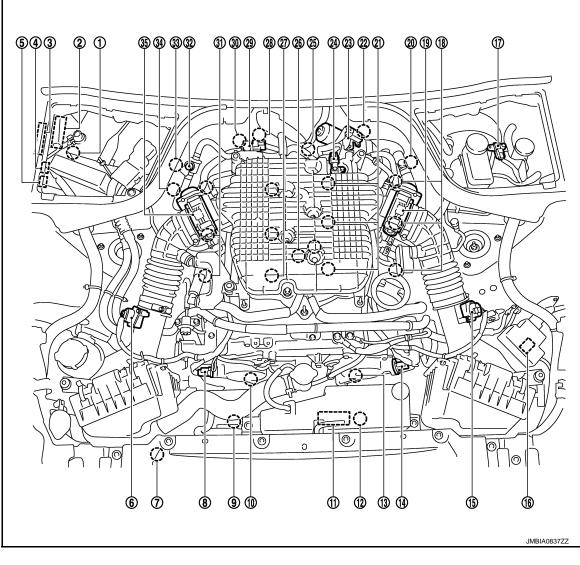
System Description

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

Component Parts Location

INFOID:000000008156154

INFOID:000000008156153



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

< SYSTEM DESCRIPTION >

- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- Electric throttle control actuator 19. (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor
- 28. VVEL actuator motor (bank 1)
- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 34. Crankshaft position sensor (POS)

- Camshaft position sensor (PHASE) 8. (bank 1)
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor

Cooling fan control module

- 20. A/F sensor 1 (bank 2)
- VVEL actuator motor (bank 2) 23.
- 26. Knock sensor

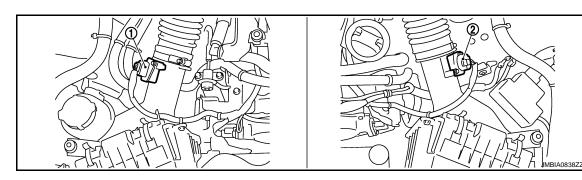
11.

- 29. EVAP canister purge volume control solenoid valve
- 32. EVAP service port
- 35. Electric throttle control actuator (bank 1)

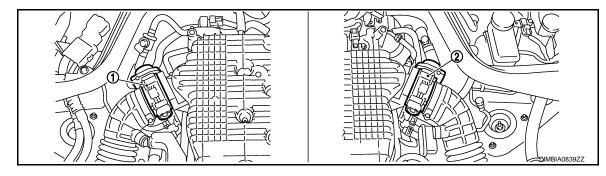
- Cooling fan motor-2
- 12. Cooling fan motor-1

9.

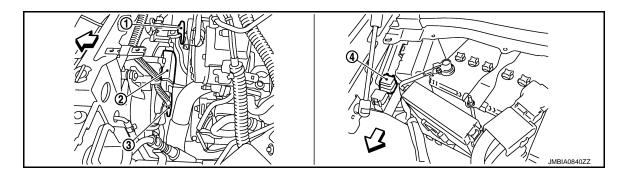
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2) 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)
- 30. VVEL control shaft position sensor (bank 1)
- 33. A/F sensor 1 (bank 1)



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



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



2013 G Convertible

[VQ37VHR]

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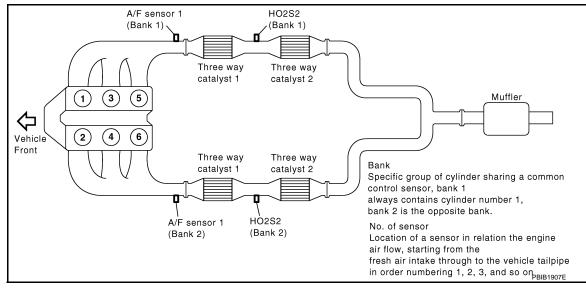
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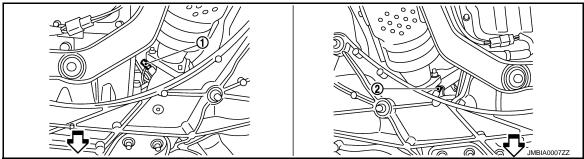
< SYSTEM DESCRIPTION >

C: Vehicle front

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

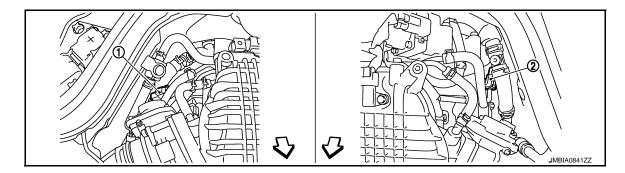
4. Cooling fan relay





C : Vehicle front

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



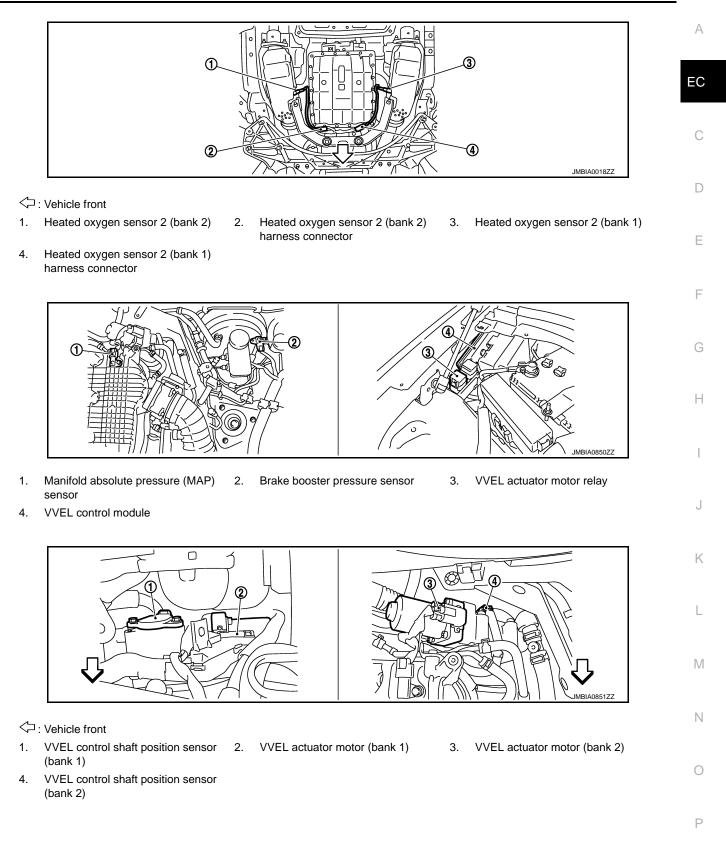
C : Vehicle front

1. A/F sensor 1 (bank 1) harness con- 2. A/F sen nector nector

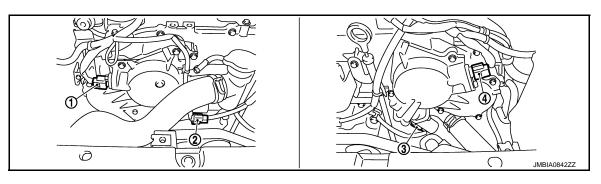
A/F sensor 1 (bank 2) harness con-

< SYSTEM DESCRIPTION >

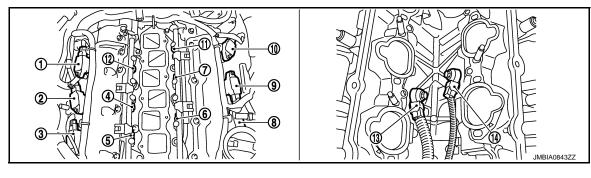
[VQ37VHR]



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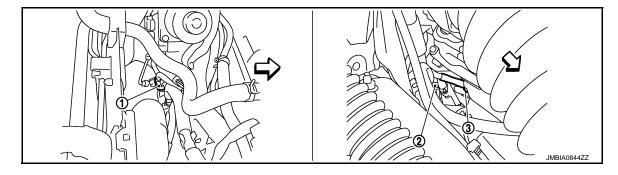
- Camshaft position sensor (PHASE) 2. 1. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid 3. valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector



- Ignition coil No.5 (with power transis- 2. 1. tor)
- 4. Fuel injector No.3
- Fuel injector No.4 7.
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)

- Ignition coil No.3 (with power transis- 3. tor)
- 5. Fuel injector No.1
- 8. Ignition coil No.2 (with power transis- 9. tor)
- 14. Knock sensor (bank 2)

- Ignition coil No.1 (with power transistor)
- 6. Fuel injector No.2
 - Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5

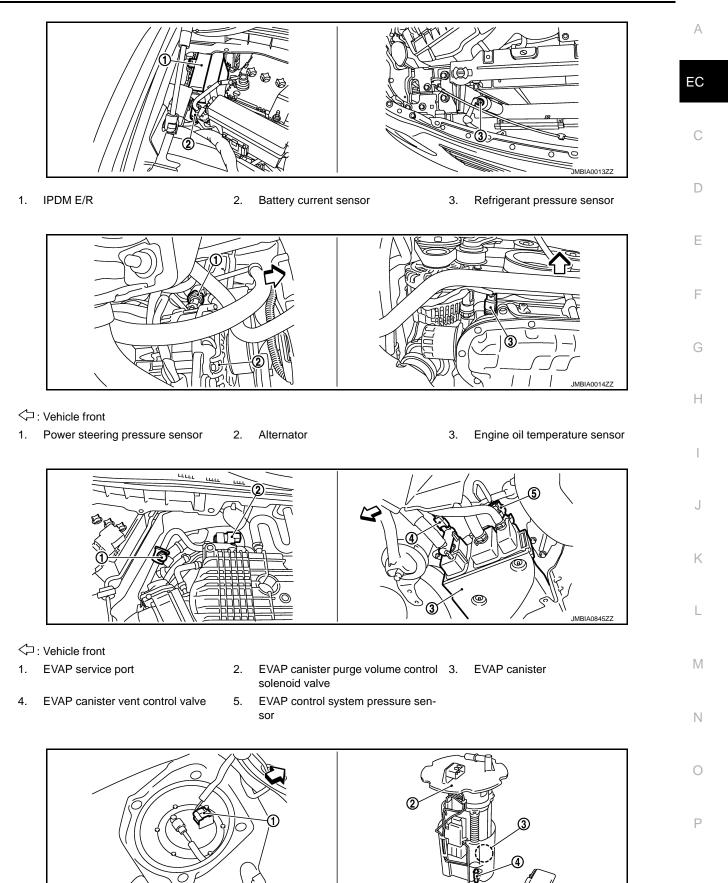


C: Vehicle front

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



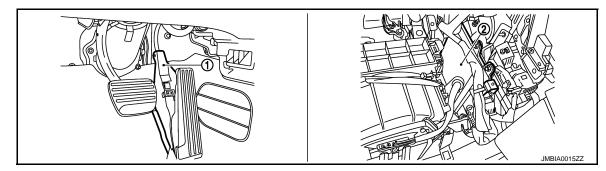
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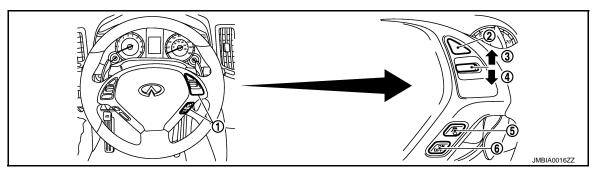
< SYSTEM DESCRIPTION >

└─ : Vehicle front

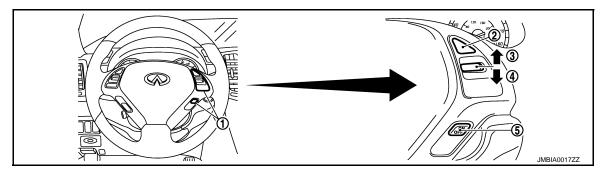
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- Fuel tank temperature sensor 4.



1. Accelerator pedal position sensor 2. ECM



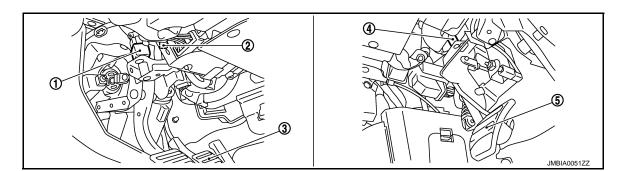
- ICC steering switch 1.
- SET/COAST switch 4.
- CANCEL switch 2.
- 5. **DISTANCE** switch
- RESUME/ACCELERATE switch 3.
- MAIN switch 6.



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANCEL switch 5. MAIN switch
- 3. RESUME/ACCELERATE switch



< SYSTEM DESCRIPTION >

[VQ37VHR]

1. Stop lamp switch

4.

- 2. ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models) 5. Clutch pedal

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Component Description

ASCD clutch switch

EC INFOID:000000008156155

| Component | Reference | C |
|---|-----------------------|----|
| A/F sensor 1 | EC-221, "Description" | _ |
| A/F sensor 1 heater | EC-172, "Description" | |
| Accelerator pedal position sensor | EC-482, "Description" | |
| ASCD brake switch | EC-448, "Description" | |
| ASCD steering switch | EC-441, "Description" | Ε |
| Battery current sensor | EC-428, "Description" | |
| Brake booster pressure sensor | EC-370, "Description" | |
| Camshaft position sensor (PHASE) | EC-297, "Description" | F |
| Cooling fan control module | EC-501, "Description" | |
| Cooling fan motor | EC-501, "Description" | (|
| Crankshaft position sensor (POS) | EC-293, "Description" | |
| Electric throttle control actuator | EC-421, "Description" | |
| Engine coolant temperature sensor | EC-206, "Description" | F |
| Engine oil temperature sensor | EC-273, "Description" | |
| EVAP canister purge volume control solenoid valve | EC-311, "Description" | |
| EVAP canister vent control valve | EC-319, "Description" | |
| EVAP control system pressure sensor | EC-327, "Description" | |
| Fuel injector | EC-507, "Description" | |
| Fuel level sensor | EC-348, "Description" | |
| Fuel pump | EC-510, "Description" | L. |
| Fuel tank temperature sensor | EC-266, "Description" | r |
| Heated oxygen sensor 2 | EC-231, "Description" | |
| Heated oxygen sensor 2 heater | EC-175, "Description" | L |
| ICC brake switch | EC-455, "Description" | |
| ICC steering switch | EC-444, "Description" | |
| Ignition signal | EC-518, "Description" | N |
| Intake air temperature sensor | EC-200, "Description" | |
| Intake valve timing control solenoid valve | EC-178, "Description" | ١ |
| Knock sensor | EC-290, "Description" | |
| Manifold absolute pressure (MAP) sensor | EC-193, "Description" | |
| Mass air flow sensor | EC-181, "Description" | (|
| PCV valve | EC-529, "Description" | |
| Power steering pressure sensor | EC-367, "Description" | F |
| Refrigerant pressure sensor | EC-531, "Description" | ' |
| Stop lamp switch | EC-474, "Description" | |
| Throttle control motor | EC-418. "Description" | |
| Throttle control motor relay | EC-426, "Description" | |
| Throttle position sensor | EC-209, "Description" | |
| VVEL actuator motor | EC-396, "Description" | |

Revision: 2012 July

< SYSTEM DESCRIPTION >

| Component | Reference |
|------------------------------------|-----------------------|
| VVEL actuator motor relay | EC-400, "Description" |
| VVEL control module | EC-467, "Description" |
| VVEL control shaft position sensor | EC-392, "Description" |

< SYSTEM DESCRIPTION >

MULTIPORT FUEL INJECTION SYSTEM

System Diagram



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INFOID:000000008156157

[VQ37VHR]

| Crankshaft position sensor (POS) | Engine speed ^{*2} & Piston position | | | | |
|--|---|------------|--------------------------------|---------------|---|
| Camshaft position sensor (PHASE) | | | | | |
| Mass air flow sensor | Amount of intake air | | | | - |
| Intake air temperature sensor | Intake air temperature | | | | |
| Engine coolant temperature sensor | Engine coolant temperature | | | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas | | | | |
| Throttle position sensor | Throttle position | | Fuel injection & mixture ratio | | |
| Accelerator pedal position sensor | Accelerator pedal position | ECM | control | Fuel injector | |
| Park/neutral position (PNP) switch (M/T models) TCM(A/T models) | Gear position | | | | |
| Battery | Battery voltage ^{*2} | | | | |
| Knock sensor | Engine knocking condition | | | | |
| Power steering pressure sensor | Power steering operation | | | | |
| Heated oxygen sensor 2 ^{*1} | Density of oxygen in exhaust gas | | | | |
| ABS actuator and electric unit (control unit) | VDC/TCS operation command | | | | |
| Unified meter and A/C amp. | Air conditioner operation & Vehicle speed | • | | | |
| *1 : This sensor is not used to control | the engine system under normal conditions. | | _ | | |
| *2 : ECM determines the start signal s | tatus by the signals of engine speed and batter | y voltage. | | | |

System Description

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 | | | | |
| Park/neutral position (PNP) switch (M/T models) TCM (A/T models) | Gear position | n exhaust gas | & mixture ratio Fue | | |
| Battery | Battery voltage*3 | | | | |
| Knock sensor | Engine knocking condition | | g condition | | |
| Power steering pressure sensor | Power steering operation | | | | |
| Heated oxygen sensor 2*1 | Density of oxygen in exhaust gas | | | | |
| ABS actuator and electric unit (control unit)*2 | VDC/TCS operation command | | | | |
| Listing mater and A/C ann | Air conditioner operation* ² | | | | |
| Unified meter and A/C amp. | Vehicle speed*2 | | | | |

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



< SYSTEM DESCRIPTION >

[VQ37VHR]

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

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

SYSTEM DESCRIPTION

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

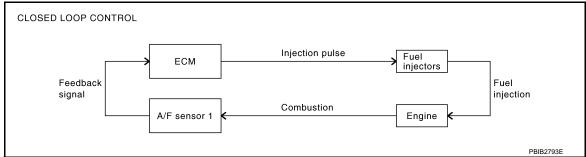
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D (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 1 can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to <u>EC-221</u>, "<u>Description</u>". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture). This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst 1. Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

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

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

EC-48

< SYSTEM DESCRIPTION >

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

| • Sequential multiport fuel injection system | • Simultaneous multiport fuel injection system |
|--|--|
| No. 1 cylinder No. 2 cylinder No. 3 cylinder No. 4 cylinder No. 5 cylinder No. 6 cylinder 1 engine cycle | No. 1 cylinder |

Two types of systems are used.

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

FUEL SHUT-OFF

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

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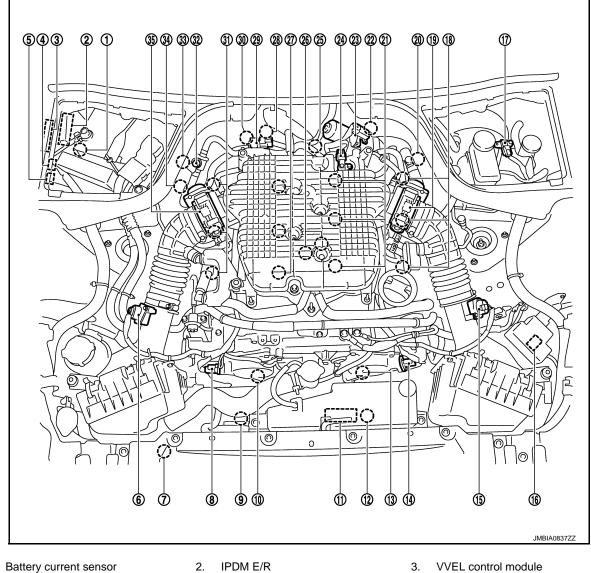
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Component Parts Location

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- 1. 4. Cooling fan relay
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- 19. Electric throttle control actuator (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor
- 28. VVEL actuator motor (bank 1)

IPDM E/R

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8. Camshaft position sensor (PHASE)

VVEL actuator motor relay

- (bank 1) 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor solenoid valve

- VVEL control module
- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)
 - (bank 1)

< SYSTEM DESCRIPTION >

- Ignition coil (with power transistor) 32 and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

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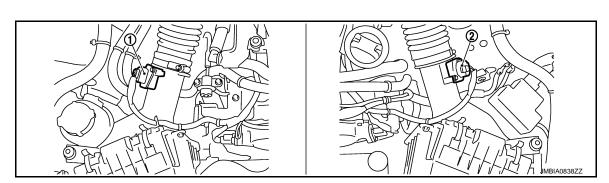
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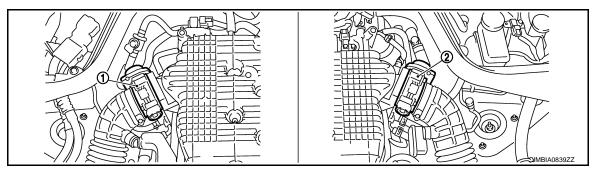
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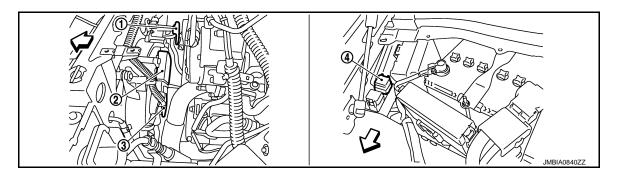
- 34. Crankshaft position sensor (POS) 35.
 - 35. Electric throttle control actuator (bank 1)



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



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



- C: Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- 3. Cooling fan motor-1

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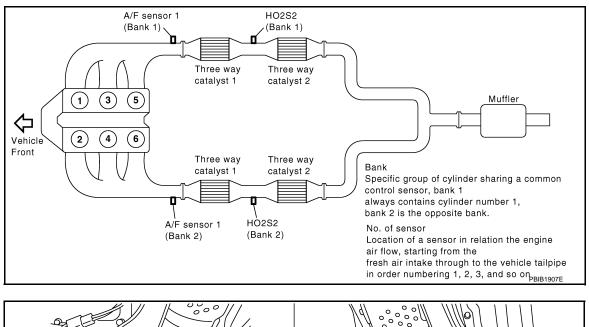
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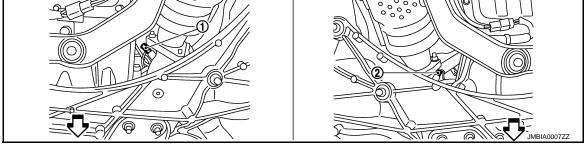
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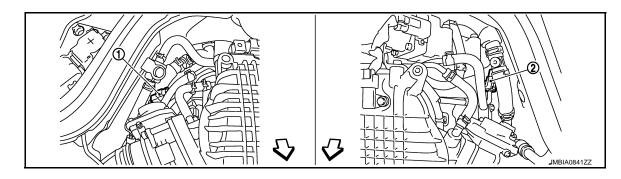
< SYSTEM DESCRIPTION >





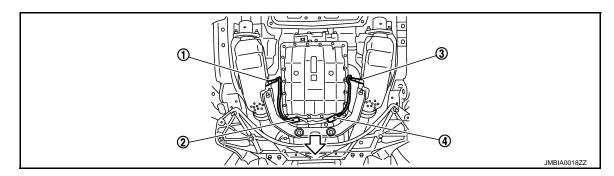
└□: Vehicle front

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



C : Vehicle front

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



MULTIPORT FUEL INJECTION SYSTEM < SYSTEM DESCRIPTION >

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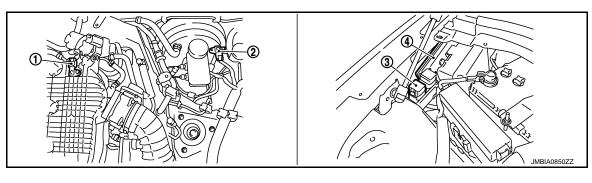
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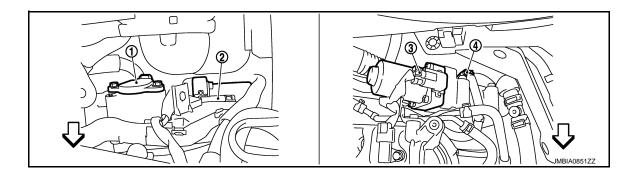
C: Vehicle front

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

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



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



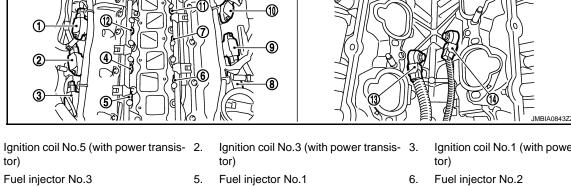
C: Vehicle front

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

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

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Fuel injector No.4 7.

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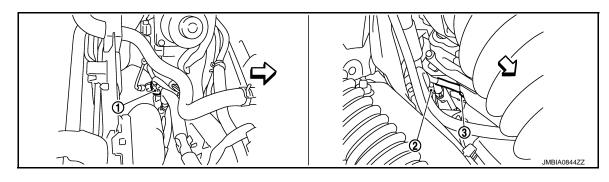
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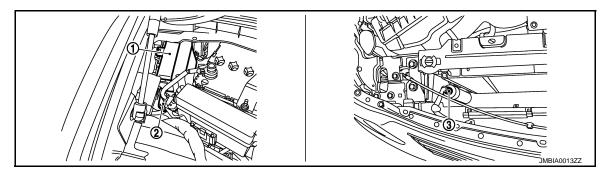
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)
- Ignition coil No.2 (with power transis- 9. 8.
 - tor)
- 14. Knock sensor (bank 2)

- Ignition coil No.1 (with power transis-
- Fuel injector No.2
- Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5



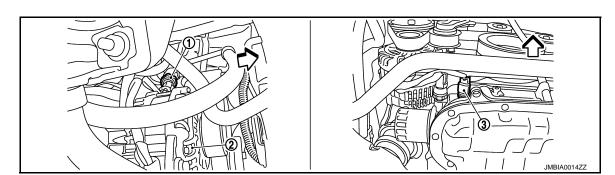
C: Vehicle front

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



IPDM E/R 1.

- 2. Battery current sensor
- Refrigerant pressure sensor 3.



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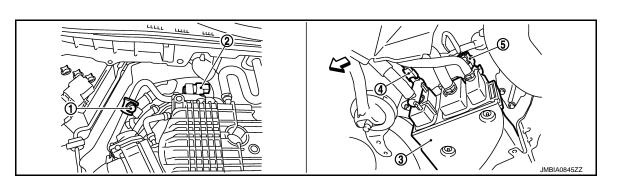
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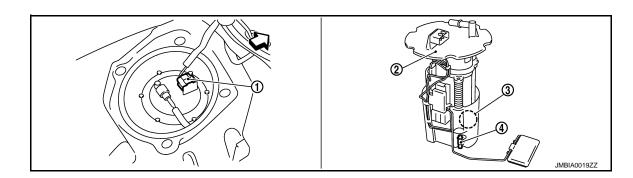
$\diamondsuit: \mathsf{Vehicle front}$

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

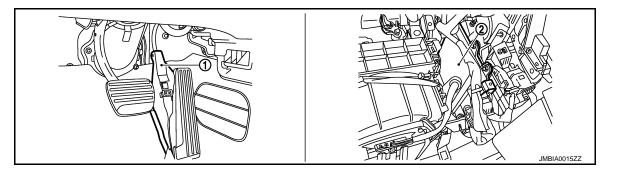


- C: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C: Vehicle front

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



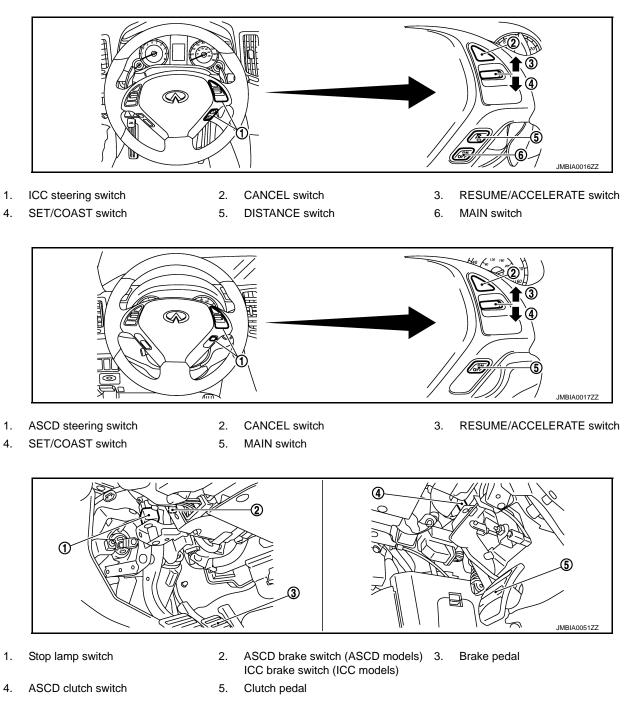
1. Accelerator pedal position sensor 2. ECM

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< SYSTEM DESCRIPTION >

[VQ37VHR]



Component Description

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| Component | Reference |
|-----------------------------------|-----------------------|
| A/F sensor 1 | EC-221, "Description" |
| Accelerator pedal position sensor | EC-482, "Description" |
| Camshaft position sensor (PHASE) | EC-297, "Description" |
| Crankshaft position sensor (POS) | EC-293. "Description" |
| Engine coolant temperature sensor | EC-206. "Description" |
| Fuel injector | EC-507, "Description" |
| Heated oxygen sensor 2 | EC-231, "Description" |
| Intake air temperature sensor | EC-200, "Description" |

Revision: 2012 July



< SYSTEM DESCRIPTION >

[VQ37VHR]

| Component | Reference | ٨ |
|--------------------------------|-----------------------|----|
| Knock sensor | EC-290, "Description" | A |
| Mass air flow sensor | EC-181, "Description" | |
| Power steering pressure sensor | EC-367, "Description" | EC |
| Throttle position sensor | EC-209, "Description" | |
| | | |

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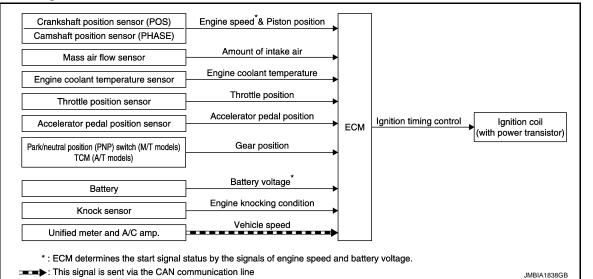
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< SYSTEM DESCRIPTION >

ELECTRIC IGNITION SYSTEM

System Diagram



System Description

INFOID:000000008156161

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|----------------------------|-------------------------|--|
| Crankshaft position sensor (POS) | Engine speed* ² | | g Ignition coil (with power transistor) |
| 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 | |
| Park/neutral position (PNP) switch (M/T models) TCM (A/T models) | Gear position | | |
| Battery | Battery voltage*2 | | |
| Knock sensor | Engine knocking | | |
| Unified meter and A/C amp. | Vehicle speed*1 | 1 | |

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

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

SYSTEM DESCRIPTION

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

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

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

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

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

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



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< SYSTEM DESCRIPTION >

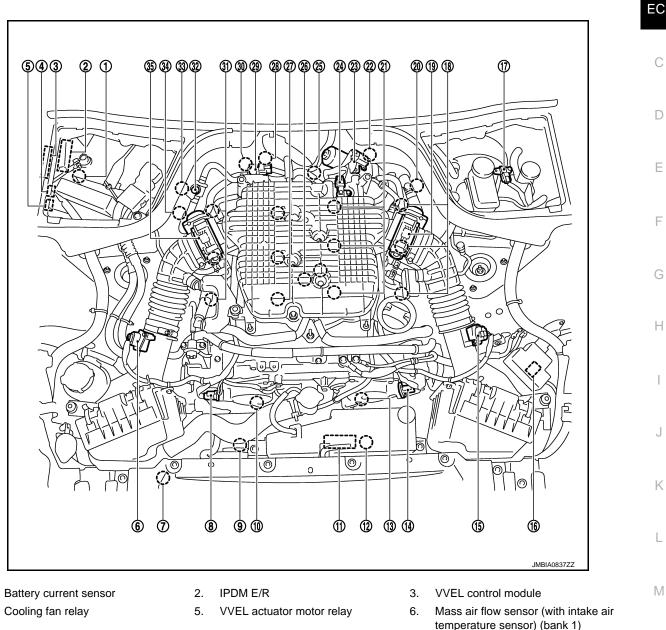
[VQ37VHR]

А

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

Component Parts Location

INFOID:000000008156162



7. Refrigerant pressure sensor

1.

4.

- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- 19. Electric throttle control actuator (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor
- 28. VVEL actuator motor (bank 1)

- 8. Camshaft position sensor (PHASE) (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor
- 29. EVAP canister purge volume control solenoid valve
- temperature sensor) (bank 1) 9. Cooling fan motor-2 Ν 12. Cooling fan motor-1 15. Mass air flow sensor (bank 2) 18. Ignition coil (with power transistor) Ρ and spark plug (bank 2) 21. Fuel injector (bank 2) 24. Manifold absolute pressure (MAP) sensor 27. Fuel injector (bank 1) 30. VVEL control shaft position sensor (bank 1)

Revision: 2012 July



< SYSTEM DESCRIPTION >

- Ignition coil (with power transistor) 32. E and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

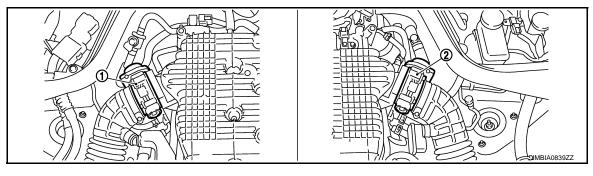
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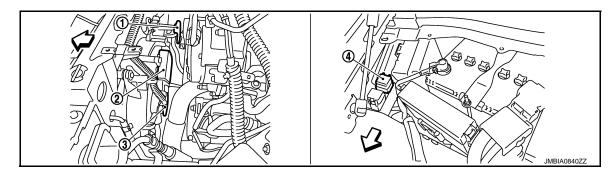
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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

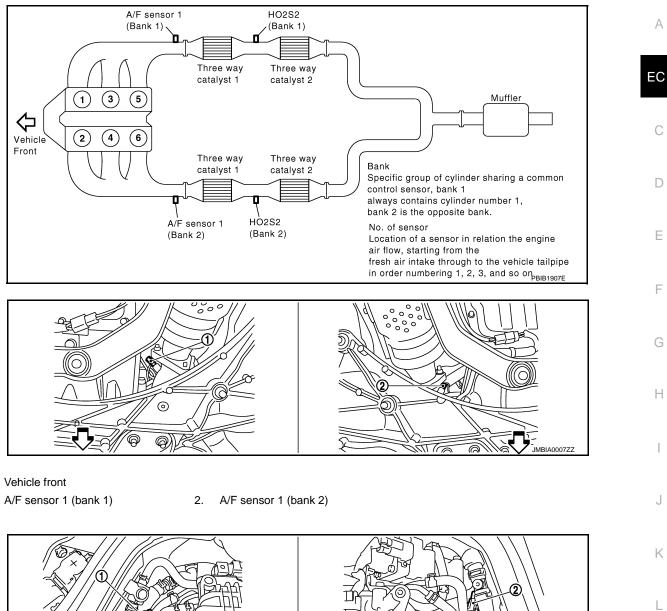


- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)

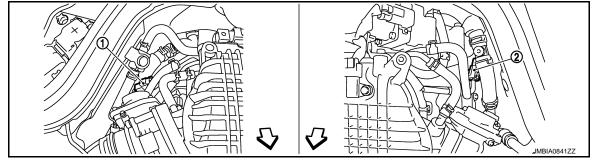


- C : Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- 3. Cooling fan motor-1

< SYSTEM DESCRIPTION >



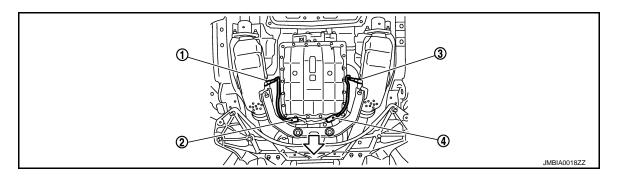
- C: Vehicle front
- 1.



C: Vehicle front

A/F sensor 1 (bank 1) harness con- 2. 1. nector nector

A/F sensor 1 (bank 2) harness con-



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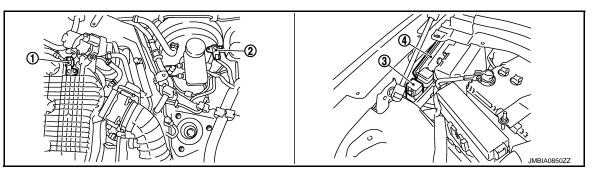
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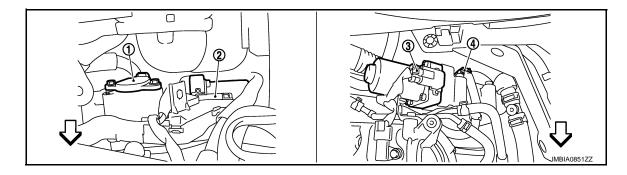
C: Vehicle front

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

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



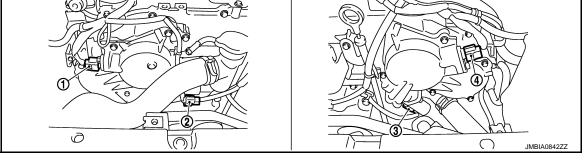
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



C: Vehicle front

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

- 4. VVEL control shaft position sensor (bank 2)
 - _____



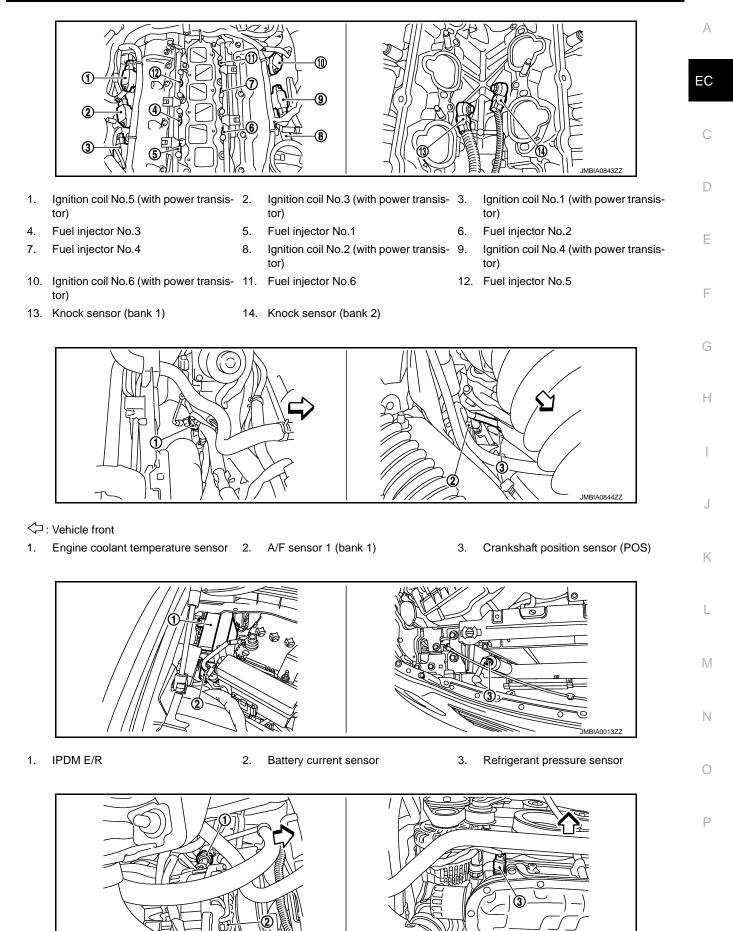
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

Intake valve timing control solenoid 3. valve (bank 1) harness connector

Intake valve timing control solenoid valve (bank 2) harness connector

< SYSTEM DESCRIPTION >

[VQ37VHR]



Revision: 2012 July

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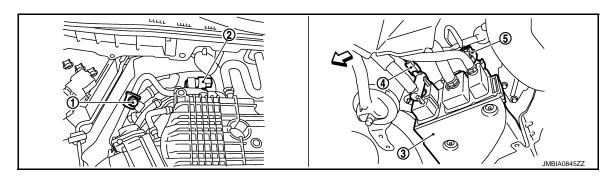
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C: Vehicle front

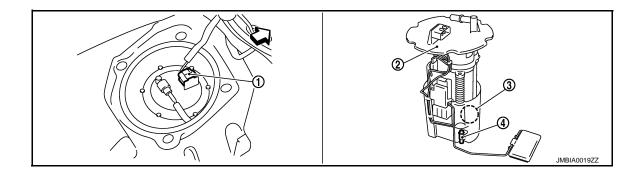
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



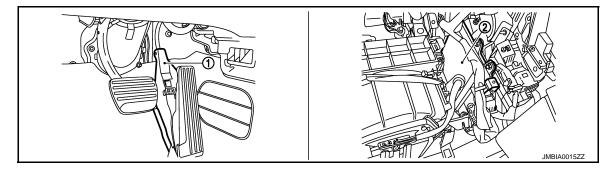
└□: Vehicle front

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



C : Vehicle front

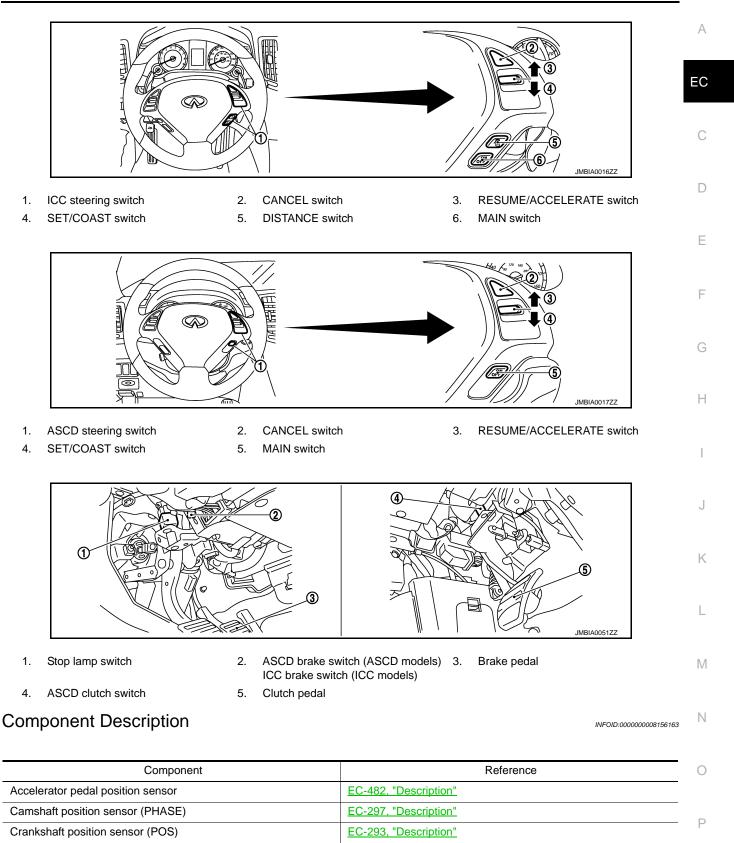
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



Mass air flow sensor

Throttle position sensor

Ignition signal

Knock sensor

Engine coolant temperature sensor



EC-206, "Description"

EC-518, "Description"

EC-290, "Description"

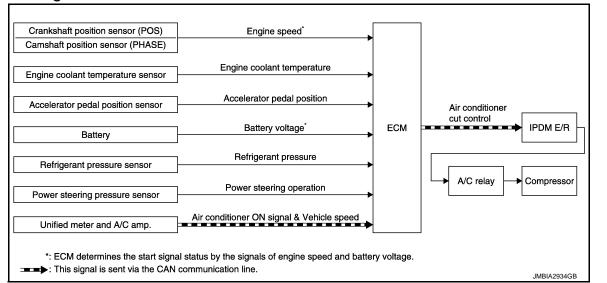
EC-181, "Description"

EC-209, "Description"

< SYSTEM DESCRIPTION >

AIR CONDITIONING CUT CONTROL

System Diagram



System Description

INFOID:000000008156165

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

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

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

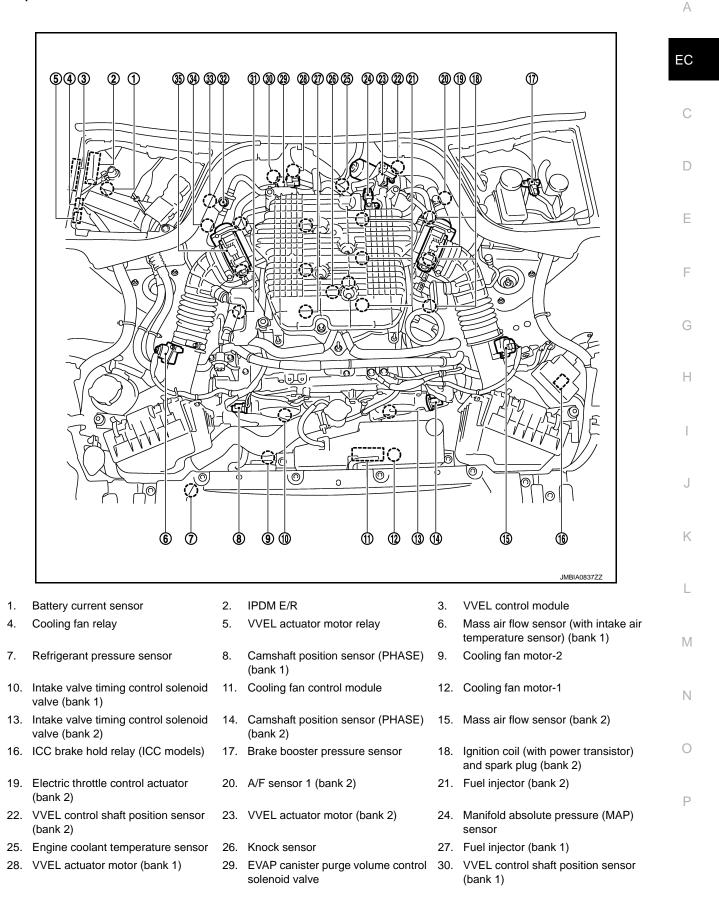
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< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]

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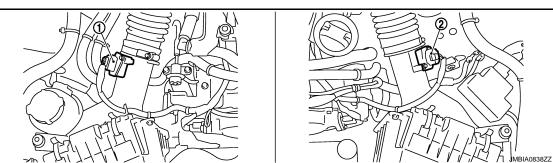
< SYSTEM DESCRIPTION >

- Ignition coil (with power transistor) 32. EVA and spark plug (bank 1)
- 32. EVAP service port

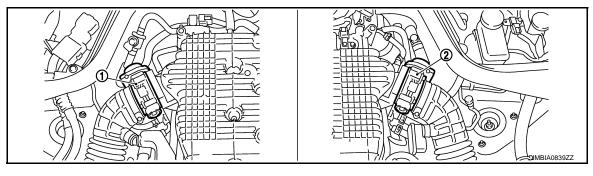
33. A/F sensor 1 (bank 1)

[VQ37VHR]

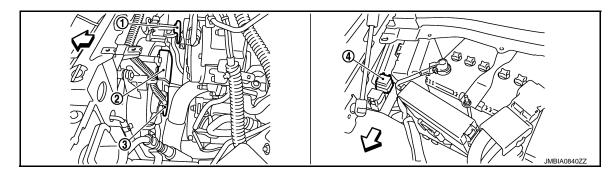
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



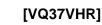
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)

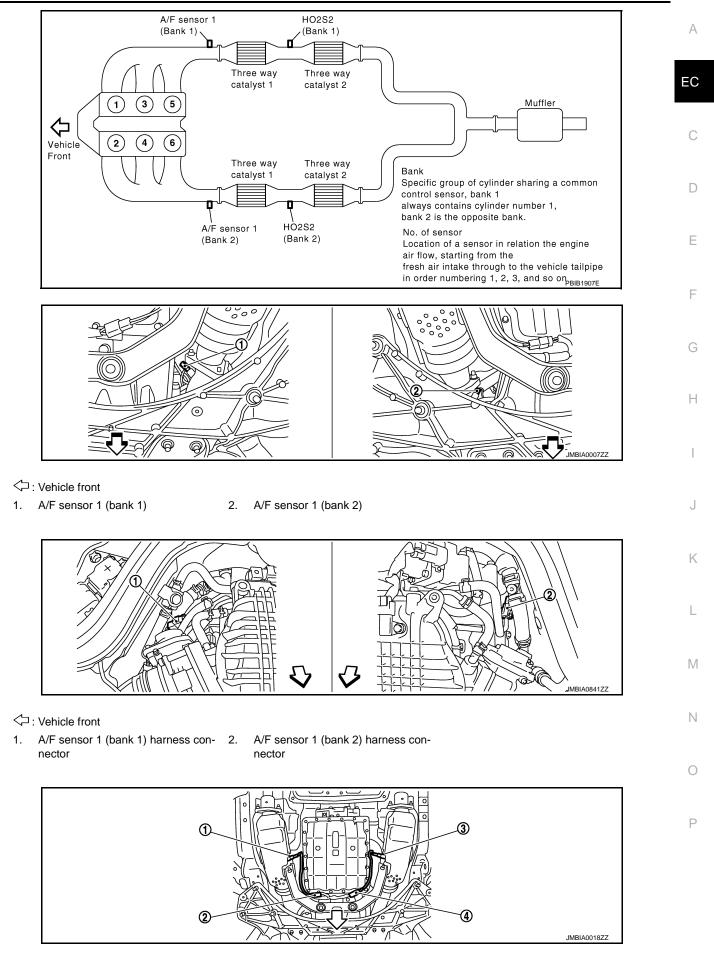


C : Vehicle front

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

< SYSTEM DESCRIPTION >



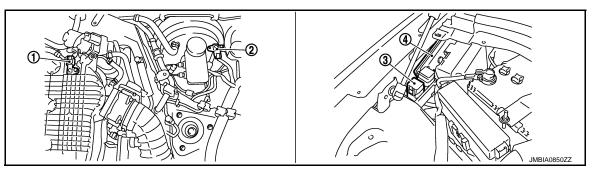


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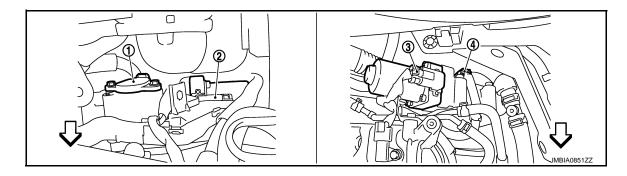
C: Vehicle front

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

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



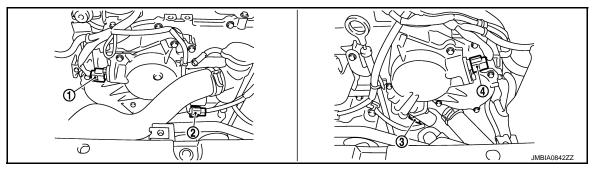
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



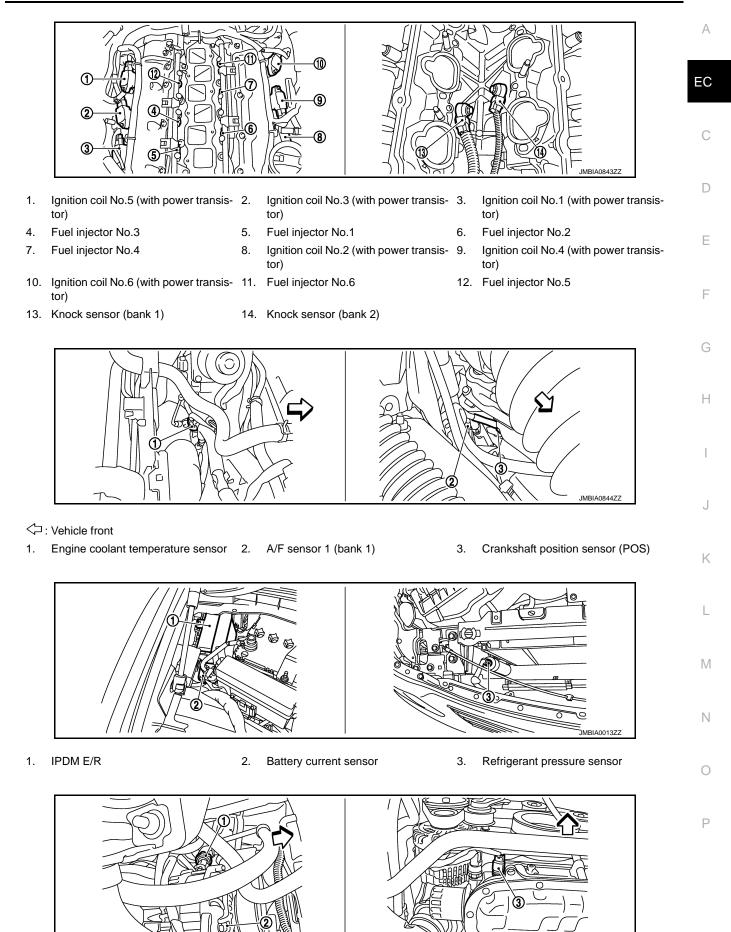
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

Intake valve timing control solenoid 3. valve (bank 1) harness connector

Intake valve timing control solenoid valve (bank 2) harness connector

< SYSTEM DESCRIPTION >

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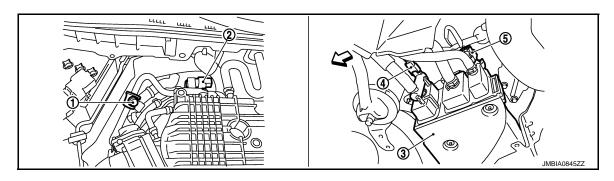
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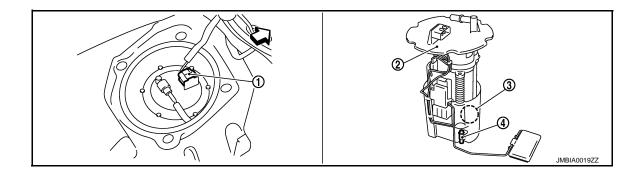
C: Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

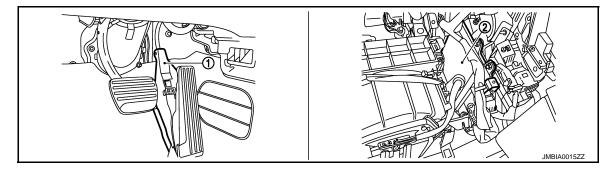


- └□: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C : Vehicle front

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

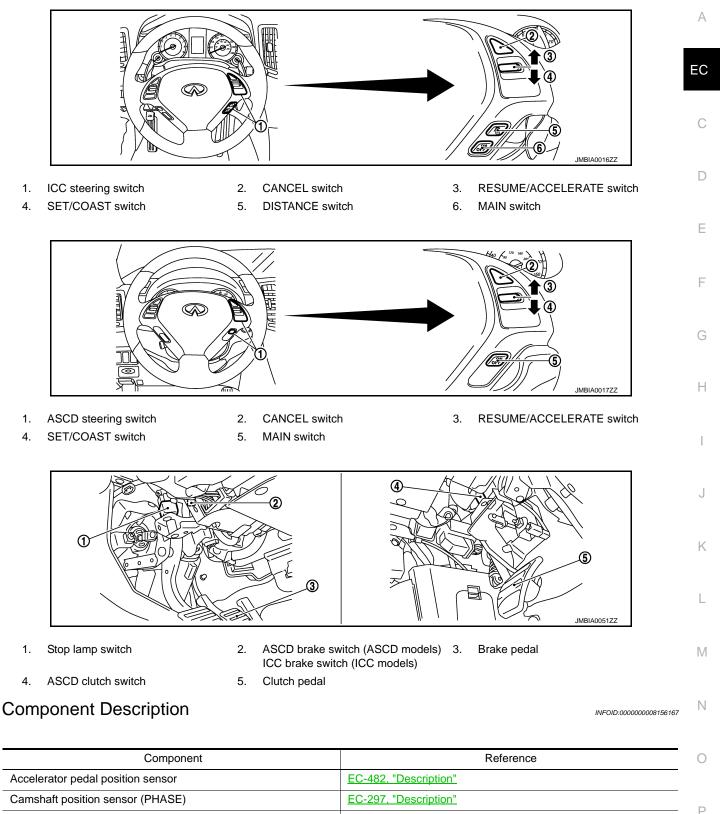


1. Accelerator pedal position sensor 2. ECM

AIR CONDITIONING CUT CONTROL

< SYSTEM DESCRIPTION >

[VQ37VHR]



< SYSTEM DESCRIPTION >

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram

| 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 |
| ark/neutral position (PNP) switch (M/T models) | Gear position | ECM | Electric throttle control actuator |
| Unified meter and A/C amp. | Vehicle speed | | |
| | Gear position | | |
| TCM (A/T models) | Powertrain revolution | | |
| |] | | _ |

System Description

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INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | |
|--|--------------------------------|----------------------------|------------------------------------|--|
| ASCD brake switch | Brake pedal operation | | | |
| Stop lamp switch | Brake pedal operation | | Electric throttle control actuator | |
| ASCD clutch switch (M/T models) | Clutch pedal operation | - | | |
| ASCD steering switch | ASCD steering switch operation | | | |
| Park/neutral position (PNP) switch (M/T models) | Gear position | ASCD vehicle speed control | | |
| Unified meter and A/C amp. | Vehicle speed* | | | |
| | Gear position | | | |
| TCM (A/T models) | Powertrain revolution* | | | |

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

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

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

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

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

NOTE:

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

SET OPERATION

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

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

ACCELERATE OPERATION

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



< SYSTEM DESCRIPTION >

And then ASCD will maintain the new set speed.

CANCEL OPERATION

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

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

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

• Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE lamp may blink slowly.

When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by pressing SET/COAST switch or RESUME/ ACCELERATE switch.

• Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

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

COAST OPERATION

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

RESUME OPERATION

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

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

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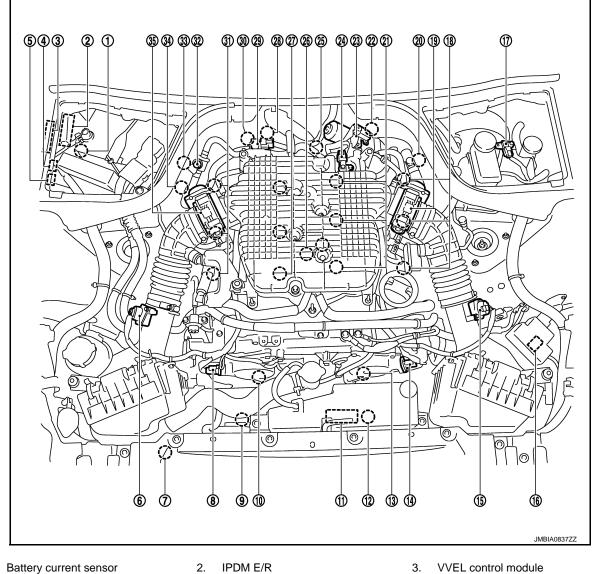
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Component Parts Location

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[VQ37VHR]



4. Cooling fan relay

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- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- 19. Electric throttle control actuator (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor
- 28. VVEL actuator motor (bank 1)

5.

- 8. Camshaft position sensor (PHASE)
- (bank 1) 11. Cooling fan control module

VVEL actuator motor relay

- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor solenoid valve

- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)
 - (bank 1)

< SYSTEM DESCRIPTION >

- Ignition coil (with power transistor) 32 and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

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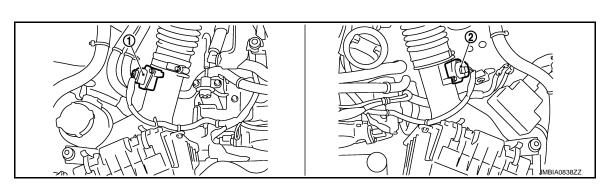
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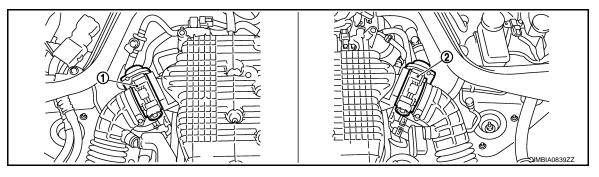
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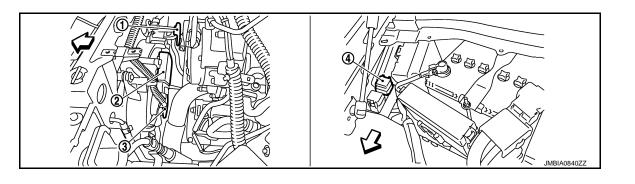
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



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

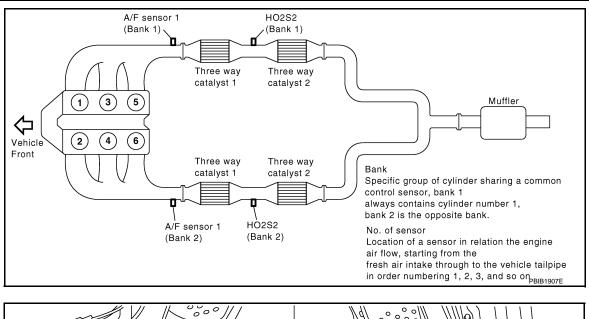


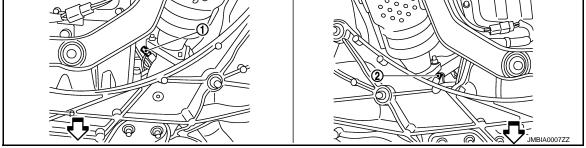
- C: Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- 3. Cooling fan motor-1

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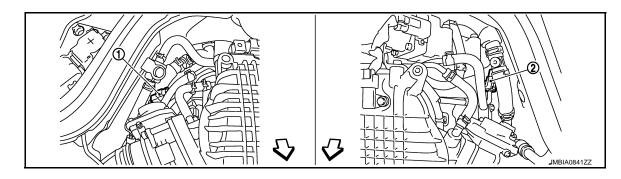
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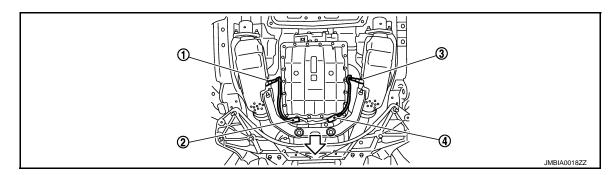
: Vehicle front

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



C : Vehicle front

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



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< SYSTEM DESCRIPTION >

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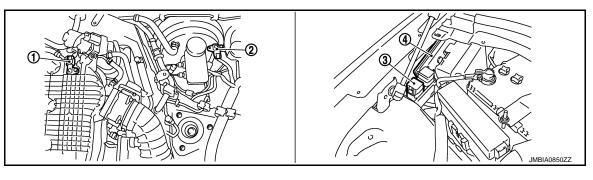
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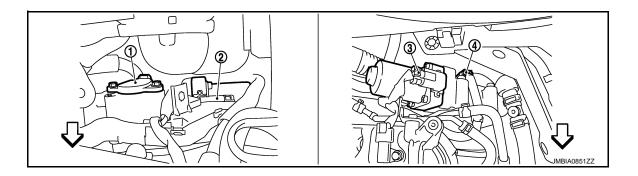
C: Vehicle front

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

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



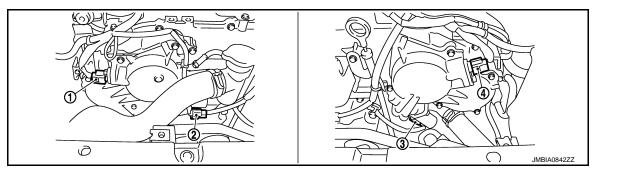
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

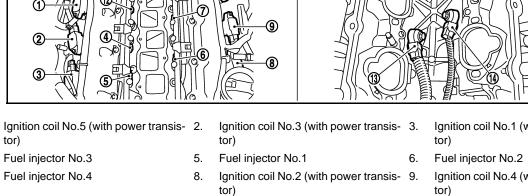
4. VVEL control shaft position sensor (bank 2)



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

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< SYSTEM DESCRIPTION >



- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)

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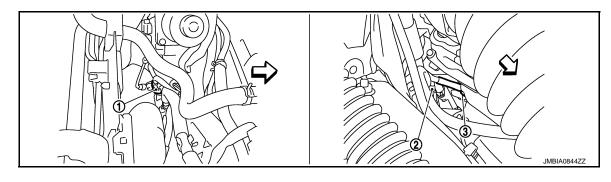
- 14. Knock sensor (bank 2)

Ignition coil No.1 (with power transis-

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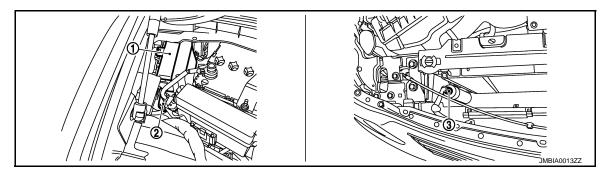
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- Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5



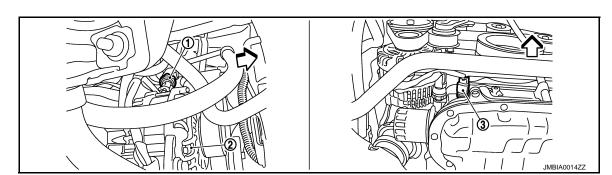
C: Vehicle front

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



IPDM E/R 1.

- 2. Battery current sensor
- 3. Refrigerant pressure sensor



Revision: 2012 July

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< SYSTEM DESCRIPTION >

[VQ37VHR]

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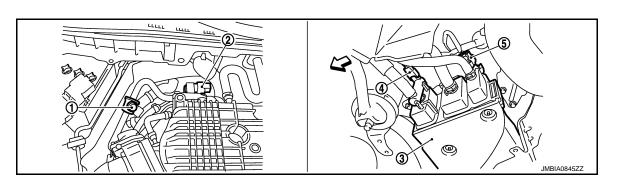
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\triangleleft : Vehicle front

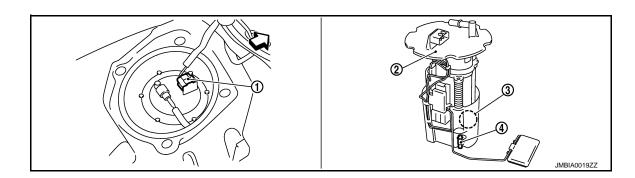
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



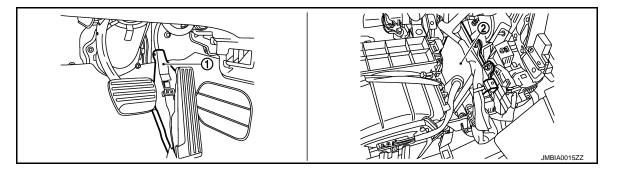
C: Vehicle front

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



C: Vehicle front

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



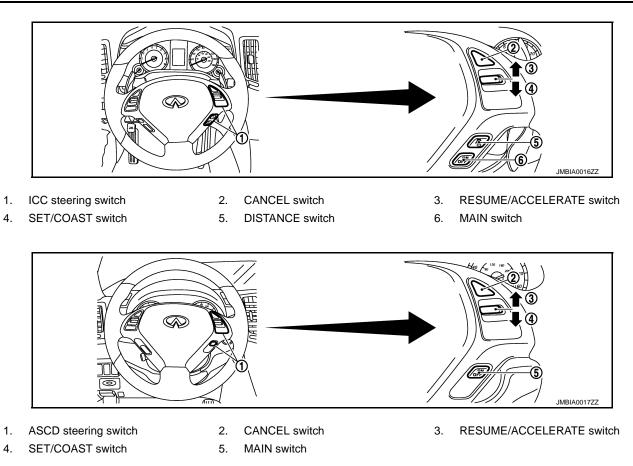
1. Accelerator pedal position sensor 2. ECM

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< SYSTEM DESCRIPTION >

[VQ37VHR]



- 1. Stop lamp switch
- 2. ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)
- 4. ASCD clutch switch
- 5. Clutch pedal

Component Description

| Component | Reference |
|------------------------------------|-----------------------|
| ASCD brake switch | EC-448. "Description" |
| ASCD indicator | EC-500. "Description" |
| ASCD steering switch | EC-441, "Description" |
| Electric throttle control actuator | EC-426, "Description" |
| Stop lamp switch | EC-448, "Description" |

CAN COMMUNICATION

System Description

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle mul-EC tiplex 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-6, "CAN Communication Control Circuit", about CAN communication for detail.

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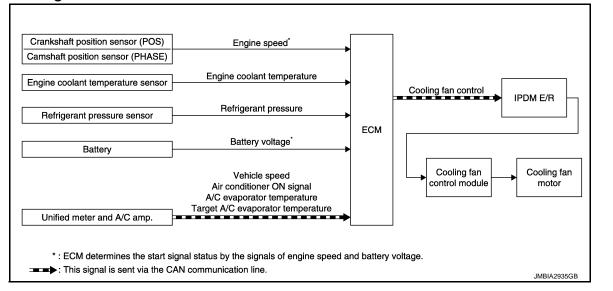
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< SYSTEM DESCRIPTION >

COOLING FAN CONTROL

System Diagram



System Description

INFOID:000000008156174

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|-------------------------------------|--------------|---------------------------------|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*1 | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Refrigerant pressure sensor | Refrigerant pressure | | IPDM E/R |
| Battery | Battery voltage*1 | | ↓ Cooling fan control module |
| | Vehicle speed* ² | | \downarrow |
| Unified meter and A/C amp. | Air conditioner ON signal*2 | | Cooling fan motor |
| onnieu meter and A/C amp. | A/C evaporator temperature*2 | _ | |
| | Target A/C evaporator temperature*2 | | |

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

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

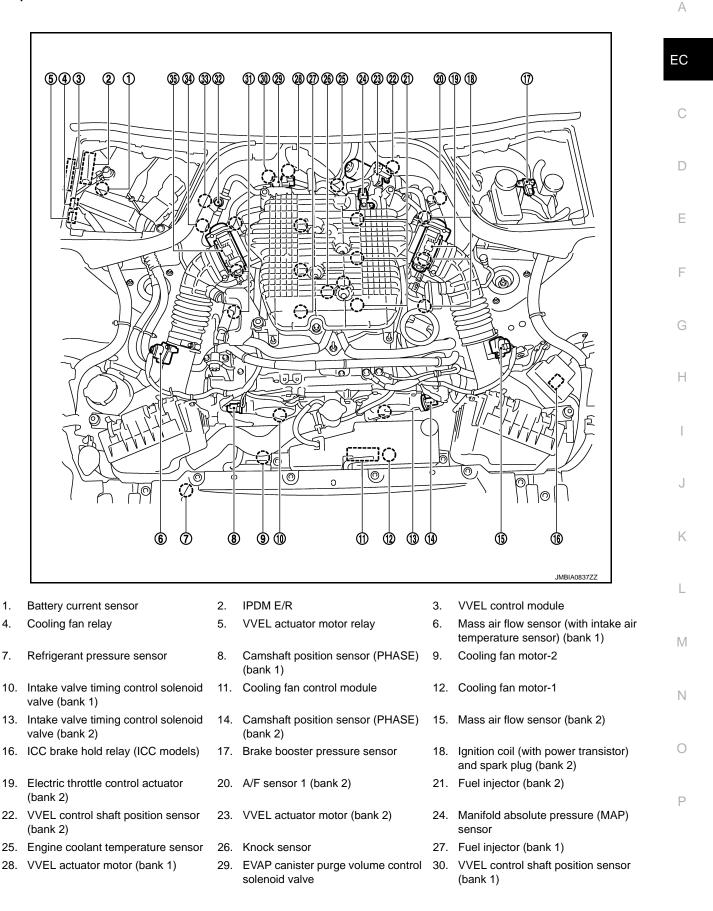
SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, air conditioner ON signal, refrigerant pressure, target A/C evaporator temperature and A/C evaporator temperature. Cooling fan control signal is sent to IPDM E/R from ECM by CAN communication line. Then, IPDM E/R sends ON/OFF pulse duty signal to cooling fan control module. Corresponding to this ON/OFF pulse duty signal, cooling fan control module gives cooling fan motor operating voltage to cooling fan motors. Cooling fan speed is controlled by duty cycle of cooling fan motor operating voltage sent from cooling fan control module.

< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]



< SYSTEM DESCRIPTION >

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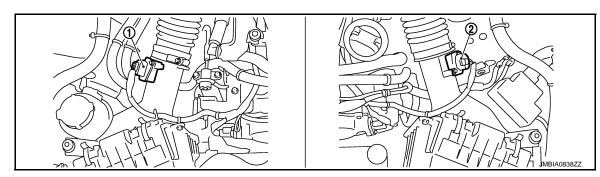
31. Ignition coil (with power transistor) 31. and spark plug (bank 1)

32. EVAP service port

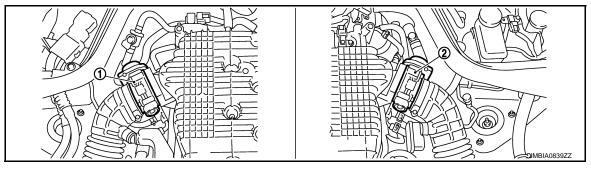
33. A/F sensor 1 (bank 1)

[VQ37VHR]

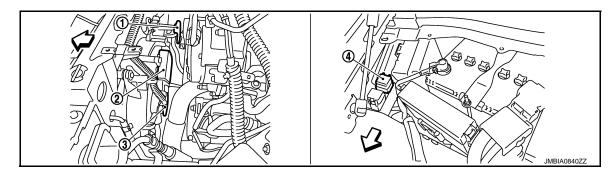
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



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

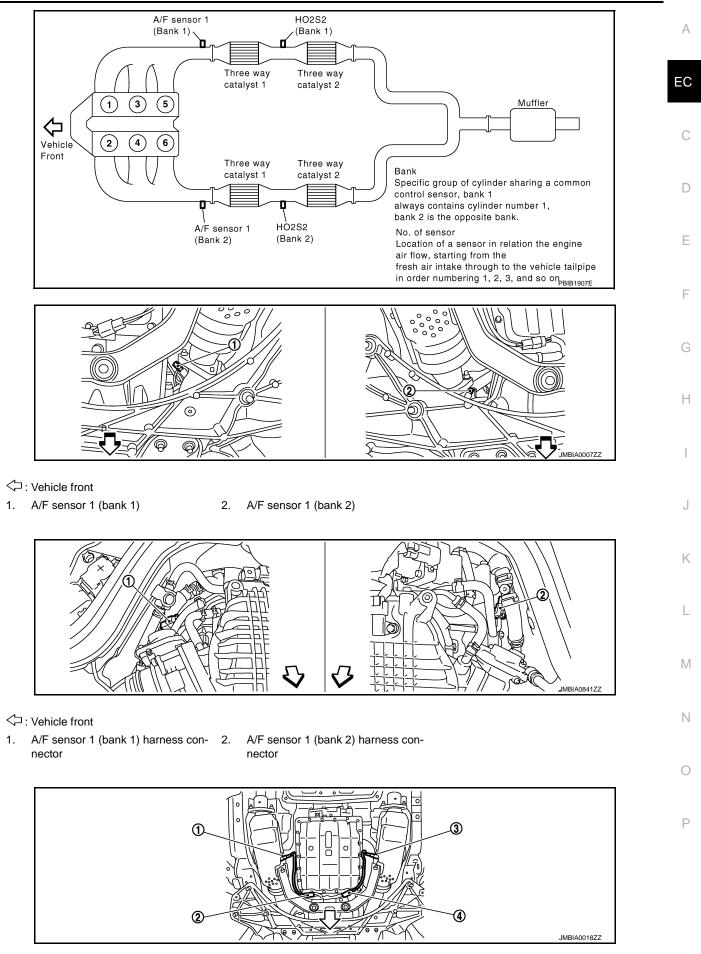


C: Vehicle front

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

< SYSTEM DESCRIPTION >





Revision: 2012 July

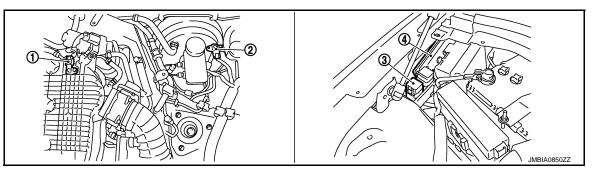
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< SYSTEM DESCRIPTION >

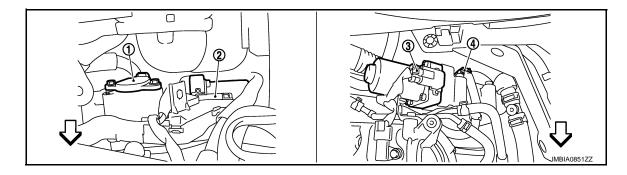
C: Vehicle front

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

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



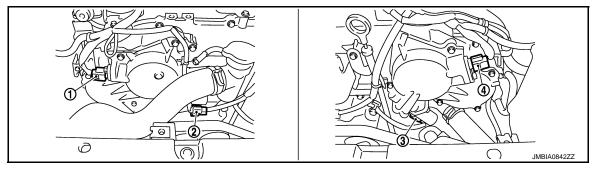
- Manifold absolute pressure (MAP) VVEL actuator motor relay 1. 2. Brake booster pressure sensor 3. sensor
- 4. VVEL control module



C: Vehicle front

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

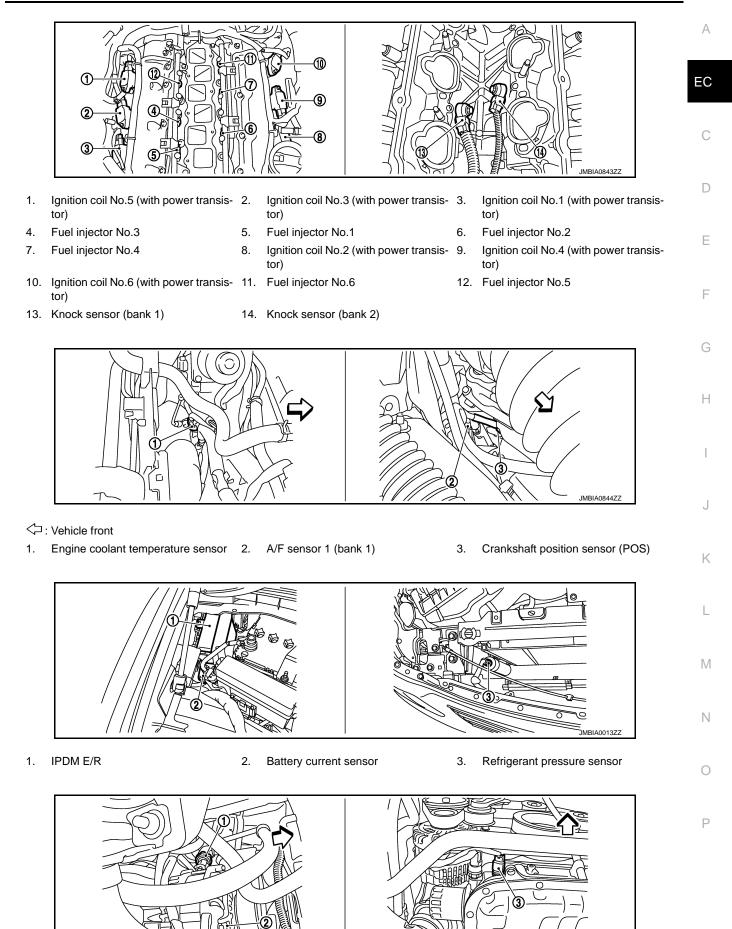
4. VVEL control shaft position sensor (bank 2)



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

< SYSTEM DESCRIPTION >

[VQ37VHR]



Revision: 2012 July

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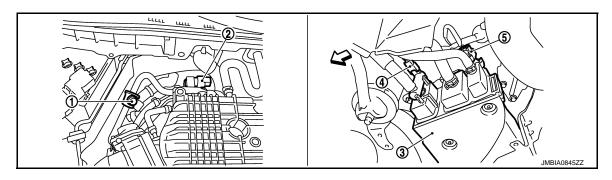
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< SYSTEM DESCRIPTION >

C: Vehicle front

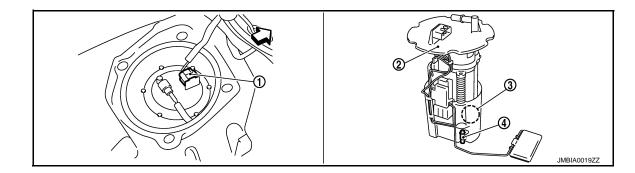
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



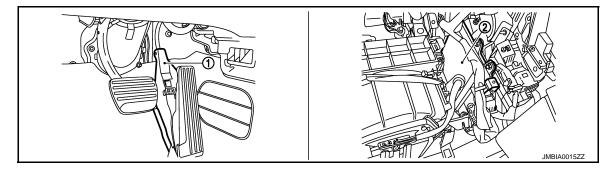
C: Vehicle front

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



C : Vehicle front

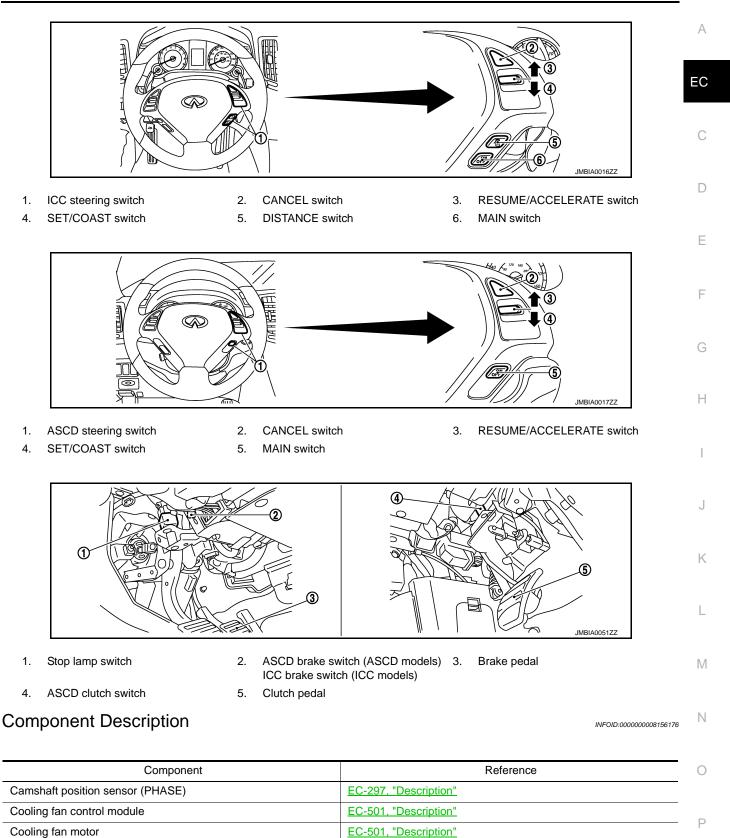
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



Crankshaft position sensor (POS)

Refrigerant pressure sensor

Engine coolant temperature sensor

EC-293, "Description"

EC-206, "Description" EC-531, "Description"

< SYSTEM DESCRIPTION >

EVAPORATIVE EMISSION SYSTEM

System Diagram

| ECM |
|--|
| economic temperature EVAP canister purge flow control EVAP canister purge volume |
| EVAP canister purge flow control purge volume |
| rottle position |
| rottle position purge flow control purge volume |
| |
| ator pedal position |
| tery voltage |
| perature in fuel tank |
| ure in purge line |
| shicle speed |
| 2 |

System Description

INFOID:000000008156178

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 | | EVAP canister purge vol- I ume control solenoid valve |
| Engine coolant temperature sensor | Engine coolant temperature | 1 5 | |
| Battery | Battery voltage*1 | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Fuel tank temperature sensor | Fuel temperature in fuel tank | | |
| EVAP control system pressure sensor | Pressure in purge line | | |
| Unified meter and A/C amp. | Vehicle speed*2 | | |

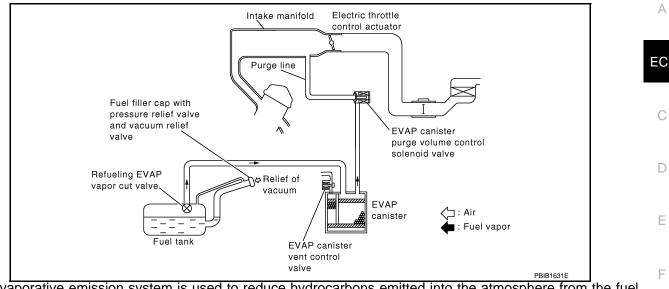
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

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

< SYSTEM DESCRIPTION >

[VQ37VHR]

SYSTEM DESCRIPTION

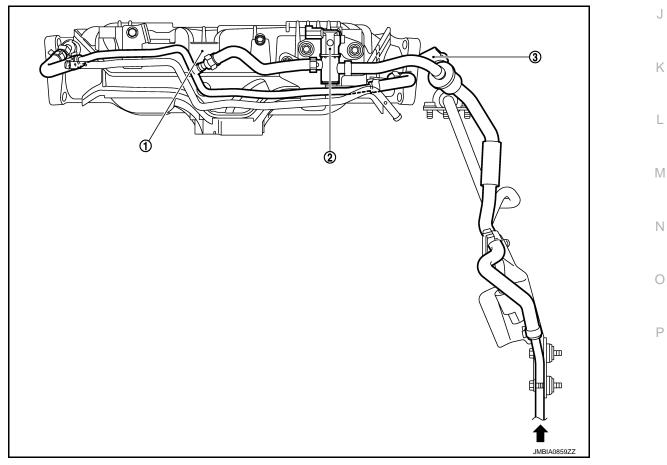


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister. The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon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

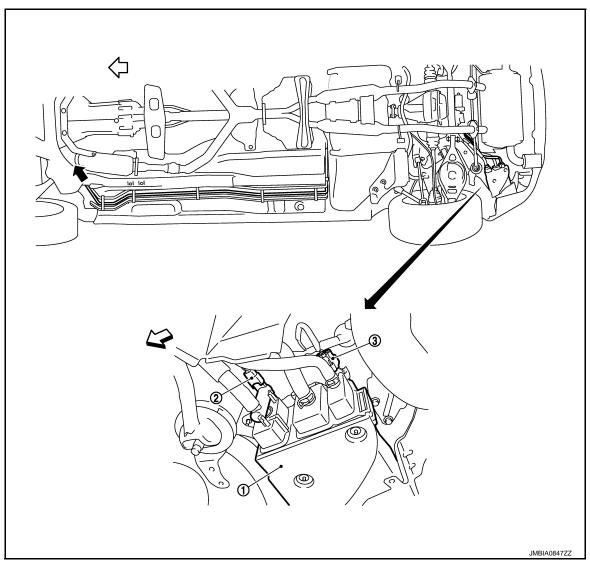
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



< SYSTEM DESCRIPTION >

- 1. Intake manifold collector
- 2. EVAP canister purge volume control 3. EVAP service port solenoid valve
- 🖛 : From next figure





1. EVAP canister

- 2. EVAP canister vent control valve
- EVAP control system pressure sensor

3.

- : To previous figure

NOTE:

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

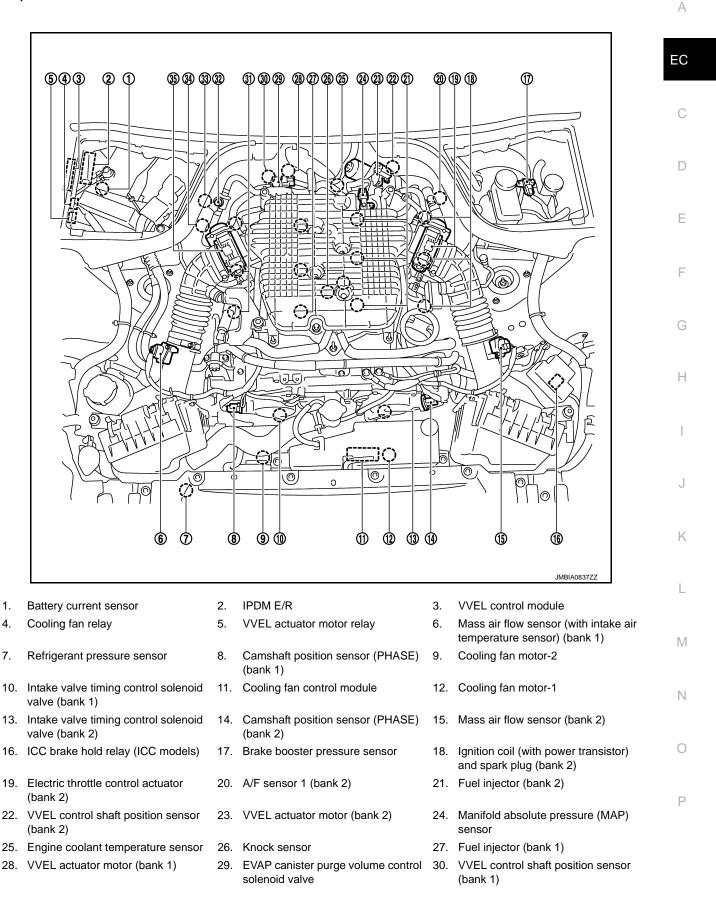
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< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]

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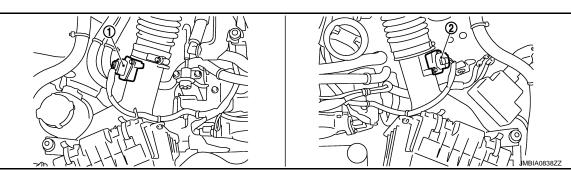
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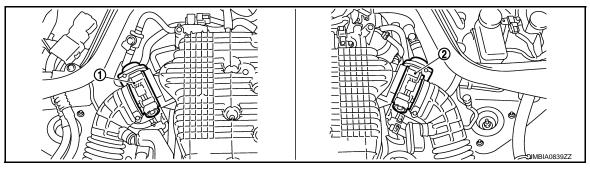
< SYSTEM DESCRIPTION >

- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

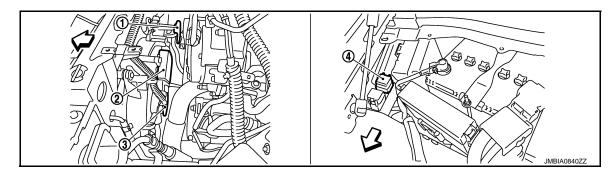
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



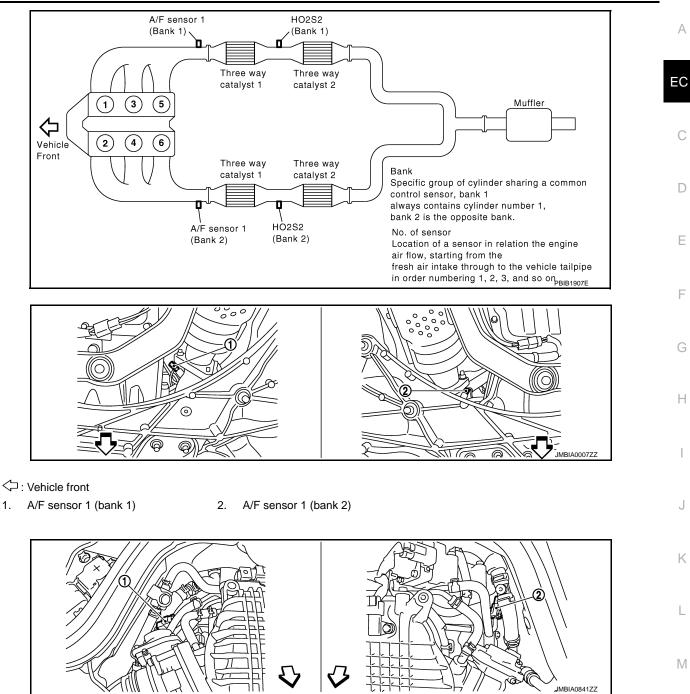
- Electric throttle control actuator 1. (bank 1)
- Electric throttle control actuator 2. (bank 2)



C: Vehicle front

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

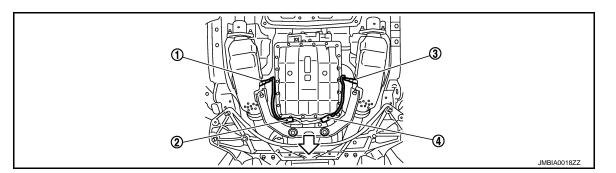
< SYSTEM DESCRIPTION >



C: Vehicle front

1.

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



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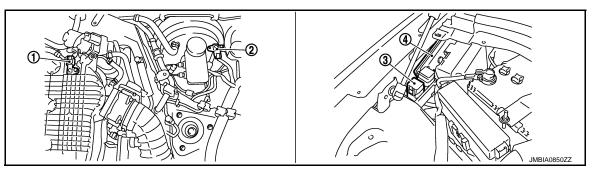
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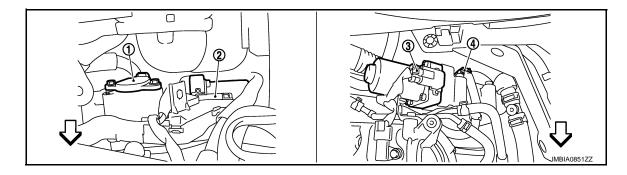
C: Vehicle front

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

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



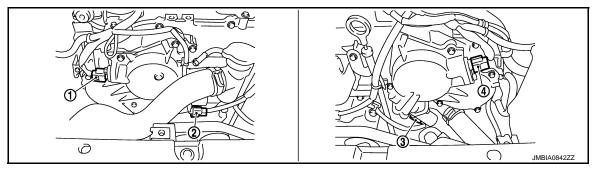
- Manifold absolute pressure (MAP) VVEL actuator motor relay 1. 2. Brake booster pressure sensor 3. sensor
- 4. VVEL control module



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



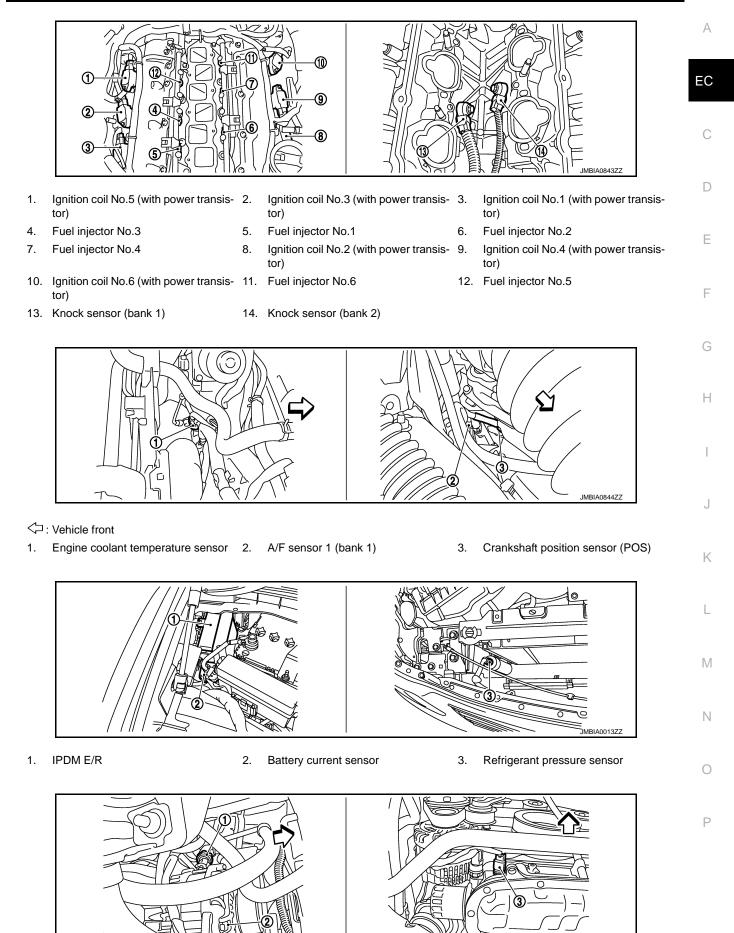
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

Intake valve timing control solenoid 3. valve (bank 1) harness connector

Intake valve timing control solenoid valve (bank 2) harness connector

< SYSTEM DESCRIPTION >

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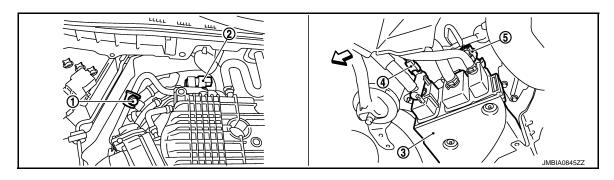
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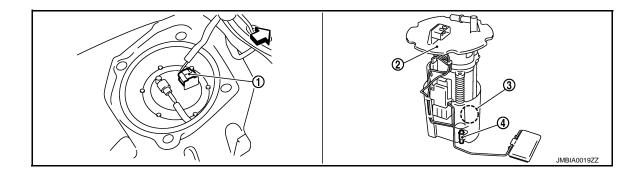
C: Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

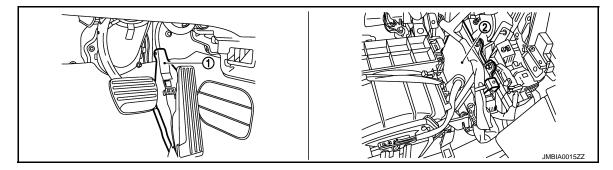


- └□: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C : Vehicle front

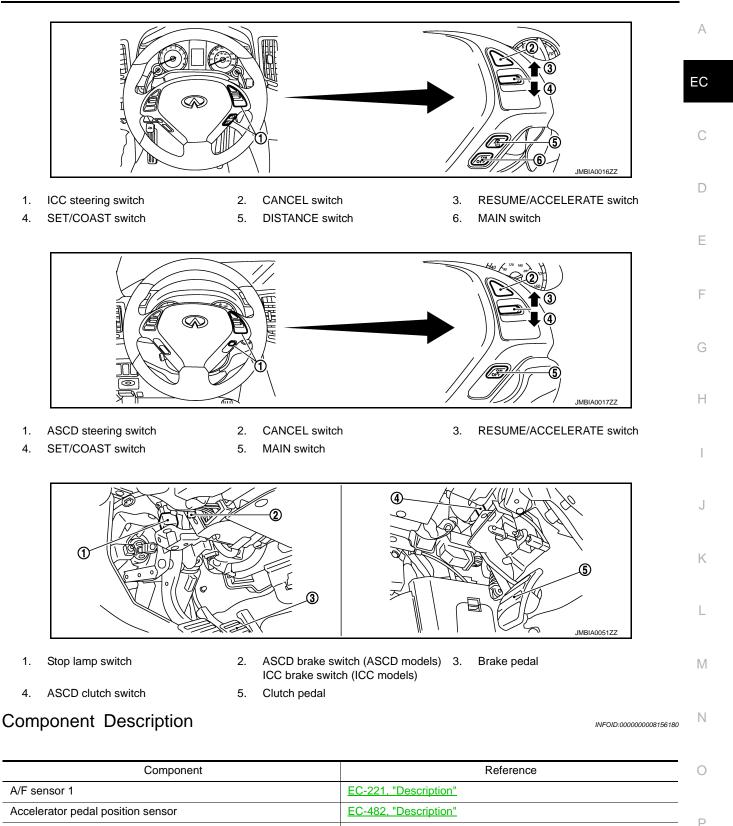
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



Revision: 2012 July

Camshaft position sensor (PHASE)

Engine coolant temperature sensor

EVAP control system pressure sensor

Fuel tank temperature sensor

EVAP canister purge volume control solenoid valve

Crankshaft position sensor (POS)



EC-297, "Description"

EC-293, "Description"

EC-206, "Description"

EC-311, "Description"

EC-327, "Description"

EC-266, "Description"

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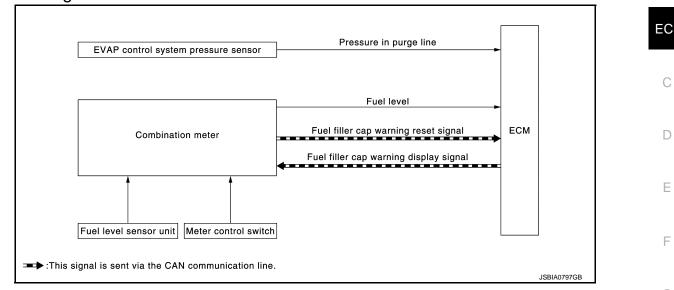
< SYSTEM DESCRIPTION >

| Component | Reference |
|--------------------------|-----------------------|
| Mass air flow sensor | EC-181, "Description" |
| Throttle position sensor | EC-209, "Description" |

< SYSTEM DESCRIPTION >

FUEL FILLER CAP WARNING SYSTEM

System Diagram



System Description

INPUT/OUTPUT SIGNAL CHART

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|----|----|----|
| | μι | ٨L |

| Unit/Sensor | Input signal to ECM | ECM function | |
|-------------------------------------|---|---------------------------------|-----|
| EVAP control system pressure sensor | Pressure in purge line | | - 1 |
| Combination meter | Fuel level | Fuel filler cap warning control | |
| | Fuel filler cap warning reset signal [*] | | J |

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

Output

| Unit | Output signal | Actuator | N |
|------|---|-------------------|---|
| ECM | Fuel filler cap warning display signal [*] | Combination meter | |

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

SYSTEM DESCRIPTION

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

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

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

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

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

Reset Operation

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

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< SYSTEM DESCRIPTION >

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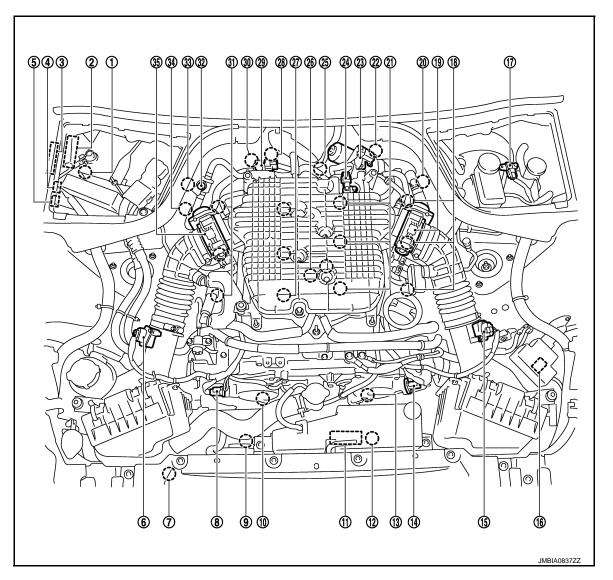
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NOTE:

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

Component Parts Location

INFOID:000000008156183



- Battery current sensor 1.
- Cooling fan relay 4.
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- 19. Electric throttle control actuator (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor

- IPDM E/R 2.
- 5. VVEL actuator motor relay
- 8. Camshaft position sensor (PHASE) (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) 15. Mass air flow sensor (bank 2) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor

- VVEL control module 3.
- Mass air flow sensor (with intake air 6. temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)

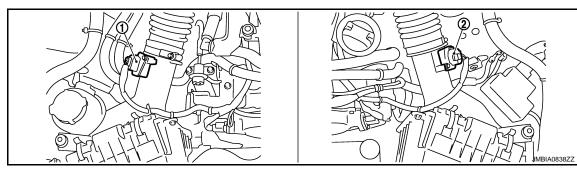
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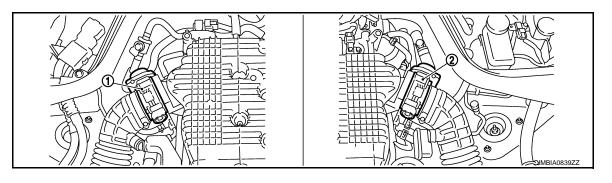
- 28. VVEL actuator motor (bank 1)
- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 34. Crankshaft position sensor (POS)
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor solenoid valve
 - (bank 1)
 - 33. A/F sensor 1 (bank 1)
- 35. Electric throttle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

32. EVAP service port

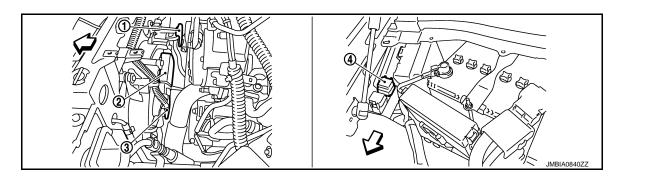


Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) 1. temperature sensor) (bank 1)

2.



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



3.

Cooling fan motor-1

C: Vehicle front

- 1. Cooling fan motor-2
- 4. Cooling fan relay

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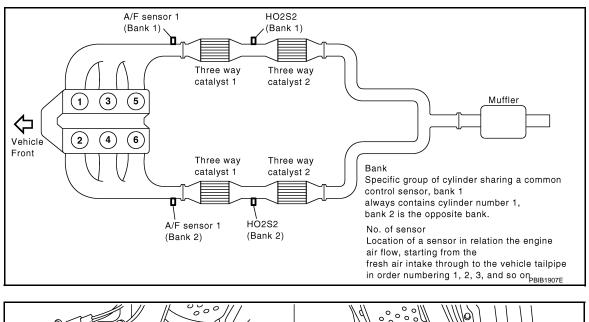
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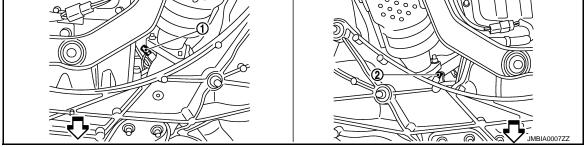
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Cooling fan control module

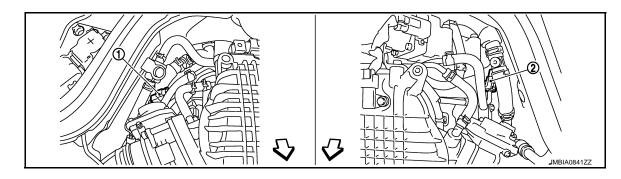
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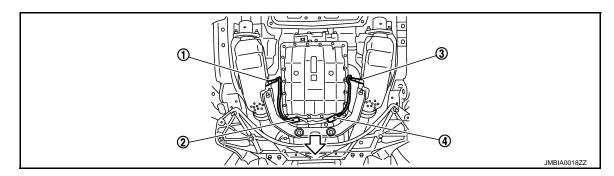
C: Vehicle front

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



C: Vehicle front

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



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< SYSTEM DESCRIPTION >

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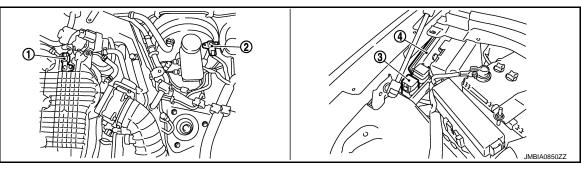
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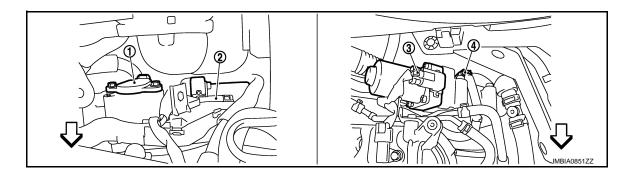
C: Vehicle front

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

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



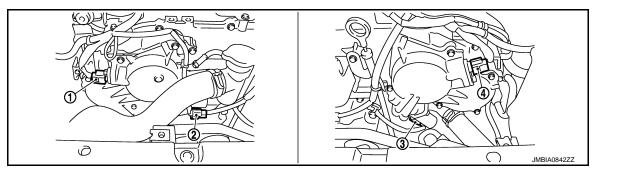
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



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

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< SYSTEM DESCRIPTION >

Ignition coil No.5 (with power transis- 2. Ignition coil No.3 (with power transis- 3. tor)

- 5. Fuel injector No.1
- Ignition coil No.2 (with power transis- 9. 8. tor)
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- tor)
- 13. Knock sensor (bank 1)

Fuel injector No.3

Fuel injector No.4

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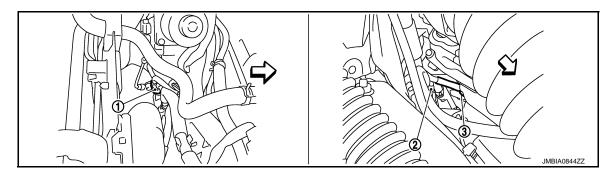
tor)

14. Knock sensor (bank 2)

Ignition coil No.1 (with power transistor)

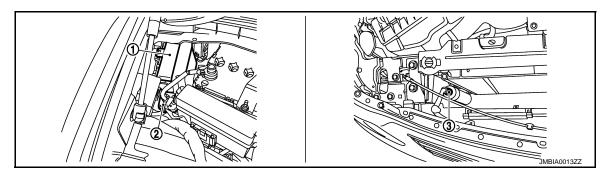
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- 6. Fuel injector No.2
 - Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5



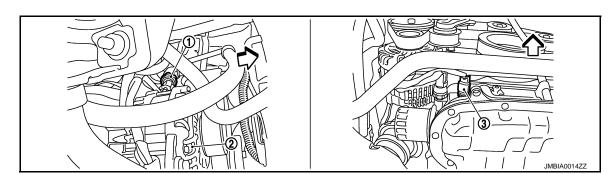
C: Vehicle front

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



IPDM E/R 1.

- 2. Battery current sensor
- 3. Refrigerant pressure sensor



2013 G Convertible

[VQ37VHR]

FUEL FILLER CAP WARNING SYSTEM

< SYSTEM DESCRIPTION >

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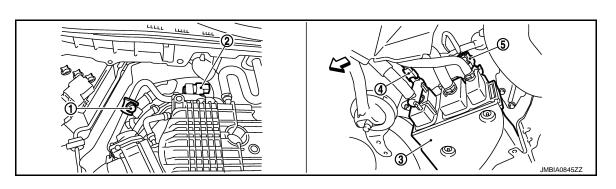
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C: Vehicle front

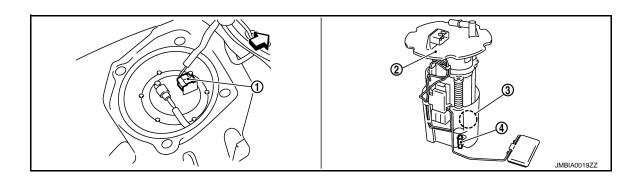
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



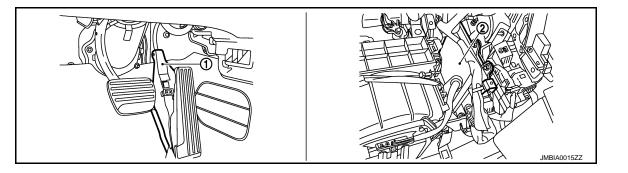
C: Vehicle front

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



C: Vehicle front

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



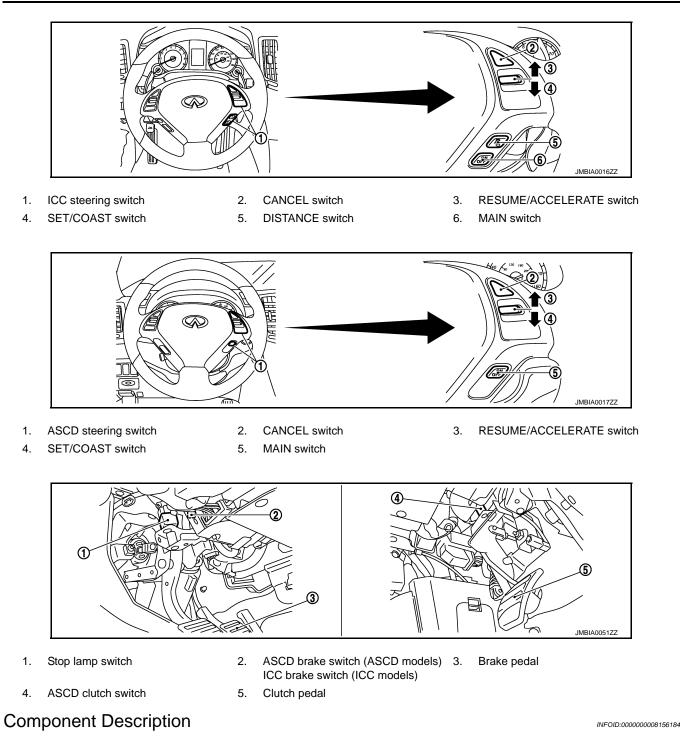
1. Accelerator pedal position sensor 2. ECM

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FUEL FILLER CAP WARNING SYSTEM

< SYSTEM DESCRIPTION >

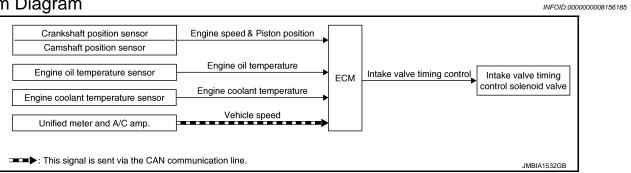


| Component | Reference |
|-------------------------------------|-----------------------|
| EVAP control system pressure sensor | EC-327, "Description" |
| Fuel level sensor | MWI-52, "Description" |

< SYSTEM DESCRIPTION >

INTAKE VALVE TIMING CONTROL

System Diagram



System Description

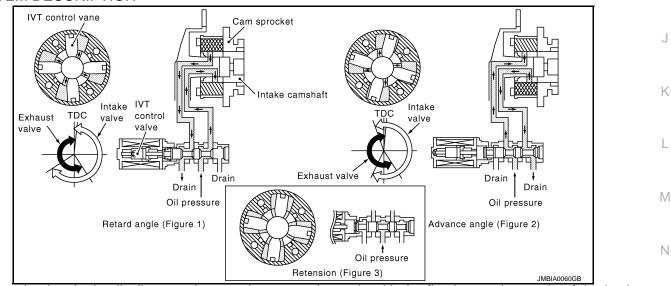
INFOID:000000008156186

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | |
|-----------------------------------|----------------------------------|--------------------------------|--|--|
| Crankshaft position sensor (POS) | Engine aread and pictor position | | | |
| 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 | |
| Engine oil temperrature sensor | Engine oil temperature | | | |
| Unified meter and A/C amp. | Vehicle speed* | | | |

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

SYSTEM DESCRIPTION



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

The ECM receives signals such as crankshaft position, camshaft position, vehicle speed, engine coolant temperature amd engine oil 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.

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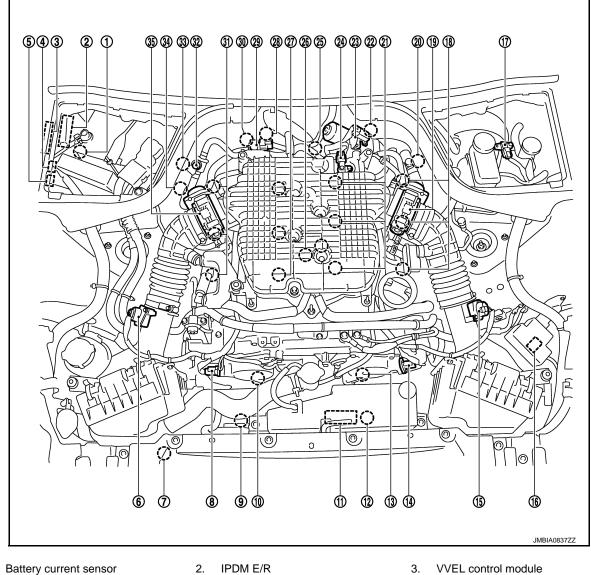
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< SYSTEM DESCRIPTION >

Component Parts Location

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[VQ37VHR]



4. Cooling fan relay

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- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- 19. Electric throttle control actuator (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor
- 28. VVEL actuator motor (bank 1)

IPDM E/R

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8. Camshaft position sensor (PHASE)

VVEL actuator motor relay

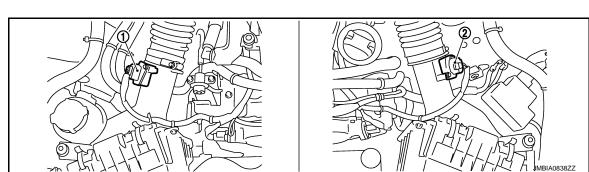
- (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor solenoid valve

- VVEL control module
- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)
 - (bank 1)

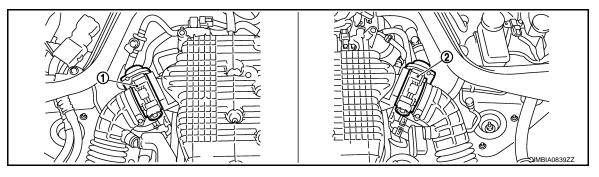
< SYSTEM DESCRIPTION >

- Ignition coil (with power transistor) 32 and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

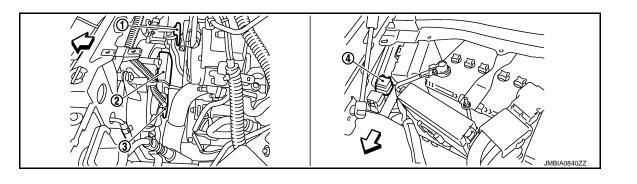
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



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



- C: Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- Cooling fan motor-1

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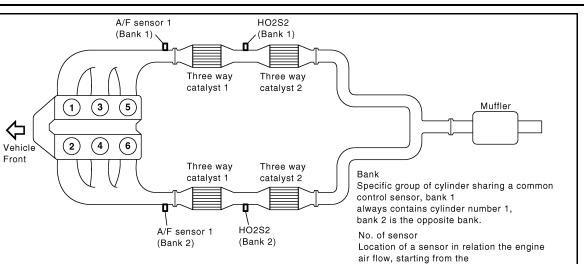
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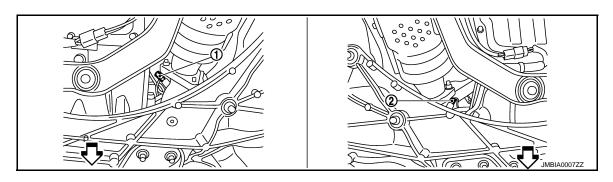
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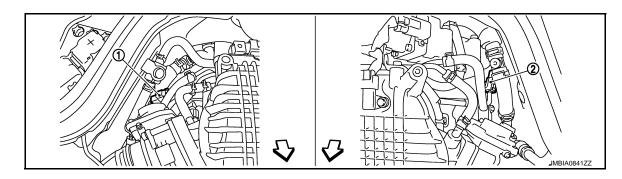
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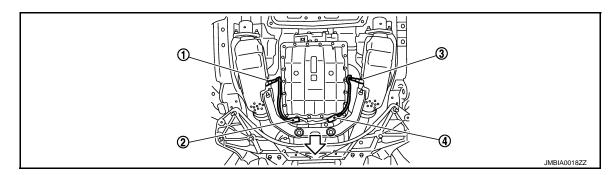
└□: Vehicle front

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



C: Vehicle front

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



[VQ37VHR]

fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so $\rm on_{PBIB1907E}$

< SYSTEM DESCRIPTION >

[VQ37VHR]

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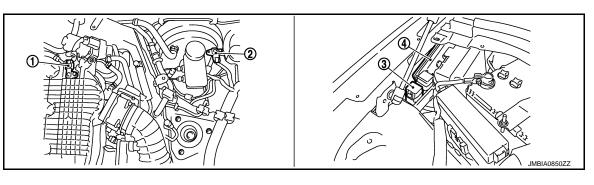
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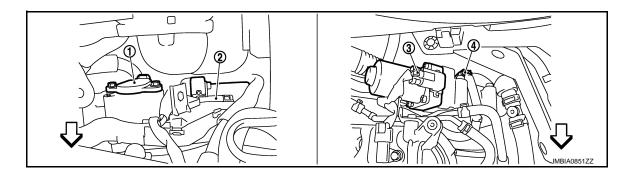
C: Vehicle front

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

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



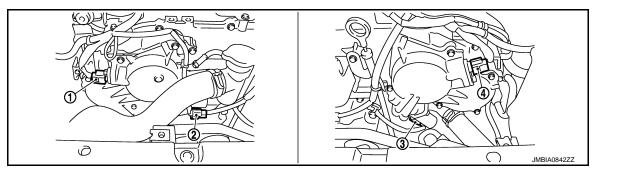
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

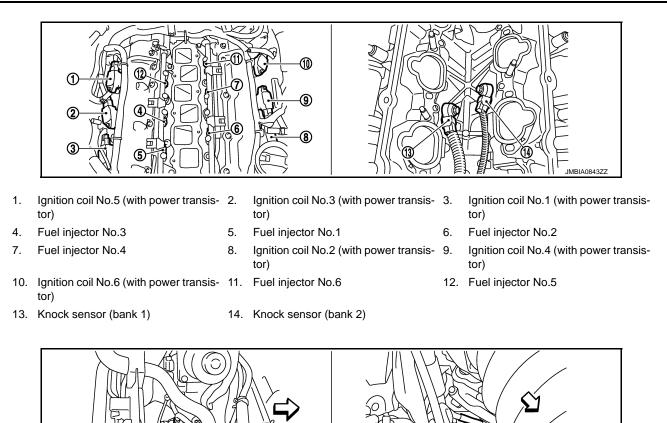
4. VVEL control shaft position sensor (bank 2)



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

< SYSTEM DESCRIPTION >

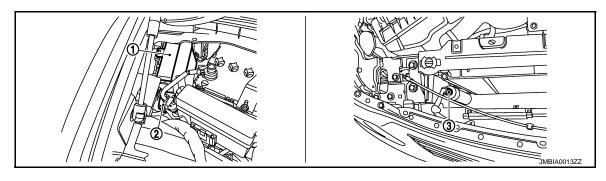
[VQ37VHR]



<☐ : Vehicle front

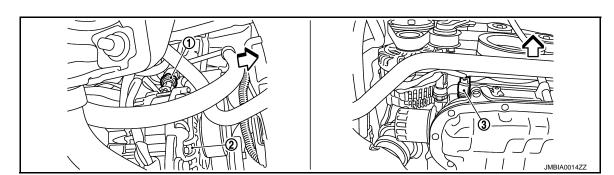
- 1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- 3. Crankshaft position sensor (POS)

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1. IPDM E/R

- 2. Battery current sensor
- 3. Refrigerant pressure sensor



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< SYSTEM DESCRIPTION >

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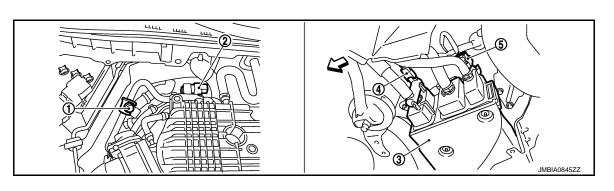
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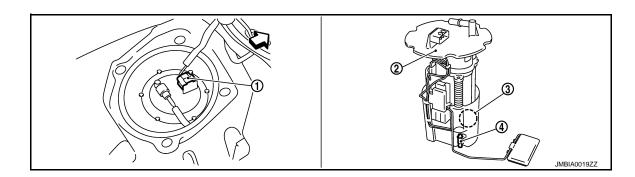
\triangleleft : Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

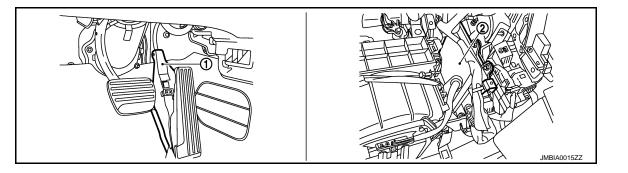


- C: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C: Vehicle front

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

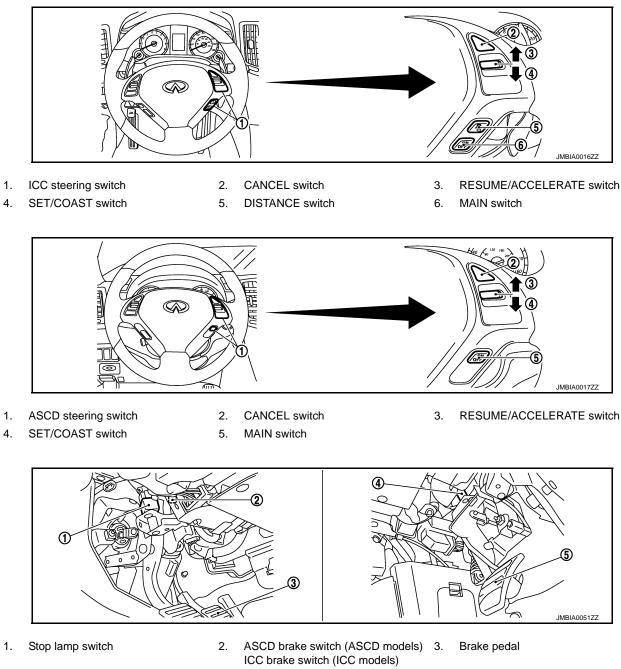


1. Accelerator pedal position sensor 2. ECM

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< SYSTEM DESCRIPTION >



- 4. ASCD clutch switch
- 5. Clutch pedal

Component Description

INFOID:000000008156188

| Component | Reference |
|--|-----------------------|
| Camshaft position sensor (PHASE) | EC-297, "Description" |
| Crankshaft position sensor (POS) | EC-293, "Description" |
| Engine coolant temperature sensor | EC-206, "Description" |
| Engine coolant temperature sensor | EC-213, "Description" |
| Intake valve timing control solenoid valve | EC-178, "Description" |

< SYSTEM DESCRIPTION >

VVEL SYSTEM



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System Diagram INFOID:000000008156189 Crankshaft position sensor (POS) Engine speed & Piston position EC Camshaft position sensor (PHASE) VVEL control VVEL control ECM Accelerator pedal position Accelerator pedal position sensor module Control shaft actual angle VVEL control shaft position sensor VVEL actuator sub assembly JMBIA2937GB

System Description

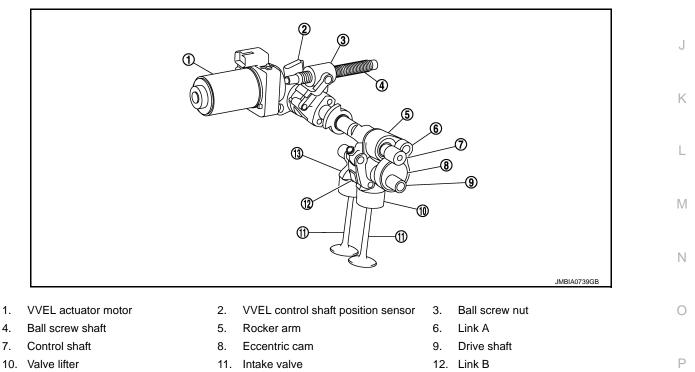
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INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | |
|------------------------------------|------------------------------------|--------------|---------------------------------|---|
| Crankshaft position sensor (POS) | - Engine speed and piston position | | | |
| Camshaft position sensor (PHASE) | | VVEL control | VVEL control module | G |
| Accelerator pedal position sensor | Accelerator pedal position | | ✓ VVEL actuator sub assembly | |
| VVEL control shaft position sensor | Control shaft actual angle* | - | | F |

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

SYSTEM DESCRIPTION



13. Output cam

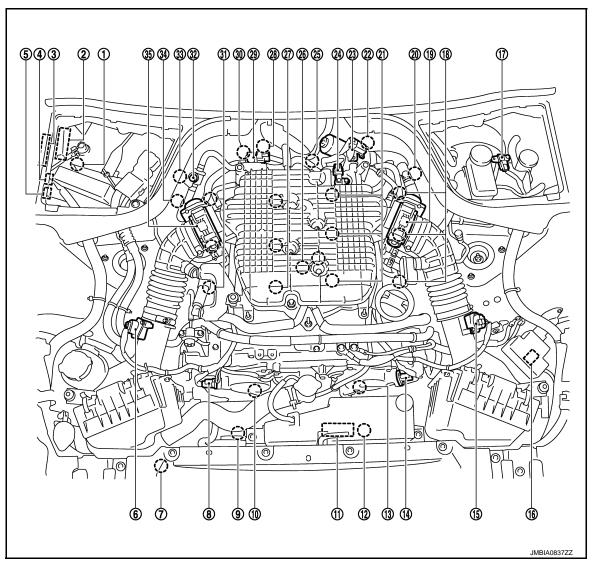
VVEL (Variable Valve Event & Lift) is a system that controls valve event and valve lift continuously. Rotational movement of the drive shaft equipped with eccentric cam is transmitted to output cam via the rocker arm and two kinds of links to depress the intake valve. ECM decides the target valve lift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

< SYSTEM DESCRIPTION >

shifting the link supporting point. As a result, valve lift changes continuously to improve engine output and response.

Component Parts Location

INFOID:000000008156191



- 1. Battery current sensor
- 4. Cooling fan relay
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- 19. Electric throttle control actuator (bank 2)
- 22. VVEL control shaft position sensor (bank 2)
- 25. Engine coolant temperature sensor
- 28. VVEL actuator motor (bank 1)

- 2. IPDM E/R
- 5. VVEL actuator motor relay
- 8. Camshaft position sensor (PHASE) (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor
- 29. EVAP canister purge volume control solenoid valve

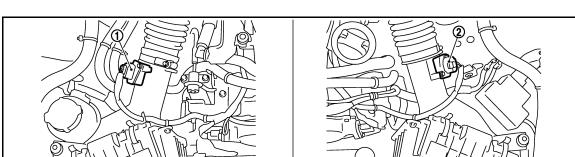
- 3. VVEL control module
- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)
- VVEL control shaft position sensor (bank 1)



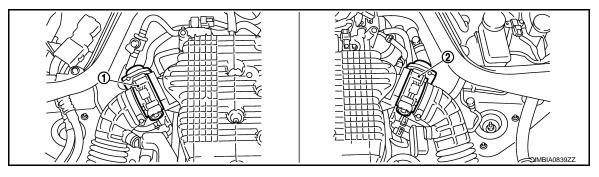
< SYSTEM DESCRIPTION >

- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

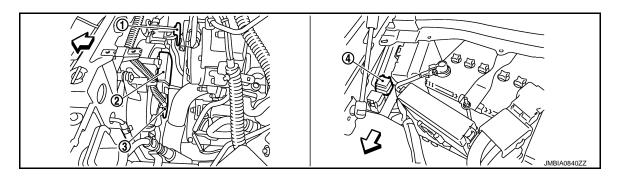
- 34. Crankshaft position sensor (POS)
 - 35. Electric throttle control actuator (bank 1)



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



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



- C: Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- Cooling fan motor-1

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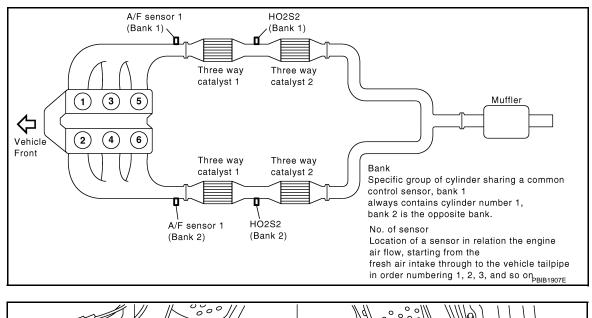
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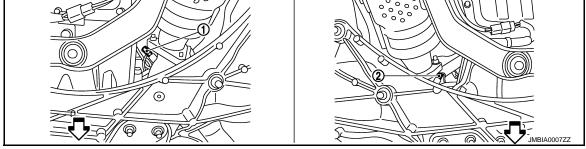
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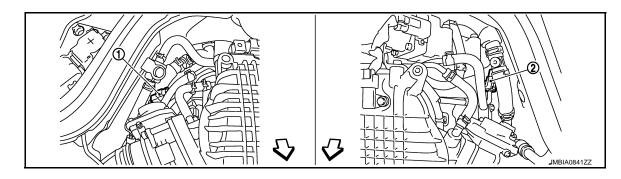
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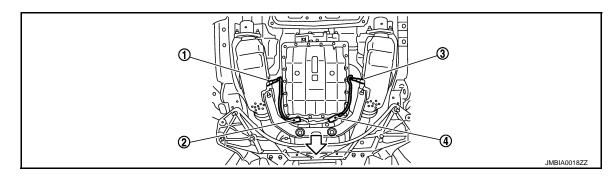


- └□: Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



C : Vehicle front

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



< SYSTEM DESCRIPTION >

[VQ37VHR]

C: Vehicle front

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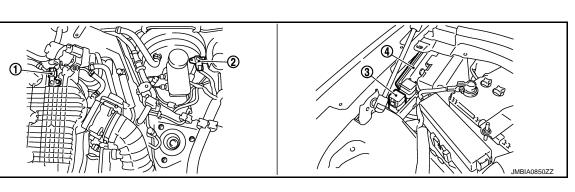
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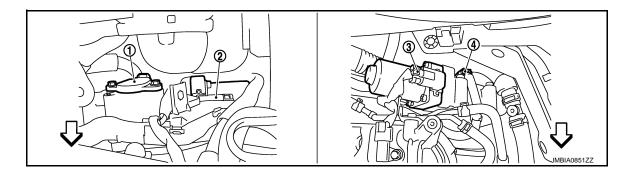
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Heated oxygen sensor 2 (bank 1) 4. harness connector



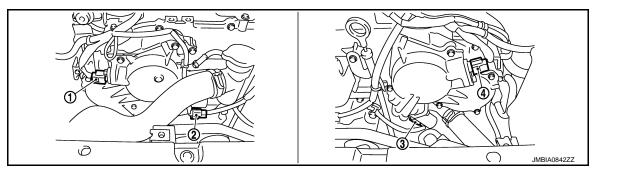
- VVEL actuator motor relay 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. sensor
- VVEL control module 4.



C: Vehicle front

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

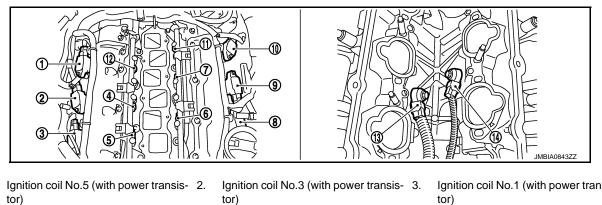
4. VVEL control shaft position sensor (bank 2)



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

< SYSTEM DESCRIPTION >

[VQ37VHR]



Ignition coil No.2 (with power transis- 9.

4. Fuel injector No.3

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- Fuel injector No.4 7.
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)

Fuel injector No.1

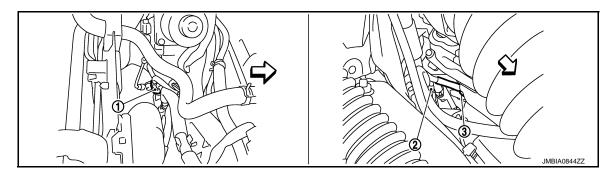
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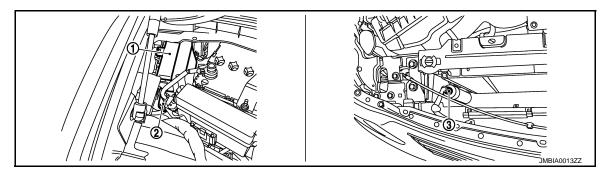
14. Knock sensor (bank 2)

- Ignition coil No.1 (with power transistor)
- 6. Fuel injector No.2
 - Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5



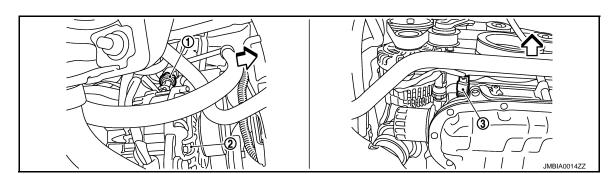
└□: Vehicle front

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



IPDM E/R 1.

- 2. Battery current sensor
- Refrigerant pressure sensor 3.



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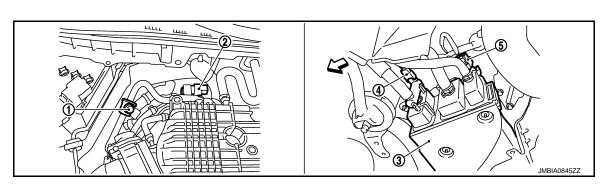
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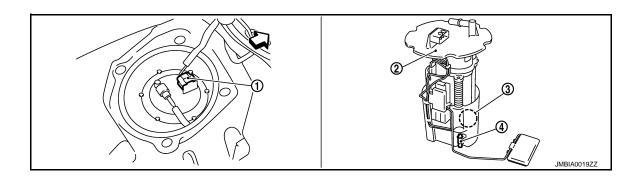
\triangleleft : Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

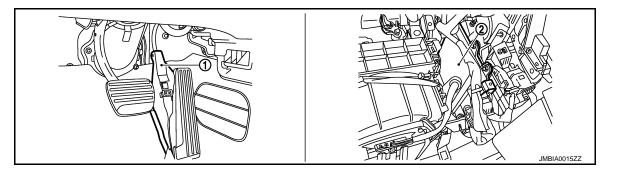


- └□: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C: Vehicle front

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

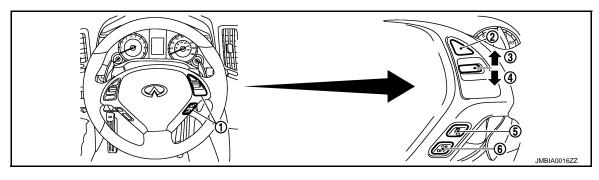


1. Accelerator pedal position sensor 2. ECM

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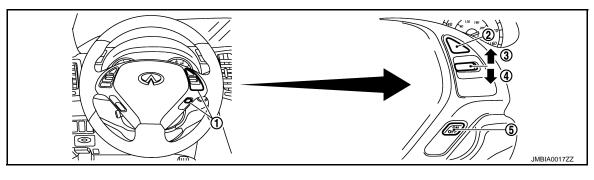


1. ICC steering switch

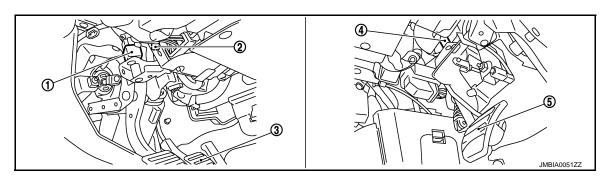
SET/COAST switch

4.

- CANCEL switch
 DISTANCE switch
- 3. RESUME/ACCELERATE switch
 - 6. MAIN switch



- ASCD steering switch
 SET/COAST switch
- CANCEL switch
 MAIN switch
- 3. RESUME/ACCELERATE switch



- 1. Stop lamp switch
- 2. ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)
- 4. ASCD clutch switch
- 5. Clutch pedal

Component Description

INFOID:000000008156192

| Component | Reference |
|------------------------------------|-----------------------|
| Accelerator pedal position sensor | EC-482, "Description" |
| Camshaft position sensro (PHASE) | EC-297, "Description" |
| Crankshaft position sensor (POS) | EC-293, "Description" |
| VVEL actuator motor | EC-396, "Description" |
| VVEL actuator motor relay | EC-400, "Description" |
| VVEL control module | EC-467, "Description" |
| VVEL control shaft position sensor | EC-392, "Description" |

ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

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

GST (Generic Scan Tool)

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to <u>EC-127</u>, "Diagnosis Description".

NOTE:

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

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DIAGNOSIS SYSTEM (ECM) DIAGNOSIS DESCRIPTION

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

INFOID:000000008156195

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

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

×: Applicable —: Not applicable

| | MIL | | | DTC | | 1st trip DTC | | |
|---|----------|-------------|----------|-------------|------------|--------------|------------|------------|
| Items | 1st trip | | 2nd trip | | 1st trip | 2nd trip | 1st trip | 2nd trip |
| | Blinking | Illuminated | Blinking | Illuminated | displaying | displaying | displaying | displaying |
| Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected | × | _ | _ | _ | _ | _ | × | _ |
| Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected | | _ | × | _ | _ | × | _ | _ |
| One trip detection diagnoses (Refer to EC-559, "DTC Index".) | _ | × | | _ | × | _ | _ | _ |
| Except above | | | _ | × | | × | × | |

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:000000008156196

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.

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

For malfunctions in which 1st trip DTCs are displayed, refer to <u>EC-559</u>, "<u>DTC Index</u>". These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

1st trip DTC is specified in Service \$07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to <u>EC-9</u>, "<u>Work Flow</u>". Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen.

< SYSTEM DESCRIPTION >

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

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

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

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

DIAGNOSIS DESCRIPTION : Counter System

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

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

COUNTER SYSTEM CHART

| | | | | IV |
|-------------------------------------|-----------------------|-------------------|----------------|----|
| Items | Fuel Injection System | Misfire | Other | |
| MIL (turns OFF) | 3 (pattern B) | 3 (pattern B) | 3 (pattern B) | _ |
| DTC, Freeze Frame Data (no display) | 80 (pattern C) | 80 (pattern C) | 40 (pattern A) | Ν |
| 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) | 0 |

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 "MIS-FIRE <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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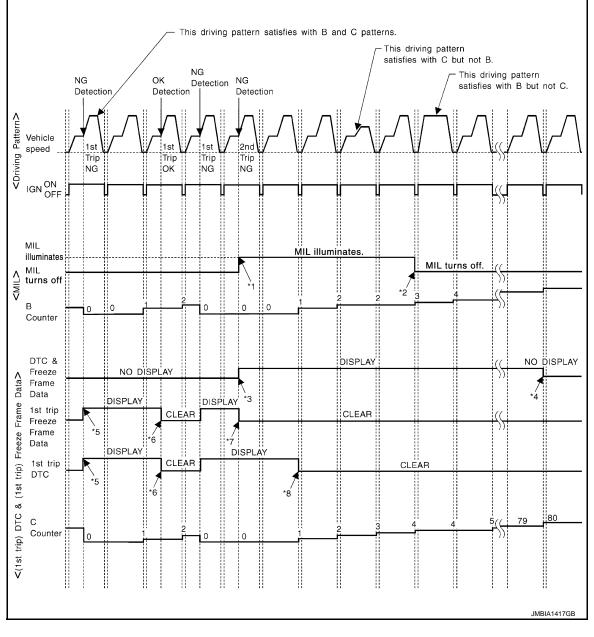
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< SYSTEM DESCRIPTION >



- *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 turn OFF after vehicle is driv- *3: When the same malfunction is deen 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.
- tected 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 Refer to EC-132, "DIAGNOSIS DESCRIPTION : Driving Pattern".

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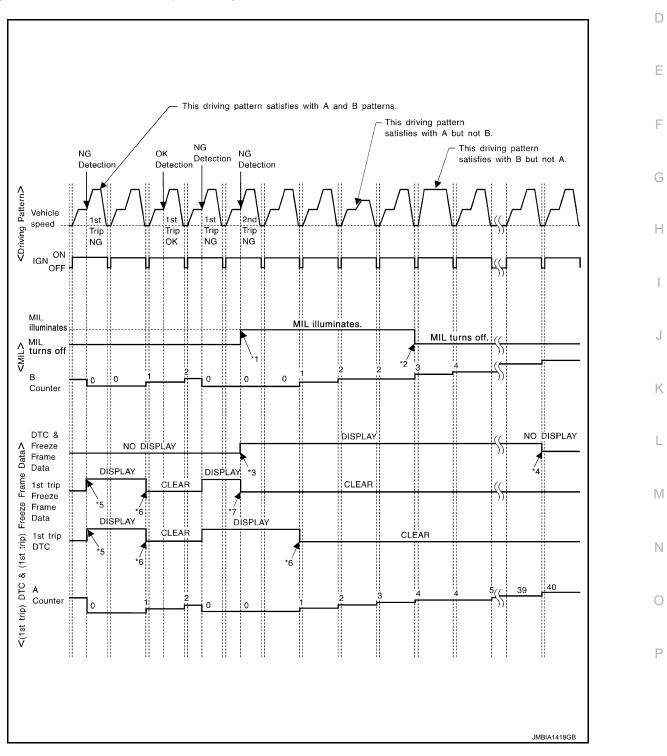
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Driving Pattern C Refer to <u>EC-132</u>, "<u>DIAGNOSIS DESCRIPTION</u> : <u>Driving Pattern</u>". Example: If the stored freeze frame data is as per the following: Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F) To be satisfied with driving pattern C, the vehicle should run under the following conditions:

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

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



< SYSTEM DESCRIPTION >

- *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 turn OFF after vehicle is driv- *3: When the same malfunction is deen 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.
- tected 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"

Driving Pattern A

Refer to EC-132, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern B Refer to EC-132, "DIAGNOSIS DESCRIPTION : Driving Pattern".

DIAGNOSIS DESCRIPTION : Driving Pattern

CAUTION:

Always drive at a safe speed.

DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

NOTE:

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

DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.

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

NOTE:

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

DRIVING PATTERN C

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

DIAGNOSIS SYSTEM (ECM)

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

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

NOTE:

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

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

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

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

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

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

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

NOTE:

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

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

NOTE:

If 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 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-diagr | nosis result | Diagnosis | $\leftarrow ON \rightarrow$ | | $\begin{array}{llllllllllllllllllllllllllllllllllll$ | $\leftarrow ON \rightarrow$ | |
| 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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| | | Example | | | | | |
|-------------|-------------|-------------------|-----------------------------|---------|---|-----------------------------|--|
| Self-diagno | osis result | Diagnosis | $\leftarrow ON \rightarrow$ | | n cycle FF \leftarrow ON \rightarrow OFF | $\leftarrow ON \rightarrow$ | |
| NG exists | Case 3 | P0400 | OK | ОК | — | _ | |
| | | P0402 | _ | — | — | _ | |
| | | P1402 | NG | — | NG | NG (Consecutive NG) | |
| | | (1st trip) DTC | 1st trip DTC | _ | 1st trip DTC | DTC (= MIL ON) | |
| | | SRT of EGR | "INCMP" | "INCMP" | "INCMP" | "CMPLT" | |

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

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

-: Self-diagnosis is not carried out.

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

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

If one or more SRT related self-diagnoses show 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 the number one (1) for each self-diagnosis (Case 1 & 2) or the number two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

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

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

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:000000008156200

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

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

Check the MIL circuit if MIL does not illuminate. Refer to <u>EC-523. "Component Function Check"</u>.

2. When the engine is started, the MIL should go off. **NOTE:**

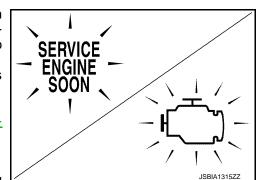
If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission-related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).

On Board Diagnosis Function

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

| Diagnostic test mode | Function |
|----------------------|------------------------------------|
| Bulb check | MIL can be checked. |
| SRT status | ECM can read if SRT codes are set. |



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| Diagnostic test mode | Function | |
|--|---|----|
| Malfunction warning | If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected. | A |
| Self-diagnostic results | DTCs or 1st trip DTCs stored in ECM can be read. | EC |
| Accelerator pedal released position learning | ECM can learn the accelerator pedal released position. Refer to EC-19, "ACCELER- ATOR PEDAL RELEASED POSITION LEARNING : Description". | EC |
| Throttle valve closed position learning | ECM can learn the throttle valve closed position. Refer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Description". | С |
| Idle air volume learning | ECM can learn the idle air volume. Refer to EC-20, "IDLE AIR VOLUME LEARNING : Description". | |
| Mixture ratio self-learning value clear | Mixture ratio self-learning value can be erased. Refer to <u>EC-24</u> , "MIXTURE RATIO <u>SELF-LEARNING VALUE CLEAR</u> : <u>Description</u> ". | D |

BULB CHECK MODE

Description

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

Operation Procedure

- 1. Turn ignition switch ON.
- The MIL on the instrument panel should stay ON. If it remains OFF, check MIL circuit. Refer to <u>EC-523, "Diagnosis Procedure"</u>.

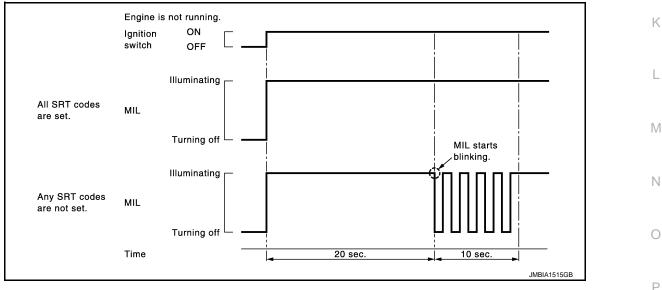
SRT STATUS MODE

Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to <u>EC-133</u>, "<u>DIAGNOSIS DESCRIPTION</u> : <u>System Readiness Test (SRT) Code</u>".

Operation Procedure

- 1. Turn ignition switch ON and wait 20 seconds.
- 2. SRT status is indicated as shown blow.
 - ECM continues to illuminate MIL if all SRT codes are set.
 - ECM blinks MIL for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

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

Operation Procedure

< SYSTEM DESCRIPTION >

- 1. Turn ignition switch ON.
- Check that MIL illuminates. If it remains OFF, check MIL circuit. Refer to <u>EC-523</u>, "Diagnosis Procedure".
- 3. Start engine and let it idle.
 - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
 - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
 - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

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

How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- After ignition switch is turned off, ECM is always released from the "self-diagnostic results" mode.
- 1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 2. Repeat the following procedure quickly five times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.
- 3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.

NOTE:

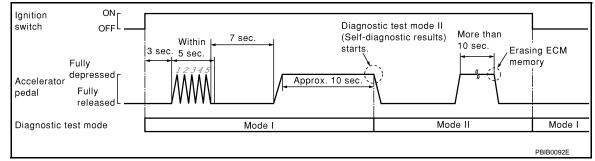
Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

4. Fully release the accelerator pedal.

ECM has entered to "Self-diagnostic results" mode.

NOTE:

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



How to Read Self-diagnostic Results

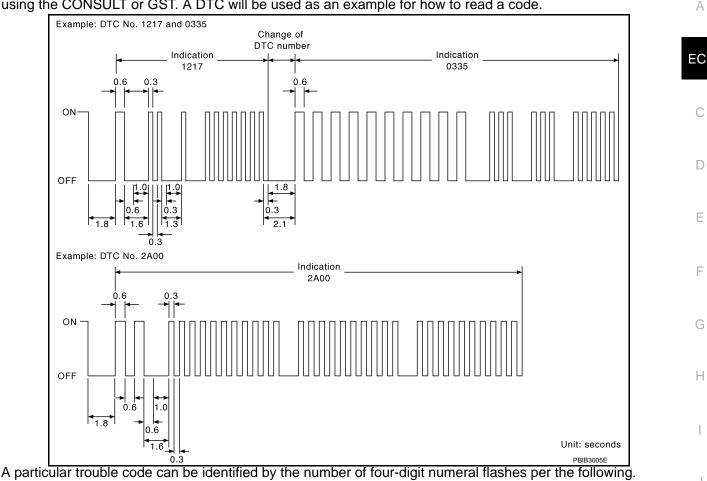
The DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in "malfunction warning" mode, it is a DTC; if two or more codes are displayed, they may be either

< SYSTEM DESCRIPTION >

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DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



| Number | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | А | 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. Refer to <u>EC-559, "DTC Index"</u>.

How to Erase Self-diagnostic Results

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

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

Test values

NOTE:

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

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

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

CONSULT Function

INFOID:000000008156202

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 unit. | | | |
| Self-diagnostic results | elf-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame dat in be read and erased quickly.* | | | |
| Data monitor | Input/Output data in the ECM can be read. | | | |
| CAN diagnostic support monitor | The results of transmit/receive diagnosis of CAN communication can be read. | | | |
| Active test | Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range. | | | |
| DTC & SRT confirmation | The status of system monitoring tests and the self-diagnosis status/results can be confirmed. | | | |
| ECU part number | ECM part number can be read. | | | |

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

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

WORK SUPPORT MODE

Work Item

| WORK ITEM | CONDITION | USAGE |
|-----------------------|---|--|
| IDLE AIR VOL LEARN | THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM. | When learning the idle air volume |
| EVAP SYSTEM CLOSE | CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. IGN SW ON ENGINE NOT RUNNING AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM FUEL TANK TEMP. IS MORE THAN 0°C (32°F). WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" WHEN TRYING TO EXECUTE "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. NOTE: WHEN VOLTAGE IS LOW. CHARGE BATTERY", EVEN WHEN USING A CHARGED BATTERY. | When detecting EVAP vapor leak in the EVAP system |
| FUEL PRESSURE RELEASE | • FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |

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|--|--|---|---|--|--|--|
| WORK ITEN | N | CONDITION | USAGE | | | |
| SELF-LEARNING CON | IT | • THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT. | When clearing mixture ratio self- learning value | | | |
| TARGET IDLE RPM A | GET IDLE RPM ADJ* • IDLE CONDITION When setting | | | | | |
| TARGET IGN TIM ADJ | T IGN TIM ADJ* • IDLE CONDITION When adjusting target ignition tin ing | | | | | |
| VIN REGISTRATION | | IN THIS MODE, VIN IS REGISTERED IN ECM. | When registering VIN in ECM | | | |
| CLSD THL POS LEAR | N | IGNITION ON AND ENGINE STOPPED. | When learning the throttle valve closed position | | | |
| VVEL POS SEN ADJ P | PREP | USE THIS ITEM ONLY WHEN REPLACING VVEL ACTU- ATOR SUB ASSEMBLY. IGNITION ON AND ENGINE STOPPED. | When adjusting VVEL control shaft position sensor | | | |
| *: This function is no | ot necessa | ary in the usual service procedure. | | | | |
| SELF-DIAG RESU | JLTS MO | DE | | | | |
| Self Diagnostic Item Regarding items of | DTC and | 1st trip DTC, refer to <u>EC-559, "DTC_Index"</u> . | | | | |
| When ECM has deIf "TIME" is neither | etected a r "0" nor " | p DTC, 1t" is displayed for "TIME". current DTC, "0" is displayed for "TIME". 1t", the DTC occurred in the past and ECM shows he last detection of the DTC. | the number of times the vehi- | | | |
| seconds and then • If the DTC is not for 1. Erase DTC in T 2. Select "ENGINE 3. Select "SELF-D 4. Touch "ERASE" | ch stays (turn it ON or A/T rela CM. Refe Tag with CC IAG RES '. (DTC in | DN after repair work, be sure to turn ignition switc I (engine stopped) again. ated items (see <u>EC-559, "DTC_Index"</u>), skip step 1. r to <u>TM-154, "Diagnosis Description"</u> . DNSULT. | | | | |
| Freeze frame data item* | Description | | | | | |
| DIAG TROUBLE CODE [PXXXX] | The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to <u>EC-559, "DTC Index</u>".) | | | | | |
| CAL/LD VALUE [%] | The calc | culated load value at the moment a malfunction is detected is c | lisplayed. | | | |
| COOLANT TEMP [°C] or [°F] | The eng | ine coolant temperature at the moment a malfunction is detect | ed is displayed. | | | |
| L-FUEL TRM-B1 [%] | | | | | | |
| L-FUEL TRM-B2 [%] | The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than | | | | | |

L-FUEL TRM-B2 [%]

S-FUEL TRM-B1 [%]

S-FUEL TRM-B2 [%]

ENGINE SPEED [rpm]

VEHICL SPEED

[km/h] or [mph] ABSOL TH-P/S [%] short-term fuel trim.

ule.

• The throttle valve opening angle at the moment a malfunction is detected is displayed

• "Short-term fuel trim" at the moment a malfunction is detected is displayed.

· The engine speed at the moment a malfunction is detected is displayed

• The vehicle speed at the moment a malfunction is detected is displayed

• The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel sched-

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| Freeze frame data item* | Description | | |
|-------------------------------|---|--|--|
| B/FUEL SCHDL [msec] | The base fuel schedule at the moment a malfunction is detected is displayed | | |
| INT/A TEMP SE [°C] or [°F] | The intake air temperature at the moment a malfunction is detected is displayed | | |
| FUEL SYS-B1 | • "Fuel injection system status" at the moment a malfunction is detected is displayed. | | |
| FUEL SYS-B2 | One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop | | |
| INT MANI PRES [kPa] | | | |
| COMBUST CONDI- TION | These items are displayed but are not applicable to this model. | | |

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

DATA MONITOR MODE

NOTE:

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

Monitored Item

×: Applicable

| Monitored item | Unit | Description | Remarks |
|----------------|----------|---|---|
| ENG SPEED | rpm | Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). | Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated. |
| MAS A/F SE-B1 | | | When the engine is stopped, a |
| MAS A/F SE-B2 | V | The signal voltage of the mass air flow sensor is displayed. | certain value is indicated.When engine is running, specification range is indicated in "SPEC". |
| B/FUEL SCHDL | msec | • "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | • When engine is running, speci- fication range is indicated in "SPEC". |
| A/F ALPHA-B1 | | | • When the engine is stopped, a |
| A/F ALPHA-B2 | % | The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated. | certain value is indicated. This data also includes the data for the air-fuel ratio learning control. When engine is running, specification range is indicated in "SPEC". |
| 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 tem- perature 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 | |
| A/F SEN1 (B2) | v | the air fuel ratio (A/F) sensor 1 is displayed. | |
| HO2S2 (B1) | V | • The signal voltage of the heated oxygen sensor 2 | |
| HO2S2 (B2) | v | is displayed. | |

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| Monitored item | Unit | Description | Remarks | ٥ |
|------------------------------------|-------------|---|---|---------|
| HO2S2 MNTR (B1) HO2S2 MNTR (B2) | 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. | A EC |
| VHCL SPEED SE | km/h or mph | • The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | | С |
| BATTERY VOLT | V | The power supply voltage of ECM is displayed. | | |
| ACCEL SEN 1 ACCEL SEN 2 | V | The accelerator pedal position sensor signal volt- age is displayed. | ACCEL SEN 2 signal is con- verted by ECM internally. Thus, they differs from ECM terminal voltage signal. | D |
| TP SEN 1-B1 TP SEN 2-B1 | V | The throttle position sensor signal voltage is dis- played. | • TP SEN 2-B1 signal is convert- ed by ECM internally. Thus, they differs from ECM terminal voltage signal. | E |
| 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. | | G |
| EVAP SYS PRES | V | The signal voltage of EVAP control system pres- sure sensor is displayed. | | Н |
| FUEL LEVEL SE | V | • The signal voltage of the fuel level sensor is displayed. | | Ι |
| START SIGNAL | ON/OFF | Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. | • After starting the engine, [OFF] is displayed regardless of the starter signal. | J |
| CLSD THL POS | ON/OFF | Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. | | K |
| AIR COND SIG | ON/OFF | • Indicates [ON/OFF] condition of the air condition- er switch as determined by the air conditioner signal. | | |
| P/N POSI SW | ON/OFF | Indicates [ON/OFF] condition from the park/neu- tral position (PNP) signal. | | L |
| PW/ST SIGNAL | ON/OFF | • [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated. | | M |
| 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. | | N |
| 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. | | Ρ |
| 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 sig- | When the engine is stopped, a certain computed value is indi- | |
| INJ PULSE-B2 | 11000 | nals. | cated. | |

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| Monitored item | Unit | Description | Remarks |
|-----------------|-------------|--|--|
| IGN TIMING | BTDC | Indicates the ignition timing computed by ECM according to the input signals. | • When the engine is stopped, a certain value is indicated. |
| CAL/LD VALUE | % | • "Calculated load value" indicates the value of the current air flow divided by peak air flow. | |
| MASS AIRFLOW | g/s | • Indicates the mass air flow computed by ECM ac- cording to the signal voltage of the mass air flow sensor. | |
| PURG VOL C/V | % | Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. The opening becomes larger as the value increases. | |
| INT/V TIM (B1) | °CA | Indicates [°CA] of intake camshaft advance an- | |
| INT/V TIM (B2) | | gle. | |
| INT/V SOL (B1) | | • The control value of the intake valve timing con- | |
| INT/V SOL (B2) | % | trol solenoid valve (determined by ECM according to the input signals) is indicated.The advance angle becomes larger as the value increases. | |
| TP SEN 1-B2 | | | • TP SEN 2-B2 signal is convert- |
| TP SEN 2-B2 | V | The throttle position sensor signal voltage is dis- played. | ed by ECM internally. Thus, they differs from ECM terminal voltage signal. |
| AIR COND RLY | ON/OFF | • The air conditioner relay control condition (deter- mined 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 sig- nals. | |
| VENT CONT/V | ON/OFF | The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open | |
| THRTL RELAY | ON/OFF | Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. | |
| HO2S2 HTR (B1) | | Indicates [ON/OFF] condition of heated oxygen | |
| HO2S2 HTR (B2) | ON/OFF | sensor 2 heater determined by ECM according to the input signals. | |
| VEHICLE SPEED | km/h or mph | • The vehicle speed computed from the vehicle speed signal sent from TCM is displayed. | |
| IDL A/V LEARN | YET/CMPLT | Displays the condition of Idle Air Volume Learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully. | |
| ENG OIL TEMP | °C or °F | • The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed. | |
| TRVL AFTER MIL | km or mile | Distance traveled while MIL is activated. | |
| A/F S1 HTR (B1) | | • Air fuel ratio (A/F) sensor 1 heater control value | |
| A/F S1 HTR (B2) | % | computed by ECM according to the input signals.The current flow to the heater becomes larger as the value increases. | |

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks | |
|--------------------------|-------------|--|---------|----|
| AC PRESS SEN | V | • The signal voltage from the refrigerant pressure sensor is displayed. | | A |
| VHCL SPEED SE | km/h or mph | • The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | | EC |
| 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. | | C |
| CANCEL SW | ON/OFF | Indicates [ON/OFF] condition from CANCEL switch signal. | | D |
| 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. | | E |
| BRAKE SW1 | ON/OFF | Indicates [ON/OFF] condition from ASCD brake switch signal. | | F |
| BRAKE SW2 | ON/OFF | Indicates [ON/OFF] condition of stop lamp switch signal. | | _ |
| VHCL SPD CUT | NON/CUT | Indicates the vehicle cruse condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Cehicle speed decreased to excessively low compared withe the ASCD set speed, and ASCD operation is cut off. | | G |
| LO SPEED CUT | NON/CUT | Indicates the vehicle cruse condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Cehicle speed decreased to excessively low and ASCD operation is cut off. | | |
| CRUISE LAMP | ON/OFF | Indicates [ON/OFF] condition of CRUISE lamp deternubed by the ECM according to the input signals. | | J |
| SET LAMP | ON/OFF | Indicates [ON/OFF] condition of SET lamp deter- nubed by the ECM according to the input signals. | | K |
| AT OD MONITOR | ON/OFF | Indicates [ON/OFF] condition of A/T O/D accord- ing to the input signal from the TCM. | | L |
| AT OD CANCEL | ON/OFF | Indicates [ON/OFF] condition of A/T O/D cancel request signal from the TCM. | | |
| BAT CUR SEN | mV | The signal voltage of battery current sensor is displayed. | | M |
| ALT DUTY SIG | ON/OFF | The control condition of the power generation voltage variable control (determined by ECM ac- cording to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive. | | N |
| A/F ADJ-B1 A/F ADJ-B2 | | • Indicates the correction of factor stored in ECM. The factor is calculated from the difference be- tween the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 sig- nal. | | Ρ |
| FAN DUTY | % | Indicates a command value for cooling fan. The value is calculated by ECM based on input signals. | | |

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| Monitored item | Unit | Description | Remarks |
|----------------------|-------------|--|---------|
| AC EVA TEMP | °C or °F | Indicates A/C evaporator temperature sent from "unified meter and A/C amp.". | |
| AC EVA TARGET | °C or °F | Indicates target A/C evaporator temperature sent from "unified meter and A/C amp.". | |
| ALTDUTY | % | Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal. | |
| ATOM PRES SEN | mV | Always a certain value is displayed.This item is not efficient for HV36 models. | |
| BRAKE BST PRES SE | mV | Always a certain value is displayed. This item is not efficient for HV36 models. | |
| VVEL SEN LEARN-B1 | V | Indicates the \/\/EL learning value | |
| VVEL SEN LEARN-B2 | V | Indicates the VVEL learning value. | |
| VVEL POSITION SEN-B1 | N/ | The VVEL control shaft position sensor signal | |
| VVEL POSITION SEN-B2 | V | voltage is displayed. | |
| VVEL TIM-B1 | dea | a Indiantes [des] of \///EL control shoft angle | |
| VVEL TIM-B2 | deg | Indicates [deg] of VVEL control shaft angle. | |
| VVEL LEARN | YET/DONE | Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been per- formed successfully. | |
| EVAP LEAK DIAG | YET/CMPLT | Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been per- formed yet. CMPLT: EVAP leak diagnosis has been per- formed successfully. | |
| EVAP DIAG READY | ON/OFF | Indicates the ready condition of EVAP leak diagnosis. ON: Diagnosis has been ready condition. OFF: Diagnosis has not been ready condition. | |
| THRTL STK CNT B1* | — | — | |
| HO2 S2 DIAG1 (B1) | INCMP/CMPLT | Indicates DTC P0139 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG1 (B2) | INCMP/CMPLT | Indicates DTC P0159 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG2 (B1) | INCMP/CMPLT | Indicates DTC P0139 self-diagnosis (slow re- sponse) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG2 (B2) | INCMP/CMPLT | Indicates DTC P0159 self-diagnosis (slow re- sponse) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG1 (B1) | INCMP/CMPLT | Indicates DTC P015A or P015B self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG1 (B2) | INCMP/CMPLT | Indicates DTC P015C or P015D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |

DIAGNOSIS SYSTEM (ECM)

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| Monitored item | Unit | Description | Remarks | 0 |
|---------------------|-------------|--|---------|---------|
| A/F SEN1 DIAG2 (B1) | INCMP/CMPLT | Indicates DTC P014C or P014D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | | A EC |
| A/F SEN1 DIAG2 (B2) | INCMP/CMPLT | Indicates DTC P014E or P014F self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | | С |
| A/F SEN1 DIAG3 (B1) | ABSNT/PRSNT | Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the di- agnosis range. PRSNT: The vehicle condition is within the diag- nosis range. | | D |
| A/F SEN1 DIAG3 (B2) | ABSNT/PRSNT | Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the di- agnosis range. PRSNT: The vehicle condition is within the diag- nosis range. | | F |

*: The item is indicated, but not used.

NOTE:

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

ACTIVE TEST MODE

Test Item

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) | | | |
|------------------|--|---|---|--|--|--|
| POWER BALANCE | Engine: After warming up, idle the engine. A/C switch OFF Selector lever: P or N (A/T), Neutral (M/T) Cut off each injector signal one at a time using CONSULT. | Engine runs rough or dies. | Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil | | | |
| VENT CONTROL/V | Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound. | Solenoid valve makes an oper- ating sound. | Harness and connectorsSolenoid valve | | | |
| ENG COOLANT TEMP | Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Engine coolant temperature sensor Fuel injector | | | |
| FUEL INJECTION | Engine: Return to the original trouble condition Change the amount of fuel injection using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1 | | | |
| FUEL/T TEMP SEN | Change the fuel tank temperature using CONSULT. | | | | | |
| PURG VOL CONT/V | Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. | Engine speed changes accord- ing to the opening percent. | Harness and connectorsSolenoid valve | | | |
| FUEL PUMP RELAY | Ignition switch: ON (Engine stopped) Turn the fuel pump relay ON and OFF using CONSULT and listen to operating sound. | Fuel pump relay makes the op- erating sound. | Harness and connectorsFuel pump relay | | | |

DIAGNOSIS SYSTEM (ECM)

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[VQ37VHR]

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|-------------------|---|--|--|
| IGNITION TIMING | Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CON-SULT. | If trouble symptom disappears, see CHECK ITEM. | Perform Idle Air Volume Learning. |
| FAN DUTY CONTROL* | Ignition switch: ON Change duty ratio using CONSULT. | Cooling fan speed changes. | Harness and connectors Cooling fan motor Cooling fan relay Cooling fan control module IPDM E/R |
| ALTERNATOR DUTY | Engine: IdleChange duty ratio using CONSULT. | Battery voltage changes. | Harness and connectorsIPDM E/RAlternator |
| V/T ASSIGN ANGLE | Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Engine coolant temperature sensor Fuel injector |

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

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

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

PERMANENT DTC STATUS Mode

How to Display Permanent DTC Status

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

NOTE:

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

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

| PERMANENT DTC & SRT | CONFIRMATION | : PERMANENT DTC STATUS | 3 | |
|--|-------------------|-------------------------------------|-------------------|-------------|
| CAUTION: Turn ignition sw status screen. | itch from ON to O | FF twice to update the inform | ation on the | |
| PERMANENT D | тс | DRIVING PATTERN B | DRIVING PATTERN D |] |
| xxxx | | INCMP | INCMP | |
| xxxx | | CMPLT | INCMP | |
| xxxx | | INCMP | CMPLT | |
| xxxx | | CMPLT | INCMP | |
| xxxx | | INCMP | INCMP | |
| xxxx | | INCMP | INCMP | |
| | The pre | vious trip information is displayed | |] |
| | | | | JSBIA0062GB |

NOTE:

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

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

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EC

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SRT WORK SUPPORT Mode

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

PERMANENT DTC WORK SUPPORT Mode

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

NOTE:

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

DTC WORK SUPPORT Mode

| Test mode | Test item | Corresponding DTC No. | Reference page | - |
|--------------------|----------------------------|-----------------------|----------------|---|
| | EVP SML LEAK P0442*/P1442* | — | — | - |
| EVAPORATIVE SYSTEM | EVP V/S LEAK P0456/P1456* | P0456 | <u>EC-342</u> | _ |
| EVAPORATIVE SYSTEM | PURG VOL CN/V P1444 | P0443 | <u>EC-311</u> | |
| | PURG FLOW P0441 | P0441 | <u>EC-306</u> | |
| | A/F SEN1 (B1) P1278/P1279 | — | — | |
| | A/F SEN1 (B1) P1276 | P0130 | <u>EC-221</u> | |
| A/F SEN1 | A/F SEN1 (B2) P1288/P1289 | | — | _ |
| | A/F SEN1 (B2) P1286 | P0150 | <u>EC-221</u> | - |
| | HO2S2 (B1) P1146 | P0138 | <u>EC-237</u> | - |
| | HO2S2 (B1) P1147 | P0137 | <u>EC-231</u> | - |
| 110000 | HO2S2 (B1) P0139 | P0139 | <u>EC-245</u> | - |
| HO2S2 | HO2S2 (B2) P1166 | P0158 | <u>EC-237</u> | - |
| | HO2S2 (B2) P1167 | P0157 | <u>EC-231</u> | _ |
| | HO2S2 (B2) P0159 | P0159 | <u>EC-245</u> | _ |

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

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< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:000000008156203

[VQ37VHR]

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

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

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

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

Component Function Check

INFOID:000000008156204

1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.

TESTING CONDITION

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (1.003 1.064 kg/cm², 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
- For A/T models: After the engine is warmed up to normal operating temperature, drive vehicle until "ATF TEMP 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- For M/T models: After the engine is warmed up to normal operating temperature, drive 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 IN DATA MONITOR MODE

With CONSULT NOTE:

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

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

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> Go to <u>EC-149</u>, "Diagnosis Procedure".

< DTC/CIRCUIT DIAGNOSIS >

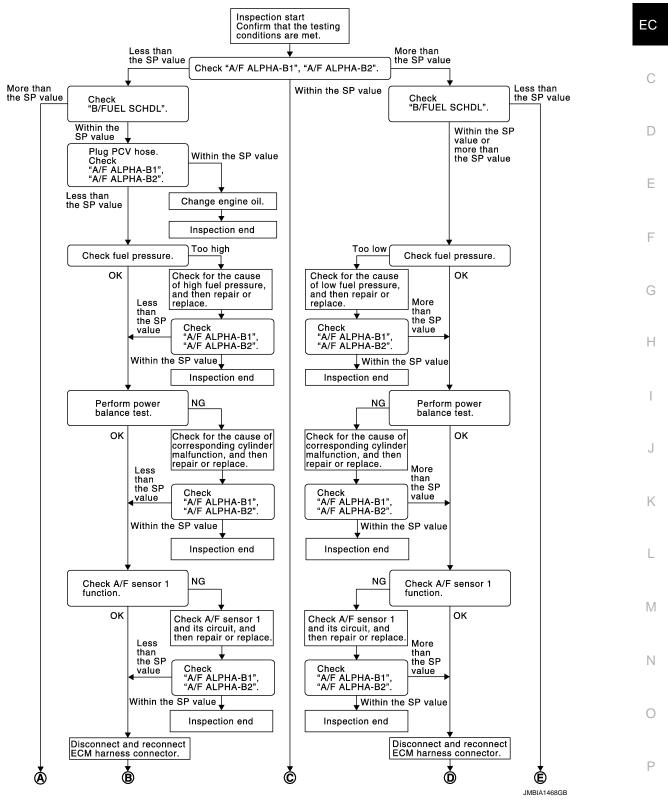
Diagnosis Procedure



INFOID:000000008156205

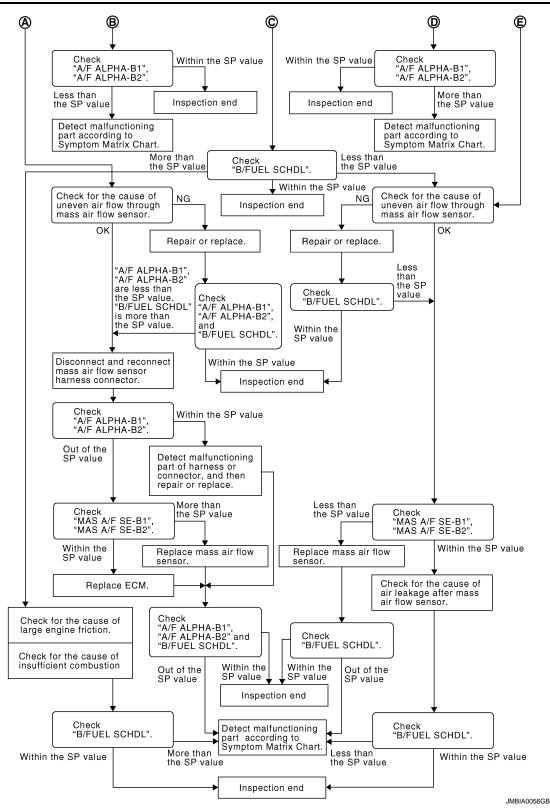
А

OVERALL SEQUENCE



< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



DETAILED PROCEDURE

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

() With CONSULT

- 1. Start engine.
- 2. Confirm that the testing conditions are met. Refer to EC-148, "Component Function Check".
- 3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

EC-150

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|---|------------------|
| NOTE: Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluct if the indication is out of the SP value even a little. | uate. It is NG A |
| <u>Is the measurement value within the SP value?</u> YES >> GO TO 17. NO-1 >> Less than the SP value: GO TO 2. NO-2 >> More than the SP value: GO TO 3. | EC |
| 2.CHECK "B/FUEL SCHDL" | С |
| Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication SP value. | |
| <u>Is the measurement value within the SP value?</u> YES >> GO TO 4. | D |
| NO >> More than the SP value: GO TO 19. 3.CHECK "B/FUEL SCHDL" | E |
| Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication | n is within the |
| SP value. <u>Is the measurement value within the SP value?</u> | F |
| YES >> GO TO 6. NO-1 >> More than the SP value: GO TO 6. NO-2 >> Less than the SP value: GO TO 25. | G |
| 4. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2" | н |
| Stop the engine. Disconnect PCV hose, and then plug it. Start engine. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and ma each indication is within the SP value. | |
| Is the measurement value within the SP value? | |
| YES >> GO TO 5. NO >> GO TO 6. | J |
| 5. 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 becau conditions (such as when engine oil temperature does not rise enough since a journey di short during winter). The symptom will not be detected after changing engine oil or changing ditions. | stance is too |
| | 111 |
| >> INSPECTION END 6.CHECK FUEL PRESSURE | Ν |
| Check fuel pressure. (Refer to <u>EC-595, "Inspection"</u> .) | |
| Is the inspection result normal? | 0 |
| YES >> GO TO 9. NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly", refer to <u>FL</u> <u>and Installation</u>", and then GO TO 8. NO-2 >> Fuel pressure is too low: GO TO 7. | |
| 7. DETECT MALFUNCTIONING PART | |
| Check fuel hoses and fuel tubes for clogging. | |
| <u>Is the inspection result normal?</u> YES >> Replace "fuel filter and fuel pump assembly", refer to <u>FL-6</u> , " <u>Removal and Installation</u> " | on" and then |
| GO TO 8. | <u>, anu men</u> |

NO >> Repair or replace and then GO TO 8.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 9.

9.Perform power balance test

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

2. Make sure that the each cylinder produces a momentary engine speed drop.

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following bellow.

- Ignition coil and its circuit (Refer to EC-518, "Component Function Check".)
- Fuel injector and its circuit (Refer to EC-507, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to <u>EM-23, "Inspection"</u>.)

Is the inspection result normal?

- YES >> Replace fuel injector, refer to EM-37, "Removal and Installation", and then GO TO 11.
- NO >> Repair or replace malfunctioning part and then GO TO 11.
- **11.**CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"
- 1. Start engine.
- 2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> GO TO 12.
- 12.CHECK A/F SENSOR 1 FUNCTION

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

- For DTC P0130, P0150, refer to EC-221, "DTC Logic".
- For DTC P0131, P0151, refer to <u>EC-225, "DTC Logic"</u>.
- For DTC P0132, P0152, refer to <u>EC-228, "DTC Logic"</u>.
- For DTC P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, refer to <u>EC-252, "DTC Logic"</u>.
- For DTC P2096, P2097, P2098, P2099, refer to <u>EC-477, "DTC Logic"</u>.

Are any DTCs detected?

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

13.CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnosis Procedure according to corresponding DTC.

>> GO TO 14.

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

1. Start engine.

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 15.

| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] |
|---|
| 15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR |
| Stop the engine. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it. |
| >> GO TO 16. |
| 16. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2" |
| Start engine. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value. |
| Is the measurement value within the SP value? |
| YES >> INSPECTION END |
| NO >> Detect malfunctioning part according to <u>EC-583, "Symptom Table"</u> . 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. Check for the cause of insufficient combustion. Refer to the following. |
| - Valve clearance malfunction |
| Intake valve timing control function malfunction Camshaft sprocket installation malfunction, etc. |
| |
| >> Repair or replace malfunctioning part, and then GO TO 30. |
| 19. CHECK INTAKE SYSTEM |
| Check for the cause of uneven air flow through mass air flow sensor. Refer to the following. |
| Crushed air ducts |
| Malfunctioning seal of air cleaner element Uneven dirt of air cleaner element |
| Improper specification of intake air system |
| Is the inspection result normal? |
| YES >> GO TO 21. NO >> Repair or replace malfunctioning part, and then GO TO 20. |
| 20. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL" |
| Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and |
| make sure that each indication is within the SP value. |
| Is the measurement value within the SP value? |
| YES >> INSPECTION END |
| NO >> "B/FUEL SCHDL" is more, "A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value: GO TO 21. |
| 21 DISCONNECT AND DECONNECT MASS AID ELOW SENSOD HADNESS CONNECTOR |

 $21. {\tt DISCONNECT} \text{ and } {\tt RECONNECT} \text{ mass air flow sensor harness connector}$

1. Stop the engine.

< DTC/CIRCUIT DIAGNOSIS >

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

>> GO TO 22.

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

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

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to <u>EC-188. "Diagno-</u> <u>sis Procedure"</u>. Then GO TO 29.

NO >> GO TO 23.

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

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

Is the measurement value within the SP value?

YES >> GO TO 24.

NO >> More than the SP value: Replace malfunctioning mass air flow sensor, refer to <u>EM-27</u>, "<u>Exploded</u> <u>View</u>", and then GO TO 29.

24.REPLACE ECM

1. Replace ECM.

2. Go to <u>EC-17</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair <u>Requirement</u>".

>> GO TO 29.

25. CHECK INTAKE SYSTEM

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

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

Is the inspection result normal?

YES >> GO TO 27.

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

26. CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

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

21.CHECK "MAS A/F SE-B1", "MAS A/F SE-B2"

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

Is the measurement value within the SP value?

- YES >> GO TO 28.
- NO >> Less than the SP value: Replace malfunctioning mass air flow sensor, refer to <u>EM-27</u>, "<u>Exploded</u> <u>View</u>", 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

TROUBLE DIACNOSIS SDECIEICATION VALUE

| IROUBLE DIAGNOSIS - SPECIFICATION VALUE | |
|--|----|
| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] | |
| Disconnection of oil level gauge Open stuck, breakage, hose disconnection, or cracks in PCV valve Disconnection or cracks in EVAP purge hose, stuck open EVAP canister purge volume control solenoid valve | A |
| Malfunctioning seal in rocker cover gasket | EC |
| >> GO TO 30. | С |
| 29. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL" Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value. | D |
| Is the measurement value within the SP value? YES >> INSPECTION END NO >> Detect malfunctioning part according to <u>EC-583</u> , "Symptom Table". 30. CHECK "B/FUEL SCHDL" | E |
| Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then make sure that the indication is | F |
| within the SP value. | |
| Is the measurement value within the SP value? YES >> INSPECTION END NO >> Detect malfunctioning part according to EC-583, "Symptom Table". | G |
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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between ECM harness connector.

| E | СМ | Ground | Continuity | |
|-----------|----------|--------|------------|--|
| Connector | Terminal | Cround | Continuity | |
| F101 | 8 | | | |
| | 123 | | Existed | |
| M107 | 124 | Ground | | |
| WITO? | 127 | | | |
| | 128 | | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F103, M116

Harness for open or short between ECM and ground

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

4.CHECK ECM POWER SUPPLY CIRCUIT-I

1. Reconnect ECM harness connector.

2. Turn ignition switch ON.

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

| | E | СМ | | |
|-----------|----------|-----------|----------|-----------------|
| + | | - | | Voltage |
| Connector | Terminal | Connector | Terminal | |
| F102 | 53 | M107 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E3, F1
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between ECM and fuse

INFOID:000000008156206

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | | | 10 seconds. connector terminals as follows. | EC | | |
|--|--|-------------------------|---------------|--|----|--|--|
| | ECM | | | | C | | |
| Connector - | + Terminal | – Terminal | | Voltage | | | |
| M107 | 125 | 128 | | gnition switch OFF, battery volt- or a few seconds, then dropto v 0 V. | D | | |
| Is the inspe | ction result | normal? | | | E | | |
| | GO TO 7. | | | | | | |
| - | | ER SUPPL | | ш | F | | |
| | nition switc | | | | | | |
| | | | DM E/R ha | rness connector and ground. | G | | |
| | | | | | G | | |
| | DM E/R | Grou | nd Ve | bltage | | | |
| Connector E7 | Termin 53 | Groui | nd Batto | ry voltage | Н | | |
| Is the inspe | | | iu Dalle | y voltage | | | |
| YES >> | GO TO 8. | | | | I | | |
| <u> </u> | • | | | -32, "Removal and Installation". | | | |
| | | TENT INCIE | | | J | | |
| Refer to GI | -42, "Interm | hittent Incide | <u>nt"</u> . | | | | |
| >> | INSPECT | ION END | | | K | | |
| • | | ER SUPPL | Y CIRCUIT- | IV | | | |
| 1. Turn ig | nition switc | h OFF and v | wait at least | 10 seconds. | | | |
| | | | | connector terminals. | L | | |
| | | СМ | | | | | |
| | E. | - | _ | Voltage | Μ | | |
| | ÷ | | | , onego | | | |
| | + Terminal | Connector | Terminal | | | | |
| | | Connector M107 | 128 | Battery voltage | Ν | | |
| Connector | Terminal 24 | M107 | | Battery voltage | Ν | | |
| Connector F101 Is the inspe YES >> | Terminal 24 ction result GO TO 13 | M107 t normal? 3. | | Battery voltage | N | | |
| Connector F101 Is the inspe YES >> NO >> | Terminal 24 ction result GO TO 13 GO TO 10 | M107 t normal? 3. | 128 | | | | |

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

EC-157

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E3, F1
- Harness or connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

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

12.CHECK 15 A FUSE

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

2. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace 15 A fuse.

13.CHECK ECM POWER SUPPLY CIRCUIT-VI

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

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

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

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

Harness or connectors E106, M6

• Harness for open or short between ECM and IPDM E/R

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

15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to <u>PCS-32, "Removal and Installation"</u>.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE) [VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

| Diagnosis | Procedu | re | | | | INFOID:000000008156207 |
|--|--|---|--|---|--------------------------------------|------------------------|
| 1.снеск д | ROUND CO | ONNECTIO | N | | | EC |
| 2. Check gr Is the inspect YES >> C NO >> F | <u>ion result n</u> GO TO 2. Repair or re _l | ections M95 <u>ormal?</u> place grour | 5, E46. Refer to ad connection. T FOR OPEN | | n in <u>GI-45, "Circuit Inspe</u> | <u>ction"</u> . C |
| | | | le harness cor VEL control m | | nector and ground. | E |
| VVEL cor Connector | ntrol module Terminal | Grou | nd Continu | uity | | F |
| E15 | 14 | Grou | | ed | | |
| Is the inspect | | | power. | | | G |
| NO >> F | | | | n harness connecto SUPPLY CIRCUIT-I | | Н |
| 2. Turn igni | tion switch | ON. | e harness con EL control mod | nector. dule harness conne | ector. | 1 |
| VVE | L control mod | ule | | | - | J |
| Connector | + Terminal | – Terminal | | Voltage | | |
| E15 | 8 | 14 | | ition switch OFF, battery for a few seconds, then nately 0 V. | | K |
| Is the inspect | | ormal? | | | - | L |
| NO >> 0 | GO TO 4. GO TO 5. | | | | | M |
| | | | | | | |
| Refer to <u>GI-4</u> Is the inspect | | | <u>t"</u> . | | | N |
| YES >> F | Replace IPD | M E/R. Rei | | "Removal and Inst r short to power in h | allation". harness or connectors. | Ν |
| 5. CHECK V | VEL CONT | ROL MODI | JLE POWER S | | II | 0 |
| | e voltage b | etween EC | ait at least 10 s M harness con | seconds. nector terminals. | | Ρ |
| | E | СМ | | | | |

| + | | _ | | Voltage |
|---------------|----------|-----------|----------|-----------------|
| Connector | Terminal | Connector | Terminal | |
| F101 | 24 | M107 | 128 | Battery voltage |
| | - IA | 10 | | |

Is the inspection result normal?

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

6.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-III

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.

| EC | CM | IPDM E/R Connector Terminal | | Continuity |
|-----------|----------|--------------------------------|----|------------|
| Connector | Terminal | | | Continuity |
| F101 | 24 | E7 | 69 | Existed |

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

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E3, F1
- Harness or connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

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

8.CHECK 15 A FUSE

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

2. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace 15A fuse.

9.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-IV

- 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 |
| M107 | 125 | E7 | 49 | Existed |

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

Is the inspection result normal?

YES >> GO TO 11. NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness or connectors E106, M6

Harness for open or short between ECM and IPDM E/R

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

11.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

EC-160

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE) [VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

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

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U0101 CAN COMM CIRCUIT

Description

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:000000008156209

INEOID:000000008156210

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check DTC.

Is DTC detected?

- YES >> EC-162, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

Go to LAN-14, "Trouble Diagnosis Flow Chart".

Revision: 2012 July

INFOID:000000008156208

< DTC/CIRCUIT DIAGNOSIS >

U1001 CAN COMM CIRCUIT

Description

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle mul-EC tiplex 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:000000008156215

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|--|--|---|---|
| U1001 | CAN communication line | When ECM is not transmitting or receiving CAN com- munication signal other than OBD (emission related diagnosis) for 2 seconds or more. | Harness or connectors (CAN communication line is open or shorted) |
| DTC CON | FIRMATION PRO | CEDURE | |
| 1.PERFO | RM DTC CONFIRM | ATION PROCEDURE | |
| Turn ig Check | | d wait at least 3 seconds. | |
| | <u>ected?</u> > <u>EC-163, "Diagnosi:</u> > INSPECTION END | | |
| Diagnosi | s Procedure | | INFOID:000000081562 |
| Go to LAN- | -14, "Trouble Diagno | <u>sis Flow Chart"</u> . | |
| | | | |
| | | | |

INFOID:000000008156214

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U1003 CAN COMM CIRCUIT

Description

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

DTC Logic

INFOID:000000008156218

DTC DETECTION LOGIC

NOTE:

If DTC U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check DTC.

Is DTC detected?

YES >> Go to EC-164, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156219

1. CHECK VVEL CAN COMMUNICATION CIRCUIT

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

| E | СМ | VVEL control module | | Continuity |
|-----------|----------|---------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F102 | 54 | E15 | 24 | Existed |
| 1102 | 55 | | 11 | LAISIEU |

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

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

INFOID:000000008156217

U1003 CAN COMM CIRCUIT

| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] | l |
|--|---------------|
| Harness connector E3, F1 Harness for open or short between ECM and VVEL control module | A |
| >> Repair open circuit, short to ground or short to power in harness or connectors. 3. CHECK INTERMITTENT INCIDENT | EC |
| Refer to <u>GI-42, "Intermittent Incident"</u> . | _ |
| Is the inspection result normal? | 0 |
| YES >> GO TO 4. | С |
| NO >> Repair or replace. | |
| 4.REPLACE VVEL CONTROL MODULE | D |
| Replace VVEL control module. Refer to <u>EC-38</u>. "Component Parts Location". Go to <u>EC-18</u>. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD ULE) : Special Repair Requirement". | E |
| >> GO TO 5. | |
| 5. PERFORM DTC CONFIRMATION PROCEDURE | F |
| Reconnect all harness connectors disconnected. Turn ignition switch ON. Erase DTC. Perform DTC Confirmation Procedure. | G |
| See <u>EC-164. "DTC Logic"</u> . | Н |
| 5. Check DTC. Is the DTC U1003 displayed again? | |
| YES >> GO TO 6. NO >> INSPECTION END | |
| 6.REPLACE ECM | |
| Replace ECM. Go to <u>EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".</u> | J <u>r</u> |
| >> INSPECTION END | Κ |
| | L |
| | M |
| | Ν |
| | 0 |
| | Р |

U1024 CAN COMM CIRCUIT

Description

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

DTC Logic

INFOID:000000008156221

DTC DETECTION LOGIC **NOTE**:

If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|--|
| U1024 | VVEL CAN communication | When VVEL control module cannot transmit/receive can communication signal from ECM for 2 seconds or more. When detecting error during the ini- tial diagnosis of CAN controller of VVEL control module. | Harness or connectors (VELL CAN communication line is open or shorted) ECM VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-166, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156222

1. CHECK VVEL CAN COMMUNICATION CIRCUIT

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

| E | СМ | VVEL control module | | Continuity |
|-----------|----------|---------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F102 | 54 | E15 | 24 | Existed |
| 1102 | 55 | | 11 | LAISteu |

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

Is the inspection result normal?

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

EC-166

INFOID:000000008156220

U1024 CAN COMM CIRCUIT

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|--|--------------------|------|
| 2.DETECT MALFUNCTIONING PART | | ٨ |
| Check the following. • Harness connector E3, F1 | | A |
| Harness for open or short between ECM and VVEL control module | | EC |
| >> Harness for open, short to ground or short to power in harness or connectors. 3. CHECK INTERMITTENT INCIDENT | • | С |
| Refer to <u>GI-42, "Intermittent Incident"</u> . | | 0 |
| Is the inspection result normal? | | |
| YES >> GO TO 4. NO >> Repair or replace. | | D |
| 4.REPLACE VVEL CONTROL MODULE | | Е |
| Replace VVEL control module. Refer to <u>EC-38, "Component Parts Location"</u>. Go to <u>EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL COULE) : Special Repair Requirement"</u>. | <u>ONTROL MOD-</u> | F |
| >> GO TO 5. | | |
| 5. PERFORM DTC CONFIRMATION PROCEDURE | | G |
| Reconnect all harness connectors disconnected. Turn ignition switch ON. | | |
| Erase DTC. Perform DTC Confirmation Procedure. | | Η |
| See <u>EC-166, "DTC Logic"</u> . | | 1 |
| Is the DTC U1024 displayed again? | | I |
| YES >> GO TO 6. NO >> INSPECTION END | | J |
| 6.REPLACE ECM | | |
| Replace ECM. Go to <u>EC-17</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : <u>Requirement</u>". | Special Repair | K |
| >> INSPECTION END | | L |
| | | в. Л |
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< DTC/CIRCUIT DIAGNOSIS >

P0011, P0021 IVT CONTROL

DTC Logic

[VQ37VHR]

INFOID:000000008156223

DTC DETECTION LOGIC

NOTE:

- If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to <u>EC-178, "DTC Logic"</u>.
- If DTC P0011 or P0021 is displayed with DTC P0524, first perform the trouble diagnosis for DTC P0524. Refer to <u>EC-364, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | Detecting condition | Possible cause |
|---------|--|--|--|
| P0011 | Intake valve timing control performance (bank 1) | | Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Intake valve control solenoid valve |
| P0021 | Intake valve timing control performance (bank 2) | There is a gap between angle of target and phase-control angle degree. | Accumulation of debris to the signal pick-up portion of the camshaft Timing chain installation Foreign matter caught in the oil groove for in- take valve timing control |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

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

| VHCL SPEED SE | 100 - 120 km/h (63 - 75 mph) |
|----------------|--|
| ENG SPEED | 1,200 - 2,000 rpm |
| COOLAN TEMP/S | More than 60°C (140°F) |
| B/FUEL SCHDL | More than 7.3 msec |
| Selector lever | D position (A/T) 5th position (M/T) |

CAUTION:

Always drive at a safe speed.

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

Is 1st trip DTC detected?

YES >> Go to EC-169, "Diagnosis Procedure"

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

< DTC/CIRCUIT DIAGNOSIS >

ENG SPEED

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

1,700 - 3,175 rpm (A constant rotation is maintained.)

| COOLAN TEMP/S | More than 70°C (158°F) | E |
|---|--|---------------------------------|
| Selector lever | 1st or 2nd position | |
| Driving location | Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) | |
| CAUTION: Always drive a 3. Check 1st trip D | t a safe speed. PTC. | |
| | <u>cted?</u> <u>C-169. "Diagnosis Procedure"</u> CTION END | |
| Diagnosis Proce | edure | INFOID:00000008156224 |
| 1. CHECK OIL PRE | SSURE WARNING LAMP | |
| Start engine. Check oil press nated. | sure warning lamp and confirm it is not illumi- | |
| Is oil pressure warni | ng lamp illuminated? <u>U-7, "Inspection"</u> . 2. | |
| | 1 | |
| 2.CHECK INTAKE | VALVE TIMING CONTROL SOLENOID VALVE | PBIA8559J |
| Refer to <u>EC-170, "C</u> | omponent Inspection". | |
| Is the inspection res | ult normal? | |
| YES >> GO TO NO >> Replace View". | 3. e malfunctioning intake valve timing control solenoid valve. F | efer to <u>EM-49, "Exploded</u> |
| <u> </u> | SHAFT POSITION SENSOR (POS) | |
| | omponent Inspection". | |
| Is the inspection res | | |
| YES >> GO TO | | |
| | e crankshaft position sensor (POS). Refer to <u>EM-111, "Exploded</u> | <u>d View"</u> . |
| 4.CHECK CAMSH | AFT POSITION SENSOR (PHASE) | |
| Refer to EC-299, "C | omponent Inspection". | |
| Is the inspection res | ult normal? | |
| YES >> GO TO NO >> Replace | 5. malfunctioning camshaft position sensor (PHASE). Refer to <u>E</u> | M-49. "Exploded View". |
| 5. CHECK CAMSH | | |
| Check the following. | | |
| | | |

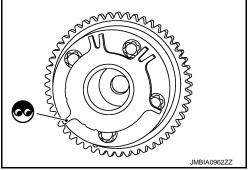
А

< DTC/CIRCUIT DIAGNOSIS >

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

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to <u>EM-85</u>, "Disassembly and Assembly".



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 <u>EM-50, "Removal and Installation"</u>.

NO >> GO TO 7.

7.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to <u>LU-7, "Inspection"</u>. <u>Is the inspection result normal?</u>

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

8.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000008156225

[VQ37VHR]

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-49</u>, "<u>Exploded</u> <u>View</u>".

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve. Refer to <u>EM-49</u>, "Exploded View".

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

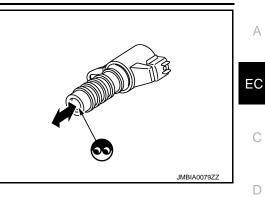
Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve. NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-49</u>, "<u>Exploded</u> <u>View</u>".



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

< DTC/CIRCUIT DIAGNOSIS >

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

Description

INFOID:000000008156226

[VQ37VHR]

SYSTEM DESCRIPTION

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

INFOID:000000008156227

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0031 | Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit low | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.) | Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) A/F sensor 1 heater |
| P0032 | Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit high | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.) | Harness or connectors (The A/F sensor 1 heater circuit is shorted.) A/F sensor 1 heater |
| P0051 | Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit low | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.) | Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) A/F sensor 1 heater |
| P0052 | Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit high | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.) | Harness or connectors (The A/F sensor 1 heater circuit is shorted.) A/F sensor 1 heater |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

- YES >> Go to EC-173, "Diagnosis Procedure".
- NG >> INSPECTION END

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

[VQ37VHR]

| < DTC/CIRCU | | - | • | 001,100 | | | [VQ37VHR] |
|---|-------------------|----------------------|------------|-----------------------------|-------------|-------------------------------------|-----------------------|
| Diagnosis | Proce | dure | | | | | INFOID:00000008156228 |
| 1.снеск д | ROUNE | | TION | | | | A |
| Turn ignit Check group | | | 195. Refer | to Ground | Inspectior | n in <u>GI-45, "Circuit Inspect</u> | ion". EC |
| Is the inspecti | | | | | | | |
| | O TO 2 epair o | r replace gi | ound coni | nection. | | | С |
| 2.CHECK AI | R FUEL | RATIO (A | /F) SENS | OR 1 POW | ER SUPP | LY CIRCUIT | |
| 2. Turn ignit | ion swit | ch ON. | | 1 harness o or 1 harness | | or and ground. | D |
| DTC | | A/F senso | r 1 | Ground | Voltag | | L |
| | Bank | Connector | Terminal | | νοιιαί | | _ |
| P0031, P0032 | 1 | F3 | 4 | Ground | Battery v | bltage | F |
| P0051, P0052 Is the inspecti | 2 | F20 | 4 | | | | |
| | O TO 4 | | | | | | G |
| • | о то з | | | | | | |
| 3.DETECT N | | | G PART | | | | Η |
| Check the follHarness cor | | s E3 E1 | | | | | |
| • IPDM E/R h | arness | | E7 | | | | I |
| 15 A fuse (N Harness for | | r short bety | veen A/F s | sensor 1 ar | nd fuse | | |
| | • | | | | | | J |
| | • | • | | connectors | | | |
| 4.CHECK A/ | | | TER OUT | PUT SIGN | AL CIRCU | ЛТ | K |
| Turn ignit Disconne | | ch OFF. harness c | onnector. | | | | I X |
| | | | | isor 1 harne | ess conne | ctor and ECM harness co | nnector. |
| | | A/F sensor | 1 | EC | N 4 | | L |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0031, P0032 | 1 | F3 | 3 | | 1 | | Μ |
| P0051, P0052 | 2 | F20 | 3 | F101 | 5 | Existed | |
| 4. Also chec | | | t to groun | d and short | t to power. | | Ν |
| Is the inspecti | | | | | | | |
| | O TO 5 epair o | | short to g | round or sh | nort to pow | ver in harness or connecto | ors. O |
| 5. CHECK A/ | | | | | | | |
| Refer to EC-1 | 74, "Co | mponent Ir | nspection" | | | | Р |
| Is the inspecti | | | | | | | I |
| | O TO 7 | | | | | | |
| 6.REPLACE | | | (A/F) SEN | ISOR 1 | | | |
| | | | | | Refer to E | M-34, "Exploded View". | |
| CAUTION | | - | . , | | | | |

Revision: 2012 July

CAUTION:

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

< DTC/CIRCUIT DIAGNOSIS >

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

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

>> Repair or replace.

Component Inspection

INFOID:000000008156229

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

1. Turn ignition switch OFF.

2. Disconnect A/F sensor 1 harness connector.

3. Check resistance between A/F sensor 1 terminals as follows.

| Terminal | Resistance (Ω) | | |
|------------|-------------------------------|--|--|
| 3 and 4 | 1.8 - 2.44 [at 25°C (77°F)] | | |
| 3 and 1, 2 | ∞ | | |
| 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 malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

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

>> INSPECTION END

P0037, P0038, P0057, P0058 HO2S2 HEATER

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed,

Input signal to ECM

Engine coolant temperature

Amount of intake air

Engine speed

< DTC/CIRCUIT DIAGNOSIS >

Sensor Camshaft position sensor (PHASE)

Crankshaft position sensor (POS)

Engine coolant temperature sensor

amount of intake air and engine coolant temperature.

Engine speed rpm

Keeping the engine speed between 3,500 and 4,000 rpm for 1

Below 3,600 rpm after the following conditions are met.

minute and at idle for 1 minute under no load

Mass air flow sensor

OPERATION

Above 3.600

DTC Logic

SYSTEM DESCRIPTION

P0037, P0038, P0057, P0058 HO2S2 HEATER

Description

· Engine: After warming up

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0037 | Heated oxygen sensor 2 heater (bank 1) control circuit low | The current amperage in the heated oxygen sen- sor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) Heated oxygen sensor 2 heater |
| P0038 | Heated oxygen sensor 2 heater (bank 1) control circuit high | The current amperage in the heated oxygen sen- sor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) Heated oxygen sensor 2 heater |
| P0057 | Heated oxygen sensor 2 heater (bank 2) control circuit low | The current amperage in the heated oxygen sen- sor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) Heated oxygen sensor 2 heater |
| P0058 | Heated oxygen sensor 2 heater (bank 2) control circuit high | The current amperage in the heated oxygen sen- sor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) Heated oxygen sensor 2 heater |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11 V and 16 V at idle.

EC-175

>> GO TO 2.

ECM function

Heated oxygen sensor 2

heater control

INFOID:000000008156230

Actuator

Heated oxygen sensor 2 heater

Heated oxygen sensor 2 heater

OFF

ON

Ρ

[VQ37VHR]

А

EC

D

Ε

F

Н

INFOID:000000008156231

P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st tip DTC detected?

- YES >> Go to EC-176, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156232

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in <u>GI-45. "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.

2. Turn ignition switch ON.

3. Check the voltage between HO2S2 harness connector and ground.

| DTC | | HO2S2 | | Ground | Voltage |
|--------------|------|-----------|----------|--------|-----------------|
| DIC | Bank | Connector | Terminal | Ground | |
| P0037, P0038 | 1 | F54 | 2 | Ground | Battery voltage |
| P0057, P0058 | 2 | F53 | 2 | Ground | Dattery voltage |

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E3, F1
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)

• Harness for open or short between heated oxygen sensor 2 and fuse

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

4.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

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

| DTC | HO2S2 | | | E | Continuity | | |
|--------------|-------|-----------|----------|-----------|------------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0037, P0038 | 1 | F54 | 3 | F101 | 17 | Existed | |
| P0057, P0058 | 2 | F53 | 3 | FIUI | 33 | Existed | |

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

Is the inspection result normal?

P0037, P0038, P0057, P0058 HO2S2 HEATER

| < DTC/CIRCUIT DIAGNO | ISIS > | [VQ37VHR] |
|-------------------------------------|---|-------------------------------------|
| YES >> GO TO 5. | | |
| _ ' ' | ircuit, short to ground or short to power in harness c | or connectors. A |
| 5.CHECK HEATED OXYO | GEN SENSOR 2 HEATER | |
| Refer to EC-177, "Compor | ient Inspection". | EC |
| Is the inspection result nor | mal? | |
| YES >> GO TO 7. | | |
| NO >> GO TO 6. | | С |
| 6. REPLACE HEATED O | CYGEN SENSOR 2 | |
| | ated oxygen sensor 2. Refer to EM-34. "Exploded \ | |
| • Discard any heated oxy | ygen sensor which has been dropped from a he | D eight of more than 0.5 m (19.7 |
| in) onto a hard surface | such as a concrete floor; use a new one. | - |
| | neated oxygen sensor, clean exhaust system the | |
| cant (commercial servi | ercial service tool (J-43897-18 or J-43897-12)] a ce tool) | nd approved Anti-seize Lubri- |
| | | |
| >> INSPECTION | END | F |
| 7. CHECK INTERMITTEN | TINCIDENT | |
| Refer to GI-42, "Intermitter | nt Incident" | G |
| | <u>remotione</u> . | - |
| >> INSPECTION | END | |
| _ | | Н |
| Component Inspection | | INFOID:00000008156233 |
| 1.CHECK HEATED OXY | GEN SENSOR 2 HEATER | 1 |
| 1. Turn ignition switch Of | | |
| 2. Disconnect heated oxy | /gen sensor 2 harness connector. | |
| 3. Check resistance betw | veen HO2S2 terminals as follows. | J |
| | | |
| Terminal | | K |
| 2 and 3 | 3.4 - 4.4 [at 25°C (77°F)] | K |
| 1 and 2, 3, 4 | (Continuity should not avist) | |
| 4 and 1, 2, 3 | (Continuity should not exist) | L |
| Is the inspection result nor | | |
| YES >> INSPECTION NO >> GO TO 2. | END | |
| 2.REPLACE HEATED O | | M |
| - | | |
| Replace malfunctioning he CAUTION: | ated oxygen sensor 2. Refer to EM-34, "Exploded \ | <u>/iew"</u> . N |
| | ygen sensor which has been dropped from a he | |
| in) onto a hard surface | such as a concrete floor; use a new one. | - |
| | oxygen sensor, clean exhaust system threads a | |
| (commercial service to | service tool (J-43897-18 or J-43897-12)] and a ol). | proved Anti-Seize Lubricant |
| • | - | |

>> INSPECTION END

Ρ

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

P0075, P0081 IVT CONTROL SOLENOID VALVE

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.

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|--|---|---|--|
| P0075 | Intake valve timing control so- lenoid valve (bank 1) circuit | An improper voltage is sent to the ECM | Harness or connectors (Intake valve timing control solenoid | |
| P0081 | Intake valve timing control so- lenoid valve (bank 2) circuit | through intake valve timing control solenoid valve. | valve circuit is open or shorted.)Intake valve timing control solenoid valve | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

- YES >> Go to EC-178. "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156240

$1. \mathsf{CHECK} \text{ intake valve timing control solenoid valve power supply circuit}$

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

| DTC | IVT | control solend | oid valve | Ground | Voltage | |
|-------|------|----------------|-----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Ground | voltage | |
| P0075 | 1 | F28 | 2 | Ground | Battery voltage | |
| P0081 | 2 | F29 | 2 | Ground | Dattery Voltage | |

INFOID:00000008156238

PBIB1842E

INFOID:000000008156239



Coil

Plunger

P0075, P0081 IVT CONTROL SOLENOID VALVE

| < DTC/CIRCI | | | | IVT CON | TROL S | OLENOID | VALVE [VQ37VHR] | |
|---------------------------------|-----------------|----------------------------|----------------------------|--------------|---------------------|-----------------|-------------------------------|----|
| Is the inspecti | | | - | | | | | |
| | O TO 3 | | | | | | | А |
| NO >> G 2.DETECT M | | | | | | | | |
| Check the foll | | | GFART | | | | | EC |
| Harness cor | nnector | | | | | | | |
| Harness for | open c | or short betw | ween intak | ke valve tim | ing control | solenoid valve | e and IPDM E/R | С |
| >> R | epair o | nen circuit | short to a | iround or st | nort to now | er in harness c | r connectors | |
| • | • | - | - | | • | | SIGNAL CIRCUIT FOR OPEN | D |
| AND SHORT | | | | | | | | D |
| 1. Turn ignit | | | | | | | | |
| | | l harness c wity betwee | | valve timino | n control so | lenoid valve h | arness connector and ECM har- | E |
| ness conr | | | | | <i>y</i> control of | | | |
| | n (T | | | | | | | F |
| DTC | Bank | control solene | Terminal | Connector | CM Terminal | Continuity | | |
| P0075 | 1 1 | F28 | 1 | Connector | 18 | | | G |
| P0081 | 2 | F29 | 1 | F101 | 29 | Existed | | |
| 4. Also chec | k harne | ess for sho | rt to groun | d and shor | t to power. | | | Н |
| Is the inspecti | | | - | | | | | |
| | O TO 4 | | ah aut ta a | | | | | |
| NO >> R 4.CHECK IN | • | • | - | | - | er in harness c | or connectors. | |
| Refer to EC-1 | | | | | | | | |
| Is the inspecti | | | ISPECTON | | | | | J |
| | O TO 5 | | | | | | | |
| | eplace iew". | malfunctio | ning intak | ke valve tin | ning contro | ol solenoid val | ve. Refer to EM-49, "Exploded | K |
| 5.CHECK IN | | | | | | | | |
| Refer to GI-42 | | | | | | | | |
| | <u>., inter</u> | | <u>ident</u> . | | | | | L |
| >> IN | SPEC | TION END | | | | | | |
| Componen | t Insp | ection | | | | | INFOID:00000008156241 | M |
| | - | | | | | | | |
| 1.CHECK IN | | | ING CON | TROL SOL | ENOID VA | LVE-I | | Ν |
| 1. Turn igniti 2. Disconne | | | ing contro | l solenoid v | valve harne | ess connector. | | |
| | | | | | | | inals as follows. | 0 |
| | | Duri | (0) | | | | | 0 |
| Terminals 1 and 2 | | | tance (Ω) at 20°C (68°F | -)1 | | | | _ |
| | | 1.0 - 1.1 [d | ∞ ∞ | 11 | | | | Ρ |
| 1 or 2 and gro | und | (Continuity s | should not e | kist) | | | | |
| Is the inspecti | | | | | | | | |
| | O TO 2 | | ning intel | re valve tin | ning contr | l colonoid vol | ve Refer to EM-49 "Evoloded | |

<u>View"</u>.

NO

>> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-49, "Exploded

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

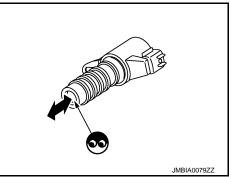
- 1. Remove intake valve timing control solenoid valve. Refer to EM-49. "Exploded View".
- Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.
 CAUTION:
 Do not apply 12 V DC continuously for 5 seconds or more.

Doing so may result in damage to the coil in intake valve timing control solenoid valve.

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

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-49</u>, "<u>Exploded</u> <u>View</u>".

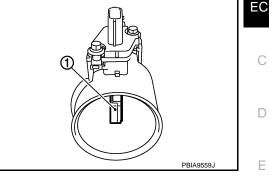


P0101, P010B MAF SENSOR

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 greater air flow, the greater the heat loss.

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



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DTC Logic

DTC DETECTION LOGIC **NOTE**:

If DTC P0101 or P010B is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0101 | MAF SEN/CIRCUIT-B1 (Mass air flow sensor (bank 1) circuit range/performance) | A high voltage from the sensor is sent to ECM under light load driving condition. A low voltage from the sensor is sent to | Harness or connectors (The sensor circuit is open or shorted.) Mass air flow sensor (bank 1) EVAP control system pressure sensor Intake air leaks Intake air temperature sensor |
| P010B | MAF SEN/CIRCUIT-B2 (Mass air flow sensor (bank 2) circuit range/performance) | ECM under heavy load driving condition. | Harness or connectors (The sensor circuit is open or shorted.) Mass air flow sensor (bank 2) EVAP control system pressure sensor Intake air leaks |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

2. Turn ignition switch ON.

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

If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch ON) instead of running engine at idle speed.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to normal operating temperature.
- 2. Drive the vehicle for at least 5 seconds under the following conditions: CAUTION:

Always drive at a safe speed.

| Selector lever | Suitable position |
|----------------|--------------------------|
| Vehicle speed | 40 km/h (25 MPH) or more |

NOTE:

- The gear must be fixed while driving the vehicle.
- Keep the accelerator pedal as steady as possible during cruising.
- 3. Check 1st trip DTC.

EC-181

2013 G Convertible

[VQ37VHR]

INFOID:000000008156234

А

INFOID:000000008156236

Is 1st trip DTC detected?

YES >> Proceed to EC-182, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK INTAKE SYSTEM

Check the following items to see the installation condition and the connection condition of the joint.

• Air duct

Vacuum hoses

• Intake air passage between air duct and intake manifold

Is the inspection result normal?

YES >> GO TO 2.

NO >> Reconnect or replace error-detected parts.

2. CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

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

| | | + | | | | | |
|-------|----------------|-----------------|----------|--------|-----------------|--|--|
| DTC | I | Mass air flow s | sensor | - | Voltage | | |
| | Bank Connector | | Terminal | | | | |
| P0101 | 1 | F31 | 5 | Ground | Batton voltago | | |
| P010B | 2 | F42 | 5 | Giouna | Battery voltage | | |
| | - | - | | | | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair or replace error-detected parts.

4.CHECK MASS AIR FLOW SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

| DTC | N | lass air flow s | ensor | EC | Continuity | |
|-------|-------------------|-----------------|----------|-----------|------------|------------|
| DIC | Bank Connector Te | | Terminal | Connector | Terminal | Continuity |
| P0101 | 1 | F31 | 4 | F102 | 68 | Existed |
| P010B | 2 | F42 | 4 | FIUZ | 94 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK MASS AIR FLOW SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between mass air flow sensor harness connector and ECM harness connector.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| DTO | Mass air flow sensor | | | | | | | | |
|--|--|---|--|--|---|---|---|----------------------|-----|
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | _ |
| P0101 | 1 | F31 | 3 | E 400 | 77 | F 1.0.1 | | | |
| P010B | 2 | F42 | 3 | F102 | 79 | Existed | | | |
| . Also ch | neck | harness for | short to | ground and | d short to | power. | | | |
| the inspe | ectior | n result norr | <u>mal?</u> | | | | | | |
| | | TO 6. | | | | | | | |
| | | pair or repla | | | | | | | |
| .CHECK | INT | AKE AIR TE | EMPERAT | URE SEN | SOR | | | | _ |
| | | - | | Refer to | EC-201, "(| Component In | <u>spection"</u> . | | |
| | | n result norr | <u>mal?</u> | | | | | | |
| - | | TO 7. | air flow | sonsor (w | ith intaka | air temperati | ure sensor) (bank 1 | 1) Refer to EM-27 | , |
| | | ploded Viev | | | | | are sensory (ballk | $\frac{1}{2}$ | - |
| CHECK | EVA | | OL SYSTE | EM PRESS | SURE SEI | NSOR | | | |
| | |), "Compon | | | | | | | _ |
| | | n result norr | | <u> </u> | | | | | |
| YES-1 (D | TC P | 0101 is det | ected)>> | | | | | | |
| | | 010B is det | | | | | | | |
| | | | | | | sor. Refer to <u>F</u> | L-14, "Exploded Vie | <u>ew"</u> . | |
| .CHECK | MAS | | | | | | | | |
| | | | | | | | | | |
| | s air | flow senso | r (bank 1) | | | Component Ir | spection". | | |
| the inspe | s air | flow senso n result norr | r (bank 1) <u>mal?</u> | . Refer to | EC-189, " | | | | _ |
| the inspe YES >> | s air ectior | flow senso n result norr eck intermit | r (bank 1) <u>mal?</u> tent Incide | . Refer to | <u>EC-189, "</u> to <u>GI-42, '</u> | "Intermittent Ir | cident". | | |
| the inspe YES >> NO >> | s air <u>ectior</u> > Che > Rep | flow senso n result norr eck intermite place mass | r (bank 1) <u>mal?</u> tent Incide air flow s | . Refer to ent. Refer ensor (ban | <u>EC-189, "</u> to <u>GI-42, '</u> ik 1). Refe | "Intermittent Ir | | | |
| the inspe YES >> NO >> CHECK | s air ectior Che Rep MAS | flow senso <u>n result norr</u> eck intermiti blace mass SS AIR FLC | r (bank 1) <u>mal?</u> tent Incide air flow s)W SENS |). Refer to ent. Refer ensor (ban OR (BANk | EC-189, " to <u>GI-42, '</u> lk 1). Refe (2) | "Intermittent Ir er to <u>EM-27, "E</u> | <u>cident"</u> Exploded View". | | _ |
| the inspe YES >> NO >> .CHECK | s air ectior Che Rep MAS | flow senso <u>n result norr</u> eck intermiti blace mass SS AIR FLC flow senso | r (bank 1) <u>mal?</u> tent Incide air flow s DW SENS r (bank 2) |). Refer to ent. Refer ensor (ban OR (BANk | EC-189, " to <u>GI-42, '</u> lk 1). Refe (2) | "Intermittent Ir | <u>cident"</u> Exploded View". | | _ |
| the inspe YES >> NO >> CHECK heck mas | s air ectior Che Rep MAS s air ectior | flow senso <u>n result norr</u> eck intermiti blace mass SS AIR FLC flow senso <u>n result norr</u> | r (bank 1) <u>mal?</u> tent Incide air flow s DW SENS r (bank 2) <u>mal?</u> |). Refer to ent. Refer ensor (ban OR (BANk). Refer to | EC-189, " to <u>GI-42, '</u> ik 1). Refe (2) EC-189, " | "Intermittent Ir er to <u>EM-27, "E</u> | icident". Exploded View". Ispection". | | _ |
| the inspe YES >> NO >> CHECK heck mas the inspe YES >> | s air ectior Che Rep MAS s air ectior | flow senso <u>n result norr</u> eck intermiti blace mass SS AIR FLC flow senso <u>n result norr</u> eck intermiti | r (bank 1) <u>mal?</u> tent Incide air flow s DW SENS DW SENS r (bank 2) <u>mal?</u> tent Incide |). Refer to ent. Refer ensor (ban OR (BANk). Refer to ent. Refer | EC-189, " to <u>GI-42, '</u> ik 1). Refe (2) EC-189, " to <u>GI-42, '</u> | "Intermittent Ir er to <u>EM-27, "E</u> Component Ir | icident". Exploded View". Ispection". | | |
| the insperiod to the inspectation to the inspe | s air ectior Che Rep MAS s air ectior Che Rep | flow senso <u>n result norr</u> eck intermiti blace mass SS AIR FLC flow senso <u>n result norr</u> eck intermiti | r (bank 1) <u>mal?</u> tent Incide air flow s DW SENS DW SENS r (bank 2) <u>mal?</u> tent Incide air flow s |). Refer to ent. Refer ensor (ban OR (BANk). Refer to ent. Refer | EC-189, " to <u>GI-42, '</u> ik 1). Refe (2) EC-189, " to <u>GI-42, '</u> | "Intermittent Ir er to <u>EM-27, "E</u> Component Ir | icident". Exploded View". spection". | INFOID:0000000081562 | |
| the inspe YES >> NO >> CHECK heck mas the inspe YES >> NO >> | s air ection Che Rep MAS s air ection Che Rep ent | flow senso <u>n result norr</u> eck intermitto blace mass SS AIR FLC flow senso <u>n result norr</u> eck intermitto blace mass Inspectio | r (bank 1) <u>mal?</u> tent Incide air flow s DW SENS DW SENS T (bank 2) mal? tent Incide air flow s |). Refer to ent. Refer ensor (ban OR (BANk). Refer to ent. Refer ensor (ban | EC-189, " to <u>GI-42, '</u> ik 1). Refe (2) EC-189, " to <u>GI-42, '</u> | "Intermittent Ir er to <u>EM-27, "E</u> Component Ir | icident". Exploded View". spection". | INFOID:0000000081562 | |
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| the inspe YES >> NO >> CHECK heck mas the inspe YES >> NO >> OMPONE .CHECK With CO Turn ig Reconr Start er | s air <u>ection</u> Che Rep MAS s air <u>ection</u> Che Rep ent MAS NSU nition nect ngine | flow senso <u>n result norr</u> eck intermitiolace mass SS AIR FLC flow senso <u>n result norr</u> eck intermitiolace mass Inspection SS AIR FLC JLT n switch OF all harness e and warm | r (bank 1) <u>mal?</u> tent Incide air flow s DW SENS r (bank 2) <u>mal?</u> tent Incide air flow s DN SENS F. connecto it up to n |). Refer to ent. Refer ensor (ban OR (BANK). Refer to ent. Refer ensor (ban OR-I | EC-189, " to <u>GI-42, '</u> ik 1). Refe (2) EC-189, " to <u>GI-42, '</u> ik 2). Refe ected. rating tem | "Intermittent In er to <u>EM-27, "E</u> <u>Component In</u> "Intermittent In er to <u>EM-27, "E</u> | icident". Exploded View". spection". | INFOID:0000000081562 | 37 |
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*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Without CONSULT

1. Turn ignition switch OFF.

< DTC/CIRCUIT DIAGNOSIS >

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

| | ECM | | | | |
|-----------|---------------------------------|----------|--|--------------------------|--|
| Connector | + – | | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 77 | 68 | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 1) signal] | 00 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4 | |
| F102 | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 79 | 94 | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4 | |

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.check for the cause of uneven air flow through mass air flow sensor

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

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.CHECK MASS AIR FLOW SENSOR-II

With CONSULT

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

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

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

Without CONSULT

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | ECM | | | | | |
|---|---|--|---|------------------|---------------------------|--|
| Connector + - | | Condition | | Voltage (V) | | |
| Connector | Terminal | Terminal | | | | |
| | | | Ignition switch ON (Engine | stopped.) | Approx. 0.4 | |
| | 77 [MAF sensor (bank 1) | 68 | Idle (Engine is warmed-up t ing temperature.) | o normal operat- | 0.7 - 1.2 | |
| | signal] | 00 | 2,500 rpm (Engine is warme operating temperature.) | ed-up to normal | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | | 0.7 - 1.2 to Approx. 2.4* | |
| FIUZ | | | Ignition switch ON (Engine | stopped.) | Approx. 0.4 | |
| | 79 [MAF sensor (bank 2) | 94 | Idle (Engine is warmed-up t ing temperature.) | o normal operat- | 0.7 - 1.2 | |
| - | signal] | 94 | 2,500 rpm (Engine is warme operating temperature.) | ed-up to normal | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | | 0.7 - 1.2 to Approx. 2.4* | |
| NO > CHECK With CC Turn ig Discor Start e Conne | gnition switch OFF. nnect mass air flow engine and warm it u ect CONSULT and s | SENSOR-III sensor harness c ip to normal oper elect "DATA MOI | | U U | | |
| Monitor it | em | Conditior | 1 | Indication | (V) | |
| | Ignition switch OI | N (Engine stopped.) | | Approx. 0 | .4 | |
| MAS A/F SI | E-B1 Idle (Engine is wa | armed-up to normal c | perating temperature.) | 0.7 - 1.2 | | |
| MAS A/F SI | E-B2 2,500 rpm (Engin | e is warmed-up to no | ormal operating temperature.) | 1.3 - 1.7 | | |
| | Idle to about 4,00 | | | | | |

Without CONSULT

1. Turn ignition switch OFF.

2. Disconnect mass air flow sensor harness connector and reconnect it again.

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

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< DTC/CIRCUIT DIAGNOSIS >

| | ECM | | | | |
|-----------|---------------------------------|----------|--|---------------------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 77 [MAF sensor (bank 1) | 68 | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | signal] | 00 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| F102 | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 79 | 94 | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace malfunctioning mass air flow sensor.

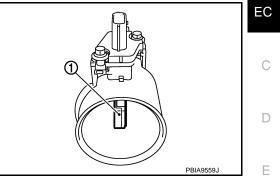
< DTC/CIRCUIT DIAGNOSIS >

P0102, P0103, P010C, P010D MAF SENSOR

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.



DTC Logic

DTC DETECTION LOGIC

Trouble diagnosis DTC No. DTC detecting condition Possible cause name Harness or connectors Mass air flow sensor An excessively low voltage from the sensor is sent (The sensor circuit is open or shorted.) P0102 (bank 1) circuit low to ECM. Intake air leaks input Mass air flow sensor Mass air flow sensor · Harness or connectors An excessively high voltage from the sensor is P0103 (bank 1) circuit high (The sensor circuit is open or shorted.) sent to ECM. input · Mass air flow sensor · Harness or connectors Mass air flow sensor An excessively low voltage from the sensor is sent (The sensor circuit is open or shorted.) P010C (bank 2) circuit low to ECM. · Intake air leaks input · Mass air flow sensor Mass air flow sensor · Harness or connectors An excessively high voltage from the sensor is P010D (bank 2) circuit high (The sensor circuit is open or shorted.) sent to ECM. Mass air flow sensor input

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

Which DTC is detected?

P0102, P010C>>GO TO 2. P0103, P010D>>GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102 AND P010C

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

Is DTC detected?

YES >> Go to <u>EC-188</u>, "Diagnosis Procedure".

NO >> INSPECTION END

3. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-I

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

2. Check DTC.

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[VQ37VHR]

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| < DTC/CIRCI | JIT DIA | | • | , 1 010 | C, P010D MA | | [VQ37VHR] |
|--|----------|--------------------|--------------|-----------------|-------------------|----------------------------|-----------------------|
| Is DTC detect | ed? | | | | | | |
| | | <u>-188, "Diag</u> | nosis Proc | edure". | | | |
| | 0 TO 4 | - | | | | | |
| | | | | | FOR DTC P010 | 3 AND P010D-II | |
| Start engination Check DT | | wait at leas | t 5 seconds | 5. | | | |
| Is DTC detect | | | | | | | |
| | | -188, "Diag | nosis Proc | <u>edure"</u> . | | | |
| NO >> IN Diagnosis l | | TON END | | | | | |
| | | | | | | | INFOID:00000000815624 |
| | | | | | | | |
| Confirm the de | | - | | | | | |
| Which DTC is P0102, P010 | | | | | | | |
| P0103, P010 | | | | | | | |
| 2.CHECK IN | TAKE S | SYSTEM | | | | | |
| Check the follo | owing fo | or connectio | on. | | | | |
| Air ductVacuum hos | 65 | | | | | | |
| Intake air pa | | between air | duct to inta | ake mani | fold | | |
| Is the inspection | | | | | | | |
| | O TO 3 | ct the parts. | | | | | |
| 3. CHECK GI | | • | | | | | |
| | | | | | | | |
| Turn igniti Check gro | | | 95. Refer to | Ground | Inspection in GI- | -45, "Circuit Inspection". | |
| Is the inspecti | on resu | lt normal? | | | | | |
| | 0 TO 4 | | | - 1 | | | |
| 4 | - | replace gro | | | u | | |
| 4.CHECK M | | | | | | | |
| Disconnee Turn igniti | | air flow (M. | AF) sensor | harness | connector. | | |
| | | | MAF senso | r harness | s connector and g | ground. | |
| | | | | | | | |
| | | MAF sens | | Ground | Voltage | | |
| DTC | Bank | Connector | Terminal | | | | |
| | | EG (| - | 1 | | | |
| DTC P0102, P0103 P010C, P010D | 1 | F31 F42 | 5 | Ground | Battery voltage | | |

DO102 DO102 DO10C DO10D MAE SENSOD

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

5. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors E106, M6

Harness connectors M116, F103

• Harness for open or short between mass air flow sensor and ECM

• Harness for open or short between mass air flow sensor and IPDM E/R

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

EC-188

< DTC/CIRCUIT DIAGNOSIS >

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

| | | MAF sense | or | EC | M | | | |
|--|---|--|---|--------------------------|------------------------|----------------|---|-------------|
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | С |
| P0102, P0103 | 1 | F31 | 4 | F 100 | 68 | F 1.4.1 | | - |
| P010C, P010D | 2 | F42 | 4 | F102 | 94 | Existed | | |
| 4. Also chec | k harne | ess for sho | rt to grour | nd and sho | rt to powe | er. | · | D |
| Is the inspection | on resu | <u>ult normal?</u> | | | | | | |
| | 0 TO 7 | | _ | | _ | | | Е |
| | • | • | | - | • | | ness or connectors. | |
| 1. CHECK MA | | | | | | | | |
| 1. Check the | contin | uity betwee | en MAF s | ensor harn | ess conn | ector and E | ECM harness connector. | F |
| | | | | | | 1 | | |
| DTC | | MAF sense | | EC | | Continuity | 1 | G |
| | Bank | Connector | Terminal | Connector | Terminal | | | 0 |
| P0102, P0103 | 1 | F31 | 3 | F102 | 77 | Existed | | |
| P010C, P010D 2. Also chec | 2 | F42 | 3 | | 79 | | | Н |
| $\frac{NO}{Refer to EC-18}$ Refer to EC-18 Is the inspection YES >> G | O TO 8 epair o ASS AI <u>39. "Co</u> on resu O TO 9 eplace FERMI | 3. pen circuit, R FLOW S <u>omponent li ult normal?</u>). malfunction TTENT INC | ENSOR hspection ning mass CIDENT | <u>"</u> | | | ness or connectors. 27, "Exploded View". | I J K |
| >> IN Componen | | TION END | | | | | INFOID:00000008156245 | M |
| | • | | _ | | | | | |
| 1. CHECK MA | ASS AI | R FLOW S | ENSOR-I | | | | | Ν |
| Start engine Connect Connect Connect | on swit It all ha ne and CONSU | tch OFF. arness conr warm it up JLT and sel SE-B1" an | to norma ect "DAT/ | al operating A MONITO | i temperat R" mode. | | ration | 0 P |
| | | | | | | | | |

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |



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EC

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

Without CONSULT

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

| | ECM | | | | |
|-----------|---------------------------------|----------|--|---------------------------|--|
| Connector | + | _ | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 77 | 68 | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 1) signal] | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| F102 | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 79 | | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

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

(B) With CONSULT

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

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

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

Without CONSULT

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

| | ECM | | | | | |
|---|---|--|--|---|-----------------------------|--|
| Connector | + | _ | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| | | | Ignition switch ON (Engine s | Ignition switch ON (Engine stopped.) | | |
| [M/ | 77 [MAF sensor (bank 1) | 68 | Idle (Engine is warmed-up to ing temperature.) | o normal operat- | 0.7 - 1.2 | |
| | signal] | 00 | 2,500 rpm (Engine is warme operating temperature.) | ed-up to normal | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | | 0.7 - 1.2 to Approx. 2.4 | |
| 1102 | | | Ignition switch ON (Engine | stopped.) | Approx. 0.4 | |
| | 79 [MAF sensor (bank 2) | 94 | Idle (Engine is warmed-up to ing temperature.) | o normal operat- | 0.7 - 1.2 | |
| | signal] | 94 | 2,500 rpm (Engine is warme operating temperature.) | ed-up to normal | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | | 0.7 - 1.2 to Approx. 2.4 | |
| With CO | MASS AIR FLOW NSULT nition switch OFF. | SENSOR-III | | | | |
| With COI . Turn igr . Disconr . Start en . Connec | NSULT nition switch OFF. nect mass air flow Igine and warm it u t CONSULT and s | sensor harness up to normal ope elect "DATA MO | connector and reconnect i rating temperature. NITOR" mode. E-B2", and check the indic | U U | | |
| With COI . Turn igr . Disconr . Start en . Connec | NSULT nition switch OFF. nect mass air flow gine and warm it u t CONSULT and s MAS A/F SE-B1" a | sensor harness up to normal ope elect "DATA MO | rating temperature. NITOR" mode. E-B2", and check the indic | U U | (V) | |
| With COI Turn igr Disconr Start en Connec Select " | NSULT nition switch OFF. nect mass air flow ogine and warm it u t CONSULT and s MAS A/F SE-B1" a | sensor harness up to normal ope elect "DATA MO and "MAS A/F Si | rating temperature. NITOR" mode. E-B2", and check the indic | cation. | | |
| With COI Turn igr Disconr Start en Connec Select " | NSULT nition switch OFF. nect mass air flow ogine and warm it u t CONSULT and s MAS A/F SE-B1" a n Ignition switch O | sensor harness up to normal ope elect "DATA MO and "MAS A/F SI Conditio N (Engine stopped.) | rating temperature. NITOR" mode. E-B2", and check the indic | cation. | 0.4 | |
| With COI Turn igr Disconr Start en Connec Select " | NSULT nition switch OFF. nect mass air flow igine and warm it u t CONSULT and s MAS A/F SE-B1" a n Ignition switch Ol B1 Idle (Engine is wa | sensor harness up to normal ope elect "DATA MO and "MAS A/F S Conditio N (Engine stopped.) armed-up to normal | rating temperature. NITOR" mode. E-B2", and check the indic | cation. Indication Approx. (| 2 | |
| With COI Turn igr Disconr Start en Connec Select " Monitor iter | NSULT nition switch OFF. nect mass air flow igine and warm it u t CONSULT and s MAS A/F SE-B1" a n Ignition switch Ol B1 Idle (Engine is wa | sensor harness up to normal ope elect "DATA MO and "MAS A/F S Conditio N (Engine stopped.) armed-up to normal e is warmed-up to n | rating temperature. NITOR" mode. E-B2", and check the indic n operating temperature.) | cation. Indication Approx. (0.7 - 1. | 2. 7 | |
| With COI Turn igr Disconr Start en Connec Select " Monitor iter IAS A/F SE- IAS A/F SE- | NSULT hition switch OFF. hect mass air flow ogine and warm it u t CONSULT and s MAS A/F SE-B1" a m Ignition switch OI B1 Idle (Engine is wa B2 2,500 rpm (Engir Idle to about 4,00 for linear voltage rise in | sensor harness up to normal ope elect "DATA MO and "MAS A/F SI Conditio V (Engine stopped.) armed-up to normal e is warmed-up to n | rating temperature. NITOR" mode. E-B2", and check the indic n operating temperature.) | Cation. Indication Approx. (0.7 - 1. 1.3 - 1. 0.7 - 1.2 to App | 2. 7 | |
| With COI Turn igr Disconr Start en Connec Select " Monitor iter MAS A/F SE- MAS A/F SE- *: Check f Without (Turn igr Disconr Start en | NSULT nition switch OFF. nect mass air flow Igine and warm it use t CONSULT and s MAS A/F SE-B1" a Ignition switch OI B1 Idle (Engine is ward) B2 2,500 rpm (Engine Idle to about 4,00 for linear voltage rise in CONSULT nition switch OFF. nect mass air flow Igine and warm it u | sensor harness up to normal ope elect "DATA MO and "MAS A/F SI Conditio N (Engine stopped.) armed-up to normal e is warmed-up to n 0 rpm n response to engine sensor harness up to normal ope | rating temperature. NITOR" mode. E-B2", and check the indic n operating temperature.) ormal operating temperature.) | cation. Indication Approx. (0.7 - 1. 1.3 - 1. 0.7 - 1.2 to App 0 rpm. it again. | 0.4 2 7 prox. 2.4* | |

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| ECM | | | | | |
|-----------|---------------------------------------|----------|--|---------------------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 77 | 68 | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 1) signal] | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F100 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| F102 | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 79 [MAF sensor (bank 2) signal] | | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 | |
| | | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace malfunctioning mass air flow sensor. Refer to EM-27, "Exploded View".

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

Description

The manifold absolute pressure (MAP) sensor is placed at intake manifold collector. It detects intake manifold pressure and sends the voltage signal to the ECM.

The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.

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DTC Logic

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INFOID:000000008156251

DTC DETECTION LOGIC

NOTE:

If DTC P010A is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-380, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|---|---|---|
| P010A | Manifold absolute pressure sensor circuit | An excessively low voltage from the sensor is sent to ECM. An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) Manifold absolute pressure (MAP) sensor | H |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2. **2.** PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-193, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK MAP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect manifold absolute pressure (MAP) sensor harness connector.

EC-193

INFOID:000000008156252



[VQ37VHR]

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

2. Turn ignition switch ON.

3. Check the voltage between MAP sensor harness connector and ground.

| MAP | sensor | Ground | Voltage (V) | |
|-----------|--------------------|--------|-------------|--|
| Connector | Connector Terminal | | voltage (v) | |
| F50 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK MAP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between MAP sensor harness connector and ECM harness connector.

| MAP sensor | | ECM | | Continuity | |
|--------------------|---|-----------|----------|------------|--|
| Connector Terminal | | Connector | Terminal | Continuity | |
| F50 | 3 | F102 | 96 | Existed | |

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

Is the inspection result normal?

YES >> GO TO 4.

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

 ${f 4.}$ CHECK MAP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| MAP | sensor | E | Continuity | |
|--------------------|--------|-----------|------------|---------|
| Connector Terminal | | Connector | | |
| F50 | 2 | F101 | 38 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK MAP SENSOR

Refer to EC-194, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace MAP sensor. Refer to EM-29, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK MAP SENSOR-I

- 1. Turn ignition switch OFF.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| ECM | | | | | |
|-----------|--------------------|------|----------|--|--|
| - | + | - | _ | | |
| Connector | Connector Terminal | | Terminal | | |
| F101 38 | | F102 | 96 | | |

NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.
- 5. Measure the atmospheric pressure.

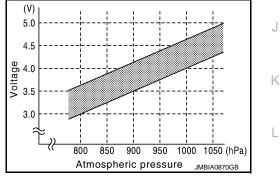
NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

| Compensated pressure (hPa) |
|----------------------------|
| 0 |
| -24 |
| -47 |
| -70 |
| -92 |
| -114 |
| -168 |
| -218 |
| |

Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure. 6.

| Atmospheric pressure (hPa) | Voltage (V) |
|----------------------------|-------------|
| 800 | 3.1 – 3.7 |
| 850 | 3.3 - 3.9 |
| 900 | 3.5 – 4.1 |
| 950 | 3.8 - 4.3 |
| 1000 | 4.0 - 4.6 |
| 1050 | 4.2 - 4.8 |
| | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace MAP sensor. Refer to EM-29, "Exploded View".

2.CHECK MAP SENSOR-II

- 1. Start engine and let it idle.
- 2. Check intake manifold vacuum.

Check the voltage between ECM harness connector terminals as per the following. 3.

| ECM | | | | | |
|-----------|--------------------|------|----------|--|--|
| | + | - | | | |
| Connector | Connector Terminal | | Terminal | | |
| F101 | 38 | F102 | 96 | | |

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

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| Intake manifold vacuum [kPa (mmHg)] | Voltage difference (V) |
|--|------------------------|
| -40 (-400) | 1.5 – 2.0 |
| -53.3 (-400) | 2.0 - 2.6 |
| -66.7 (-500) | 2.6 - 3.2 |
| -80 (-600) | 3.2 - 3.8 |

Is the inspection result normal?

YES >> INSPECTION END

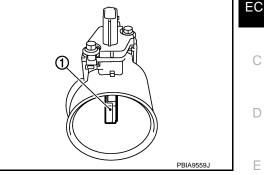
NO >> Replace MAP sensor. Refer to <u>EM-29, "Exploded View"</u>.

P0111 IAT SENSOR

Description

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

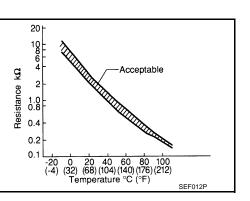
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



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DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause | K |
|----------------------------|--|--|--|---|
| P0111 | IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/perfor- mance] | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | Harness or connectors (High or low resistance in the IAT sensor circuit) IAT sensor | L |
| DTC CONFIRMATION PROCEDURE | | | | |

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-198, "Component Function Check"</u>.

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-198, "Diagnosis Procedure".

[VQ37VHR]

P0111 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

3. PRECONDITIONING

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

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

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place. NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours. CAUTION:

Never turn ignition switch ON during soaking. NOTE:

The vehicle must be cooled with the food open.

- 4. Start engine and let it idle for 5 minutes or more. CAUTION:
 - Never turn ignition switch OFF during idling.
- 5. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> Proceed to EC-198, "Diagnosis Procedure".
- NO >> INSPECTION END

Component Function Check

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect mass air flow sensor (bank 1) harness connector.
- 3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

| Terminals | Condition | | Resistance (k Ω) |
|-----------|-----------------------|---------|--------------------------|
| 1 and 2 | Temperature [°C (°F)] | 25 (77) | 1.800 – 2.200 |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-198, "Diagnosis Procedure".

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-198. "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to <u>EC-199, "Component Inspection"</u>. Is the inspection result normal?

YES >> GO TO 2.

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P0111 IAT SENSOR

| < DTC/CIRCUIT | T DIAGNOSIS > | | | | [VQ37VHR] | |
|-------------------|---|--------------|--------------------|-----------------|-------------------------|----|
| | lace mass air flow se <u>bloded View"</u> . | nsor (with i | ntake air temperat | ure sensor) (ba | ink 1). Refer to EM-27. | А |
| 2.CHECK INTE | RMITTENT INCIDENT | - | | | | |
| Check intermitte | nt incident. Refer to GI | -42, "Interm | ittent Incident". | | | EC |
| >> INSI | PECTION END | | | | | |
| Component I | nspection | | | | INFOID:00000008156258 | С |
| 1.CHECK INTA | KE AIR TEMPERATU | RE (IAT) SE | NSOR | | | |
| 1. Turn ignition | 1. Turn ignition switch OFF. | | | | D | |
| | mass air flow sensor (b tance between mass a | | | s as follows. | | Е |
| Terminals | Condition | | Resistance (kΩ) | | | |
| 1 and 2 | Temperature [°C (°F)] | 25 (77) | 1.800 - 2.200 | | | _ |
| Is the inspection | result normal? | | | | | Г |

YES >> INSPECTION END

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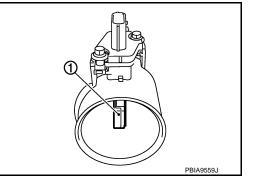
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27.</u> _G

P0112, P0113 IAT SENSOR

Description

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

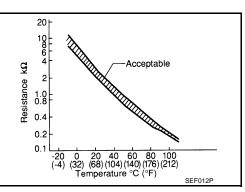
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



INFOID:000000008156260

DTC Logic

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

- YES >> Go to EC-201, "Diagnosis Procedure".
- NO >> INSPECTION END

P0112, P0113 IAT SENSOR

| < DTC/CIRCUIT DIAGNOSIS > | |
|---------------------------|--|
|---------------------------|--|

Diagnosis Procedure

[VQ37VHR]

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1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit 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

 Disconnect mass air flow (MAF) sensor (bank 1) (intake air temperature sensor is built-into) harness connector.

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

| MAF sensor (bank 1) | | Ground | Voltage (V) |
|---------------------|----------|--------|-------------|
| Connector | Terminal | Ciouna | voltage (v) |
| F31 | 2 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 3.

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

 ${f 3.}$ CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between mass air flow sensor (bank 1) harness connector and ECM harness connector.

| MAF sensor (bank 1) | | ECM | | Continuity |
|---------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F31 | 1 | F102 | 68 | Existed |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-201, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27</u>, N <u>"Exploded View"</u>.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.

3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

^{2.} Disconnect mass air flow sensor (bank 1) harness connector.

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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

Is the inspection result normal?

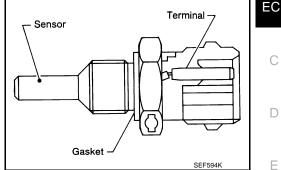
YES >> INSPECTION END

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27</u>, <u>"Exploded View"</u>.

P0116 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.



Acceptable

0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F)

20 10 6

Resistance k0 1.0 8.0 7 0.4 0.4

0.1

-20

<Reference data>

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

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

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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 <u>EC-206, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0116 | ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/performance] | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the ECT sensor is higher/ lower than that of other temperature sensors when the engine is started with its cold state. | Harness or connectors (High or low resistance in the ECT sensor circuit) ECT sensor |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-204, "Component Function Check"</u>. **NOTE:**

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

Is the inspection result normal?

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P0116 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END NO >> Proceed to <u>EC-205, "Diagnosis Procedure"</u>.

3.PRECONDITIONING

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

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

TEST CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place. **NOTE:**
- Cool the vehicle in an environment of ambient air temperature between $-10^{\circ}C$ (14°F) and 35°C (95°F). 3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION: Never turn ignition switch ON during soaking. NOTE:

The vehicle must be cooled with the food open.

4. Start engine and let it idle for 5 minutes or more. CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to EC-205, "Diagnosis Procedure".
- NO >> INSPECTION END

Component Function Check

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect ECT sensor harness connector.
- 3. Remove ECT sensor. Refer to CO-24. "Exploded View"
- 4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-205, "Diagnosis Procedure".

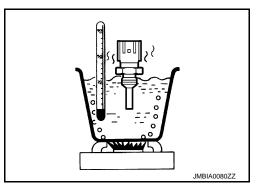
2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42. "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to <u>EC-205, "Diagnosis Procedure"</u>.



P0116 ECT SENSOR

| | | PUTTO | DECI SENSUR | (| |
|---|-------------------------|---------------|---------------------|--|----|
| < DTC/CIR | CUIT DIAGNOSIS > | | | [VQ37VHR] | |
| Diagnosis | s Procedure | | | INFOID:00000008156266 | 0 |
| Diagnosis Procedure INFORMATION DATA STREAM 1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR EC Check ECT sensor. Refer to EC-205, "Component Inspection". EC Is the inspection result normal? OK >> GO TO 2. NG >> Replace ECT sensor. Refer to CO-24, "Exploded View". C 2.CHECK INTERMITTENT INCIDENT C Check intermittent incident. Refer to GI-42, "Intermittent Incident". D >> INSPECTION END D Component Inspection MFORMORE SENSOR 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR E 1. Turn ignition switch OFF. F 2. Disconnect engine coolant temperature sensor harness connector. F | | | | | |
| - | | | | | |
| | | | | | EC |
| - | | Pefer to CO-2 | 24 "Exploded View" | | |
| • | • | - | | | С |
| | | | rmittent Incident". | | |
| | | <u> </u> | | | D |
| >> | INSPECTION END | | | | |
| Compone | ent Inspection | | | INFOID:00000008156267 | Е |
| 1. CHECK | ENGINE COOLANT TE | MPERATUR | E SENSOR | | |
| 1. Turn igr | nition switch OFF. | | | | F |
| 2. Disconr | nect engine coolant tem | | | | |
| | | | | | |
| | | | | | G |
| Terminals | Condition | | Resistance (kO) | - Standard Stand Standard Standard Stan | |
| | Condition | 20 (68) | | | Η |
| 1 and 2 | Temperature [°C (°F)] | | | | |
| | | 90 (194) | 0.236 - 0.260 | | I |
| - | | | | | |
| | | nt temperatu | re sensor Refer to | JMBIA0080ZZ | J |
| 110 22 | | | | , , | |
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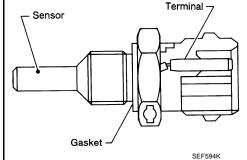
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P0117, P0118 ECT SENSOR

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 (k Ω) |
|---|--------------|--------------------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.10 - 2.90 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

20

10 6 4

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

INFOID:000000008156269

DTC DETECTION LOGIC

DTC Logic

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---------|--|---|---|
| P0117 | Engine coolant tem- perature sensor cir- cuit 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 tem- perature sensor cir- cuit 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 perform the following proceudre before conducting the next test.

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-207, "Diagnosis Procedure".
- NO >> INSPECTION END

P0117, P0118 ECT SENSOR

| FULLY, FULLY ECT SENSOR | | |
|--|------------------------|---|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| Diagnosis Procedure | INFOID:000000008156270 | |
| 1. CHECK GROUND CONNECTION | | 1 |
| 1. Turn ignition switch OFF. | <u>_</u> | Е |
| Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>. <u>Is the inspection result normal?</u> | | |
| 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. Turn ignition switch ON. | | |
| 3. Check the voltage between ECT sensor harness connector and ground. | | |
| ECT sensor | | |
| Connector Terminal Ground Voltage (V) | | |
| F17 1 Ground Approx. 5 | | |
| Is the inspection result normal? | | |
| YES >> GO TO 3. NO >> Repair or replace error-detected parts. | | (|
| 3. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT | | |
| 1. Turn ignition switch OFF. | | |
| 2. Disconnect ECM harness connector. | | |
| 3. Check the continuity between ECT sensor harness connector and ECM harness connector | | |
| ECT sensor ECM Continuity | | |
| Connector Terminal Connector Terminal | | |
| F17 2 F102 84 Existed | | |
| Also check harness for short to ground and short to power. <u>Is the inspection result normal?</u> | | |
| YES >> GO TO 4. | | |
| NO >> Repair open circuit, short to ground or short to power in harness or connectors. | | |
| 4.CHECK ENGINE COOLANT TEMPERATURE SENSOR | | |
| Refer to EC-207. "Component Inspection". | | |
| <u>Is the inspection result normal?</u> YES >> GO TO 5. | | |
| NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u> . | | |
| 5. CHECK INTERMITTENT INCIDENT | | |
| Refer to GI-42, "Intermittent Incident". | | |
| >> INSPECTION END | | (|
| Component Inspection | INFOID:000000008156271 | |
| | 130271 | |
| 1.CHECK ENGINE COOLANT TEMPERATURE SENSOR | | |
| Turn ignition switch OFF. Disconnect angles coolant temperature sensor barness connector. | | |

Disconnect engine coolant temperature sensor harness connector.
 Remove engine coolant temperature sensor. Refer to <u>CO-24</u>, "Exploded View".

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

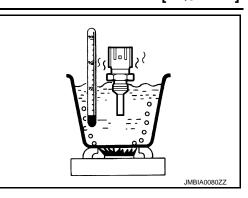
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (k Ω) | |
|-----------|-----------------------|--------------------------|-------------|
| | | 20 (68) | 2.10 - 2.90 |
| 1 and 2 | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | · · · · |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.



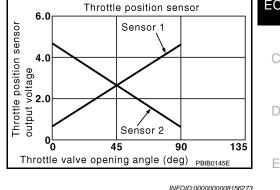
< DTC/CIRCUIT DIAGNOSIS >

P0122, P0123, P0227, P0228 TP SENSOR

Description

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

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



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0122, P0123, P0227 or P0228 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-380, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0122 | Throttle position sensor 2 (bank 1) circuit low in- put | An excessively low voltage from the TP sensor 2 is sent to ECM. | |
| P0123 | Throttle position sensor 2 (bank 1) circuit high in- put | An excessively high voltage from the TP sensor 2 is sent to ECM. | Harness or connectors (TP sensor 2 circuit is open or shorted.) |
| P0227 | Throttle position sensor 2 (bank 2) circuit low in- put | An excessively low voltage from the TP sensor 2 is sent to ECM. | Electric throttle control actuator (TP sensor 2) |
| P0228 | Throttle position sensor 2 (bank 2) circuit high in- put | An excessively high voltage from the TP sensor 2 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-210, "Diagnosis Procedure".
- NO >> INSPECTION END



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< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

INFOID:000000008156274

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.

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

| DTC | Electr | ic throttle cont | rol actuator | - Ground Voltage (V | | |
|--------------|--------|------------------|--------------|---------------------|-------------|--|
| DIC | Bank | Connector | Terminal | Giouna | voltage (v) | |
| P0122, P0123 | 1 | F6 | 6 | Ground | Approx. 5 | |
| P0227, P0228 | 2 | F27 | 1 | Ground | Арріол. 5 | |

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

| DTC | Electri | c throttle cont | rol actuator | EC | Continuity | |
|--------------|---------|-----------------|--------------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0122, P0123 | 1 | F6 | 3 | F101 | 40 | Existed |
| P0227, P0228 | 2 | F27 | 4 | FIUI | 48 | EXISTED |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | Electri | c throttle cont | rol actuator | EC | Continuity | |
|--------------|---------|-----------------|--------------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0122, P0123 | 1 | F6 | 5 | F101 | 34 | Existed |
| P0227, P0228 | 2 | F27 | 3 | FIUI | 35 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

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

 $\mathbf{5.}$ CHECK THROTTLE POSITION SENSOR

Refer to EC-211, "Component Inspection".

| < DTC/CI | RCUIT DIAGNOSIS > | | | 28 IP SENS | [VQ37VHR] | | | | | | | | | | | | | | | | | |
|---|---|--------------------|---------------------|-----------------------------------|----------------------------------|----------------|--|--|--|--|--|--|--|--|--|--|--|--|---|-----------------|----------------|--|
| Is the insp | ection result normal? | | | | | - | | | | | | | | | | | | | | | | |
| | > GO TO 7. > GO TO 6. | | | | | A | | | | | | | | | | | | | | | | |
| 6.REPLA | CE ELECTRIC THROT | TLE CONT | ROL ACTUATOR | | | | | | | | | | | | | | | | | | | |
| | ce malfunctioning electi EC-211, "Special Repa | | | efer to <u>EM-29, "</u> | Exploded View". | EC | | | | | | | | | | | | | | | | |
| | > INSPECTION END (INTERMITTENT INC) | DENT | | | | С | | | | | | | | | | | | | | | | |
| | il-42, "Intermittent Incide | | | | | D | | | | | | | | | | | | | | | | |
| > | > INSPECTION END | | | | | E | | | | | | | | | | | | | | | | |
| Compor | nent Inspection | | | | INFOID:0000000815627 | | | | | | | | | | | | | | | | | |
| 1. CHECK | K THROTTLE POSITIO | N SENSOR | | | | F | | | | | | | | | | | | | | | | |
| | gnition switch OFF. | | | | | - F | | | | | | | | | | | | | | | | |
| Record Performance | nect all harness conne m <u>EC-19, "THROTTLE</u> | | | LEARNING : S | pecial Repair Requirement". | G | | | | | | | | | | | | | | | | |
| | gnition switch ON. elector lever to D (A/T) o | or 1st (M/T) r | position. | | | | | | | | | | | | | | | | | | | |
| | the voltage between E | CM harness | connector termin | nals under the f | ollowing conditions. | F | | | | | | | | | | | | | | | | |
| | ECM | | | | | | | | | | | | | | | | | | | | | |
| Connector | + | _ | Condition | | Voltage (V) | | | | | | | | | | | | | | | | | |
| Connector | Terminal | Terminal | | | | | | | | | | | | | | | | | | | | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | Fully released | More than 0.36 | 1 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | - | Fully depressed | Less than 4.75 | |
| | 31 [TP sensor 1 (bank 2)] | 48 | | Fully released | More than 0.36 | | | | | | | | | | | | | | | | | |
| F101 | | | Accelerator pedal | Fully depressed | Less than 4.75 | k | | | | | | | | | | | | | | | | |
| | 34 [TP sensor 2 (bank 1)] | 40 | | Fully released | Less than 4.75 More than 0.36 | | | | | | | | | | | | | | | | | |
| | | | - | Fully depressed Fully released | Less than 4.75 | L | | | | | | | | | | | | | | | | |
| | 35 [TP sensor 2 (bank 2)] | 48 | | Fully depressed | More than 0.36 | | | | | | | | | | | | | | | | | |
| Is the insp | ection result normal? | | | r dify depressed | | _ | | | | | | | | | | | | | | | | |
| YES > | > INSPECTION END > GO TO 2. | | | | | N | | | | | | | | | | | | | | | | |
| 2.REPLA | CE ELECTRIC THROT | TLE CONT | ROL ACTUATOR | | | Ν | | | | | | | | | | | | | | | | |
| 1. Repla | ce malfunctioning election | ic throttle co | ontrol actuator. Re | | Exploded View". | - | | | | | | | | | | | | | | | | |
| 2. Go to | EC-211, "Special Repair | <u>r Requireme</u> | <u>ent</u> . | | | C | | | | | | | | | | | | | | | | |
| > | > INSPECTION END | | | | | | | | | | | | | | | | | | | | | |
| Special | Repair Requireme | nt | | | INFOID:0000000815627 | ⁶ F | | | | | | | | | | | | | | | | |
| | ORM THROTTLE VALVE | | | | | _ | | | | | | | | | | | | | | | | |
| Refer to <u>E</u> | <u>C-19, "THROTTLE VAL</u> | VE CLOSEI | D POSITION LEA | RNING : Speci | al Repair Requirement" | | | | | | | | | | | | | | | | | |
| > | > GO TO 2. | | | | | | | | | | | | | | | | | | | | | |
| 2.PERFC | ORM IDLE AIR VOLUM | E LEARNING | G | | | | | | | | | | | | | | | | | | | |

Revision: 2012 July

< DTC/CIRCUIT DIAGNOSIS >

Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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.

Sensor Gasket SEF594K

<Reference data>

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

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

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to <u>EC-206, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|--|---|---|---|
| P0125 | Insufficient engine cool- ant temperature for closed loop fuel control | Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. Engine coolant temperature is insufficient for closed loop fuel control. | Harness or connectors (High resistance in the circuit) Engine coolant temperature sensor Thermostat | L |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

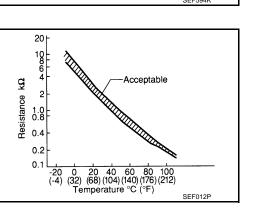
- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

- 1. Turn ignition switch ON.
- 2. Select "DATA MONITOR" mode with CONSULT.
- 3. Check that "COOLAN TEMP/S" is above $10^{\circ}C$ ($50^{\circ}F$).
- Is the temperature above 10°C (50°F)?

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3. PERFORM DTC CONFIRMATION PROCEDURE

Start engine and run it for 65 minutes at idle speed. If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK. CAUTION:

- Be careful not to overheat engine.
- 2. Check 1st trip DTC.

YES

NO

Is 1st trip DTC detected?

< DTC/CIRCUIT DIAGNOSIS >

>> GO TO 3.

>> INSPECTION END

YES >> <u>EC-214</u>, "<u>Diagnosis Procedure</u>" NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-214, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.

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 <u>CO-22, "Removal and Installation"</u>.

4.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.

- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.

INFOID:000000008156280

P0125 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

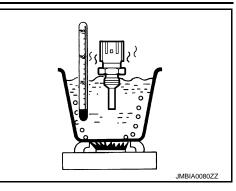
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.



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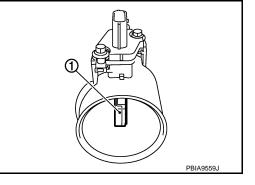
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P0127 IAT SENSOR

Description

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

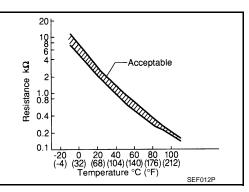
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<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 |

*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



INFOID:000000008156282

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 perform the following procedure before conducting the next test.

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Wait until engine coolant temperature is less than 90°C (194°F)
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch OFF and cool down engine.

P0127 IAT SENSOR

| < DTC/CIRC | UIT DIAGNOSIS > | | | | [VQ37VHR] |
|--|---|--------------|--------------------|---|--------------------------|
| | e following steps bef tion switch ON. | ore engin | e coolant tempera | ature is above 90°C (194°F). | |
| Select "E Start eng Hold veh | DATA MONITOR" mo jine. icle speed at more t | | | 100 consecutive seconds. | |
| | N: drive vehicle at a s st trip DTC. | afe spee | d. | | |
| | <u>C detected?</u> Go to <u>EC-217, "Diag</u> NSPECTION END | nosis Pro | cedure". | | |
| | Procedure | | | | INFOID:000000008156283 |
| | ROUND CONNECT | ION | | | |
| | tion switch OFF. | 95. Refer | to Ground Inspec | tion in <u>GI-45, "Circuit Inspection</u> | ". |
| s the inspect | tion result normal? | | | <u> </u> | - |
| NO >> F | GO TO 2. Repair or replace gro NTAKE AIR TEMPEI | | | | |
| | 217, "Component In | spection". | | | |
| YES >> 0 NO >> F | Exploded View" | | r (with intake air | temperature sensor) (bank 1) | . Refer to <u>EM-27,</u> |
| | NTERMITTENT INC 2, "Intermittent Incid | | | | |
| (elei lo <u>61-4</u> | | <u>ent</u> . | | | |
| | NSPECTION END | | | | |
| | nt Inspection | | | | INFOID:000000008156284 |
| | | RATURE | SENSOR | | |
| 2. Disconne | tion switch OFF. ect mass air flow ser esistance between m | | | ector.) terminals as follows. | |
| Terminals | Condition | | Resistance (kΩ) | | |
| 1 and 2 | Temperature [°C (°F)] | 25 (77) | 1.800 - 2.200 | - | |
| YES >> I NO >> F | tion result normal? NSPECTION END Replace mass air fle Exploded View". | ow sensc | r (with intake air | temperature sensor) (bank 1) | . Refer to <u>EM-27,</u> |
| | | | | | |

P0128 THERMOSTAT FUNCTION

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305 or P0306, first perform the trouble diagnosis for P0300, P0301, P0302, P0303, P0304, P0305, P0306. Refer to <u>EC-284, "DTC Logic"</u>.

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

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

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|---|
| P0128 | Thermostat function | The engine coolant temperature does not reach to specified temperature even though the engine has run long enough. | Thermostat Leakage from sealing portion of thermostat Engine coolant temperature sensor |

DTC CONFIRMATION PROCEDURE **NOTE**:

Never refuel before and during the following procedure.

1.PRECONDITIONING-I

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

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

>> GO TO 2.

2.PRECONDITIONING-II

() With CONSULT

- 1. Turn ignition switch ON.
- 2. Check the following conditions:

| Ambient temperature | –10°C (14°F) or more |
|---------------------|----------------------|
| A/C switch | OFF |
| Blower fan switch | OFF |

- 3. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
- 4. Check the following conditions:

| COOLAN TEMP/S | –10°C – 52°C (14 – 126°F) |
|---------------|---------------------------|
| | |

Is the condition satisfied?

YES >> GO TO 3.

NO >> 1. Satisfy the condition.

2. GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

(I) With CONSULT

- 1. Start engine.
- 2. Drive the vehicle until the following condition is satisfied.

CAUTION:

Always drive vehicle at safe speed.

STEP 1

Drive the vehicle under the conditions instructed below until the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" becomes at least 25°C (45°F).



P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| COOLAN TEMP/S | 71°C (159°F) or less | |
|---|---|----|
| FUEL T/TMP SE | Less than the value calculated by sub- tracting 25°C (45°F) from "COOLAN TEMP/S".* | E |
| *: Example | | |
| COOLAN TEMP/S | FUEL T/TMP SE | |
| 70°C (158°F) | 45°C (113°F) or less | |
| 65°C (149°F) | 40°C (104°F) or less | |
| 60°C (140°F) | 35°C (95°F) or less | |
| T/TMP SE" maintained at 25° NOTE: Keep the accelerator pedal as s STEP 3 | MPH) or more with the difference between "COOLAN TEMP/S" and "FUE C (45°F) or more. teady as possible during cruising. MPH) or more until "COOLAN TEMP/S" increases by 6°C (11°F). | L |
| NOTE: | | |
| • | teady as possible during cruising. | |
| s the condition satisfied? YES >> GO TO 4. | | |
| NO >> GO TO 1. | | |
| 1. PERFORM DTC CONFIRMAT | ION PROCEDURE-II | |
| With CONSULT | | - |
| Drive the vehicle until the follo | owing condition is satisfied. | |
| | | |
| COOLAN TEMP/S | 71°C (159°F) or more | |
| CAUTION: Always drive vehicle at safe Check 1st trip DTC. S 1st trip DTC detected? | e speed. | |
| YES >> Proceed to <u>EC-219, "</u> | Diagnosis Procedure" | |
| NO >> INSPECTION END | | |
| Diagnosis Procedure | INFOID:0000000081562 | 86 |
| | | |
| .CHECK ENGINE COOLANT T | EMPERATURE SENSOR | |
| efer to EC-219, "Component Ins | pection". | - |
| s the inspection result normal? | | |
| YES >> GO TO 2. | ent temperature concer Defer to CO 24. "Evolution View" | |
| | Int temperature sensor. Refer to <u>CO-24, "Exploded View"</u> . | |
| CHECK THERMOSTAT | | _ |
| Check thermostat. Refer to CO-22 | 2. "Inspection". | |
| s the inspection result normal? | | |
| YES >> INSPECTION END NO >> Replace thermostat. F | Refer to <u>CO-22, "Exploded View"</u> . | |
| Component Inspection | INFOID:0000000081562 | 87 |
| | | |
| .CHECK ENGINE COOLANT T | EMPERATURE SENSOR | _ |
| . Turn ignition switch OFF. | | |

2. Disconnect engine coolant temperature sensor harness connector.

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

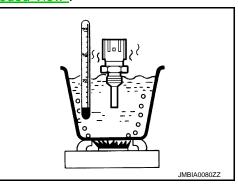
- 3. Remove engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.



[VQ37VHR]

P0130, P0150 A/F SENSOR 1

Description

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

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor

outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

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

DTC Logic

DTC DETECTION LOGIC

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

| DTC No. | Trouble diagnosis name | | DTC detecting condition | Possible Cause | K |
|---|-------------------------------|----|--|---|---|
| P0130 Air fuel ratio (A/F) sensor 1 (bank 1) circuit | | A) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | | |
| | (Dank T) circuit | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | Harness or connectors (The A/F sensor 1 circuit is open | |
| P0150 | Air fuel ratio (A/F) sensor 1 | | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | or shorted.) • A/F sensor 1 | M |
| (bank 2) circuit | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | | Ν |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

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PBIB3354F

INFOID:000000008156289

Holder

Zirconia element

Air fuel ratio

Protector

4500

4000

3500

€ 3000 2500 voltage 2000

Output 1500 1000

> 500 0 -10 12 14 16 18 20 22 24 26 28 30

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

Is 1st trip DTC detected?

- YES >> Go to EC-223, "Diagnosis Procedure".
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 7.

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

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "Ă/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
- Does the indication fluctuate around 2.2 V?

YES >> GO TO 4.

NO >> Go to EC-223, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

- Select "A/F SEN1 (B1) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT.
- 2. Touch "START".
- 3. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen.

| ENG SPEED | 1,100 - 3,200 rpm |
|----------------|--|
| VHCL SPEED SE | More than 64 km/h (40 mph) |
| B/FUEL SCHDL | 1.0 - 8.0 msec |
| Selector lever | D position (A/T) 5th position (M/T) |

If "TESTING" is not displayed after 20 seconds, retry from step 2. CAUTION:

Always drive vehicle at a safe speed.

Is "TESTING" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Check A/F sensor 1 function again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

Release accelerator pedal fully.

NOTE:

Never apply brake when releasing the accelerator pedal.

Which does "TESTING" change to?

COMPLETED>>GO TO 6.

OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-223, "Diagnosis Procedure".

7. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to EC-223, "Component Function Check".

NOTE:

Use component function check to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

P0130, P0150 A/F SENSOR 1

| P0130, P0150 A/F SENSOR 1 | | |
|--|------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| YES >> INSPECTION END NO >> Go to EC-223, "Diagnosis Procedure". | | Α |
| Component Function Check | INFOID:000000008156290 | |
| 1. PERFORM COMPONENT FUNCTION CHECK | | EC |
| 窗With GST | | |
| 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 point. Shift the selector lever to D position (A/T) or 5th position (M/T), then release the accele until the vehicle speed decreases to 50 km/h (30 MPH). | | С |
| CAUTION: Always drive vehicle at a safe speed. | | |
| NOTE: Never apply brake when releasing the accelerator pedal. 4. Repeat steps 2 and 3 for five times. 5. Stop the vehicle and turn ignition switch OFF. | | E |
| Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. Restart engine. | | F |
| Stop the vehicle and connect GST to the vehicle. Check 1st trip DTC. | | (|
| Is 1st trip DTC detected? YES >> Go to <u>EC-223, "Diagnosis Procedure"</u> . NO >> INSPECTION END | | ŀ |
| Diagnosis Procedure | INFOID:000000008156291 | |
| 1. CHECK GROUND CONNECTION | | |
| Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>. Is the inspection result normal? | | J |
| YES >> GO TO 2. NO >> Repair or replace ground connection. | | ŀ |
| 2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT | | |
| 1. Disconnect A/F sensor 1 harness connector. | | L |
| Turn ignition switch ON. Check the voltage between A/F sensor 1 harness connector and ground. | | |
| | | Ν |
| DTC A/F sensor 1 Ground Voltage | | |
| Bank Connector Terminal | | |
| P0130 1 F3 4 D0450 0 F00 Ground Battery voltage | | ľ |
| P0150 2 F20 4 | | |
| le the inequation regult normal? | | (|
| Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. | | |
| YES >> GO TO 4. NO >> GO TO 3. | | |
| YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. | | |
| YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART | | |

• Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

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

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

| DTC | A/F sensor 1 | | | EC | Continuity | |
|-------|--------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0130 | 1 | F3 | 1 | F102 | 57 | Existed |
| F0130 | 1 | 15 | 2 | | 61 | |
| P0150 | 2 | 2 F20 | 1 | 1102 | 65 | EXISTED |
| FU130 | 50 2 F2 | | 2 | | 66 | |

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

| DTC | | A/F sensor | Ground | Continuity | | |
|-------|----------------|------------|----------|------------|-------------|--------|
| DIC | Bank Connector | | Terminal | | | Giouna |
| P0130 | 1 | F3 | 1 | | Not existed | |
| F0130 | 1 | 15 | 2 | Ground | | |
| P0150 | n | E20 | 1 | Giouna | NUL EXISIEU | |
| P0150 | 2 F20 - | | 2 | | | |

| DTC | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|----------|-------------|
| DIC | Bank | Connector | Terminal | Giouna | |
| P0130 | 1 | | 57 | - Ground | Not existed |
| P0130 | I | F102 | 61 | | |
| P0150 | 2 | F102 | 65 | | |
| PU150 | 2 | | 66 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to <u>EM-34. "Exploded View"</u>.

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

>> INSPECTION END

P0131, P0151 A/F SENSOR 1

Description

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

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor

outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

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

DTC Logic

DTC DETECTION LOGIC

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

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause | Κ |
|---------|---|--|--|---|
| P0131 | Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage | • The A/F signal computed by ECM from the A/ | Harness or connectors (The A/F sensor 1 circuit is open or | |
| P0151 | Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage | F sensor 1 signal is constantly approx. 0 V. | shorted.) • A/F sensor 1 | L |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

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

- Start engine and warm it up to normal operating temperature. 1.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT. 2.
- Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication. 3.

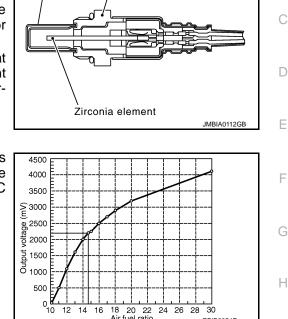
Is the indication constantly approx. 0 V?

EC-225

INFOID:000000008156292



EC



Air fuel ratio

Holder

Protector

12 14 16 18 20 22 24 26 28 30

INFOID:000000008156293

PBIB3354E

Ν

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P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

YES >> Go to EC-226, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Restart engine.
- 5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine. CAUTION:

Always drive vehicle at a safe speed.

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

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

NOTE:

• Keep the accelerator pedal as steady as possible during cruising.

• If this procedure is not completed within 1 minute after restarting engine at step 4, return to step

1.

7. Check 1st trip DTC.

Is 1st trip DTC detected?

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

Diagnosis Procedure

INFOID:000000008156294

[VQ37VHR]

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

| DTC | | A/F senso | 1 | Ground | Voltage | |
|-------|------|-----------|----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Ciouna | voltage | |
| P0130 | 1 | F3 | 4 | Ground | Battery voltage | |
| P0150 | 2 | F20 | 4 | Ground | Ballery vollage | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E3, F1

• IPDM E/R harness connector E7

15 A fuse (No. 46)

• Harness for open or short between A/F sensor 1 and fuse

P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

>> Repair or replace harness or connectors.

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

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

| | DTC | A/F sensor 1 | | | EC | Continuity | | |
|---|-------|--------------|-----------|----------|-----------|------------|------------|--|
| | DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| - | P0130 | 1 | 1 F3 | 1 | F102 | 57 | | |
| | F0130 | P0130 I | | 2 | | 61 | Existed | |
| - | D0150 | 2 | F20 | 1 | 1102 | 65 | | |
| | P0150 | 2 F20 | F20 | 20 2 | | 66 | | |

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

| DTC | | A/F sensor | Ground | Continuity | |
|-------|-------------------------|------------|--------|------------|-------------|
| DIC | Bank Connector Terminal | | Giouna | Continuity | |
| P0130 | 1 | F3 | 1 | | Not existed |
| F0130 | I | ГJ | 2 | Ground | |
| P0150 | 2 | F20 | 1 | Ground | |
| P0150 | 2 | F20 | 2 | | |

| DTC | ECM | | | Ground | Continuity |
|--------|------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Giouna | Continuity |
| P0130 | 1 | | 57 | Ground | Not existed |
| F 0130 | 1 | F102 | 61 | | |
| P0150 | 2 | FIUZ | 65 | Giouna | |
| P0150 | 2 | | 66 | 1 | |

5. Also check harness for short to power.

| <u>Is the ir</u> | nspection result normal? | | | | | |
|------------------|---|--|--|--|--|--|
| YES | >> GO TO 5. | | | | | |
| NO | >> Repair open circuit, short to ground or short to power in harness or connectors. | | | | | |
| 5 | | | | | | |

5. CHECK INTERMITTENT INCIDENT

Perform <u>GI-42, "Intermittent Incident"</u>. <u>Is the inspection result normal?</u> YES >> GO TO 6.

NO >> Repair or replace.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to <u>EM-34, "Exploded View"</u>. CAUTION:

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

>> INSPECTION END

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P0132, P0152 A/F SENSOR 1

Description

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

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

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

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

DTC Logic

DTC DETECTION LOGIC

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

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause |
|---------|--|---|--|
| P0132 | Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage | • The A/F signal computed by ECM from the A/F | Harness or connectors (The A/F sensor 1 circuit is open or |
| P0152 | Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage | sensor 1 signal is constantly approx. 5 V. | shorted.) • A/F sensor 1 |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

TESTING CONDITION:

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

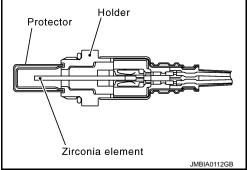
EC-228

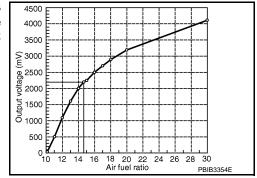
>> GO TO 2.

2. CHECK A/F SENSOR FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 5V?





INFOID:000000008156296

INFOID:000000008156295

| < DTC/CI | RCUIT | DIAGNOS | | 32, P0 | 152 A/F SE | NSOR 1 | [VQ37VHR] | |
|------------------------|--------------------|--|----------------|-----------|------------------------------------|-----------------------------|------------------------------|----|
| NO > | > GO T | | - | | | | | А |
| 3.PERFC | ORM D | IC CONFIR | MATION P | ROCED | URE | | | |
| 2. Turn i 3. Turn i | gnition gnition | switch OFF switch ON. switch OFF | | | | | | EC |
| 5. Drive CAUT | ION: | | | | 0 km/h (25 MPH | I) within 20 second | ds after restarting engine. | С |
| | | | | | 0 consecutive s | econds. | | D |
| ENG SPEE | D | | 1,000 - 3,200 | rom | | | | |
| VHCL SPE | | | More than 40 | - | mph) | | | Е |
| B/FUEL SC | HDL | | 1.5 - 9.0 mse | | . , | | | |
| Selector le | ver | | Suitable posit | tion | | | | |
| NOTE | | | | | | | | F |
| • If th 1. | | edure is n | | | s possible duri n 1 minute afte | | ne at step 4, return to step | G |
| Is 1st trip | | | | | | | | |
| YES > | > Go to | D <u>EC-229, "I</u> ECTION EI | | Procedur | <u>e"</u> . | | | Η |
| Diagnos | is Pro | ocedure | | | | | INFOID:00000008156297 | I |
| 1.снеси | (GROI | JND CONN | ECTION | | | | | 1 |
| | • | switch OFF | | | | | | J |
| | - | | | er to Gro | ound Inspection | in <u>GI-45, "Circuit I</u> | nspection". | |
| | | result norma | <u>al?</u> | | | | | |
| | > GO 1 > Repa | oz. air or replace | e around co | onnectio | า. | | | Κ |
| • | | | • | | POWER SUPPL | Y CIRCUIT | | |
| | | /F sensor 1 | | | | | | L |
| | | switch ON. | | onneotor | • | | | |
| 3. Check | c the vo | ltage betwe | en A/F ser | nsor 1 ha | rness connecto | r and ground. | | |
| | | A/F sensor | • 1 | | | | | Μ |
| DTC | Bank | Connector | Terminal | Ground | Voltage | | | |
| P0130 | 1 | F3 | 4 | | | | | Ν |
| P0150 | 2 | F20 | 4 | Ground | Battery voltage | | | |
| Is the insp | ection | result norma | al? | 1 | 1 | | | 0 |
| | > GO 1 | | | | | | | |
| - | > GO 1 | | _ | | | | | _ |
| J.DETEC | T MAL | FUNCTION | IING PART | | | | | Ρ |
| Check the | | | | | | | | |
| | 00000 | otore E2 E4 | | | | | | |
| | | ctors E3, F1 ess connec | | | | | | |

15 A fuse (No. 46)Harness for open or short between A/F sensor 1 and fuse

P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

>> Repair or replace harness or connectors.

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

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

| DTC | A/F sensor 1 | | | EC | Continuity | | |
|-------|--------------|-----------|----------|-----------|------------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0130 | 1 | F3 | 1 | | 57 | | |
| F0130 | 1 | гэ | 2 | F102 | 61 | Existed | |
| P0150 | 2 | E20 | 1 | FIUZ | 65 | Existed | |
| F0150 | 2 | F20 | F20 2 | | 66 | | |

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

| DTC | A/F sensor 1 | | | Ground | Continuity | |
|-------|-------------------------|-----|--------|--------|-------------|--|
| DIC | Bank Connector Terminal | | Giouna | | | |
| P0130 | 1 | F3 | 1 | | Not existed | |
| F0130 | I | 15 | 2 | Ground | | |
| P0150 | 2 | E20 | 1 | Giouna | | |
| P0150 | 2 F20 | | 2 | | | |

| DTC | ECM | | | Ground | Continuity |
|--------|------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Giouna | Continuity |
| P0130 | 1 | | 57 | Ground | Not existed |
| F 0130 | I | F102 | 61 | | |
| P0150 | 2 | F102 | 65 | Giouna | |
| F0150 | Z | | 66 | - | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to <u>EM-34, "Exploded View"</u>. **CAUTION:**

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

>> INSPECTION END

P0137, P0157 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic



The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.

| | | | | J |
|---------|---|--|---|---|
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
| P0137 | Heated oxygen sensor 2 (bank 1) circuit low volt- age | The maximum voltage from the sensor does not | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 | K |
| P0157 | Heated oxygen sensor 2 (bank 2) circuit low volt- age | reach the specified voltage. | Fuel pressureFuel injectorIntake air leaks | L |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

2.preconditioning

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

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

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

TESTING CONDITION:

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

>> GO TO 3.

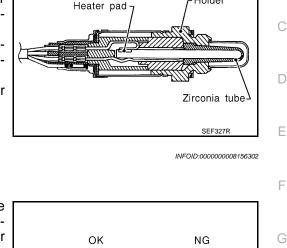
EC-231

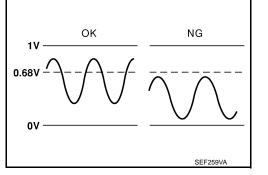
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3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F). 9. Open engine hood.
- 10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 11. Start engine and follow the instruction of CONSULT display. **NOTE:**

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-233, "Diagnosis Procedure".

CAN NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-232, "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-233, "Diagnosis Procedure".

Component Function Check

INFOID:000000008156303

1.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT

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

| | | ECM | | | |
|-------|-----------|----------|----------|--|---------------------------------------|
| DTC | Connector | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0137 | F102 | 76 | 84 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.68 V at |
| P0157 | 1102 | 80 | 04 | least 10 times | least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

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

| DTC | | ECM | | | |
|---|---|--|--|---|---|
| | Connector | + | _ | Condition | Voltage |
| | | Terminal | Terminal | | |
| P0137 P0157 | F102 | 76 80 | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.68 V at least once during this procedure. |
| the ins | spection re | sult norm | al? | | |
| YES | >> INSPE | | ND | | |
| | >> GO TC | | | | |
| | | | | TION CHECK-III | |
| heck th | ne voltage l | oetween E | ECM harr | ness connector terminals under the f | ollowing condition. |
| | | ECM | | | |
| DTC | Connector | + | - | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0137 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) in D po- | The voltage should be above 0.68 V at |
| P0157 | - | 80 | - | sition (A/T), 4th gear position (M/T) | least once during this procedure. |
| | spection re | | | | |
| YES NO | >> INSPE | | | s Procedure". | |
| | | | Diagnosia | <u>strocedure</u> . | |
| nagno | osis Proc | edure | | | INFOID:000000008156 |
| .CHE | | | IECTION | | |
| . Turr | n ignition sv | witch OFF | | | |
| | - | | | efer to Ground Inspection in <u>GI-45.</u> | "Circuit Inspection" |
| | spection re | sult norma | <u>al?</u> | | |
| | - | | | | |
| YES | >> GO TC | | e around | connection. | |
| YES NO | >> GO TC >> Repair | or replace | • | connection. LF-LEARNING VALUE | |
| YES NO .CLEA | >> GO TC >> Repair AR THE MI | or replace XTURE R | ATIO SE | LF-LEARNING VALUE | E RATIO SELE-LEARNING VALU |
| YES NO CLEA . Clea <u>CLE</u> | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci | or replace XTURE R ure ratio s ial Repair | ATIO SE self-learni <u>Requirer</u> | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>nent"</u> . | E RATIO SELF-LEARNING VALU |
| YES NO CLEA Clea <u>CLE</u> . Run | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci engine for | or replace XTURE R ure ratio s ial Repair at least 1 | ATIO SE self-learni <u>Requirer</u> 10 minute | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>nent"</u> . s at idle speed. | |
| YES NO CLEA Clea <u>CLE</u> Run the 1s | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci engine for at trip DTC | or replace XTURE R ure ratio s ial Repair at least 1 P0171 or | ATIO SE self-learni <u>Requirer</u> 10 minute P0174 de | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>ment"</u> . is at idle speed. etected? Is it difficult to start engine? | <u>.</u> |
| YES NO CLEA Clea <u>CLE</u> Run the 1s YES | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci engine for at trip DTC >> Perforr | or replace XTURE R ure ratio s <u>ial Repair</u> at least 1 <u>P0171 or</u> n trouble | ATIO SE self-learni <u>Requirer</u> 10 minute P0174 de | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>nent"</u> . s at idle speed. | <u>.</u> |
| YES NO CLEA Clea <u>CLE</u> Run the 1s YES NO | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci engine for at trip DTC >> Perforr >> GO TC | or replace XTURE R ure ratio s ial Repair at least 1 P0171 or n trouble) 3. | ATIO SE self-learni <u>Requirer</u> 10 minute <u>P0174 d</u> diagnosis | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>nent"</u> . s at idle speed. <u>etected? Is it difficult to start engine?</u> s for DTC P0171 or P0174. Refer to | <u>.</u> |
| YES NO CLEA Clea <u>CLE</u> Run the 1s YES NO CHEO | >> GO TC >> Repair AR THE MI AR THE MI AR : Speci engine for engine for trip DTC >> Perforr >> GO TC CK HO2S2 | or replace XTURE R ure ratio s ial Repair at least 1 P0171 or n trouble 3. GROUNI | ATIO SE self-learni <u>Requirer</u> 10 minute <u>P0174 de</u> diagnosis | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>ment"</u> . is at idle speed. etected? Is it difficult to start engine? | <u>.</u> |
| YES NO CLEA CLEA CLEA CLEA Run the 1s YES NO CHEO | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci engine for engine for st trip DTC >> Perforr >> GO TC CK HO2S2 | or replace XTURE R are ratio s al Repair at least 1 P0171 or n trouble 3. GROUNI witch OFF | ATIO SE self-learni Requirer 10 minute P0174 de diagnosis D CIRCU | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>nent"</u> . s at idle speed. <u>etected? Is it difficult to start engine?</u> s for DTC P0171 or P0174. Refer to IT FOR OPEN AND SHORT | <u>.</u> |
| YES NO CLEA CLEA CLEA Run the 1s YES NO CHEO . Turr Disc | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci- engine for engine for st trip DTC >> Perforr >> GO TC CK HO2S2 n ignition sw connect heat | or replace XTURE R ure ratio s al Repair at least 1 P0171 or n trouble 3. GROUNI witch OFF ated oxyg M harnes | ATIO SE self-learni <u>Requirer</u> 10 minute <u>P0174 de</u> diagnosis D CIRCU E en senso | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>ment"</u> . s at idle speed. <u>etected? Is it difficult to start engine?</u> s for DTC P0171 or P0174. Refer to IT FOR OPEN AND SHORT or 2 (HO2S2) harness connector. | EC-258, "DTC Logic". |
| CLEA Clea CLEA CLEA CLEA Run the 1s (ES VO .CHEO Turr Disc Disc | >> GO TC >> Repair AR THE MI ar the mixtu AR : Speci- engine for engine for st trip DTC >> Perforr >> GO TC CK HO2S2 n ignition sw connect heat | or replace XTURE R ure ratio s al Repair at least 1 P0171 or n trouble 3. GROUNI witch OFF ated oxyg M harnes | ATIO SE self-learni <u>Requirer</u> 10 minute <u>P0174 de</u> diagnosis D CIRCU E en senso | LF-LEARNING VALUE ng value. Refer to <u>EC-24, "MIXTUR</u> <u>ment"</u> . s at idle speed. <u>etected? Is it difficult to start engine?</u> s for DTC P0171 or P0174. Refer to IT FOR OPEN AND SHORT or 2 (HO2S2) harness connector. | EC-258, "DTC Logic". |

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0157 | 2 | F53 | 1 | 1102 | 04 | LAISteu |

P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F54 | 4 | F102 | 76 | Existed |
| P0157 | 2 | F53 | 4 | FIUZ | 80 | EXISTED |

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

| DTC | | HO2S2 | | Ground | Continuity | |
|-------|------|-----------|----------|---------|-------------|--|
| DIC | Bank | Connector | Terminal | Giouna | Continuity | |
| P0137 | 1 | F54 | 4 | Ground | Not existed | |
| P0157 | 2 | F53 | 4 | Gibuliu | NUL EXISTED | |

| DTC | | ECM | | Ground | Continuity | | |
|-------|------|-----------|----------|--------|-------------|--|--|
| DIC | Bank | Connector | Terminal | Cround | Continuity | | |
| P0137 | 1 | F102 | 76 | Ground | Not existed | | |
| P0157 | 2 | 1 102 | 80 | Gibunu | NUL EXISTED | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-235, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EM-34, "Exploded View"</u>.

CAUTION:

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

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

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1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

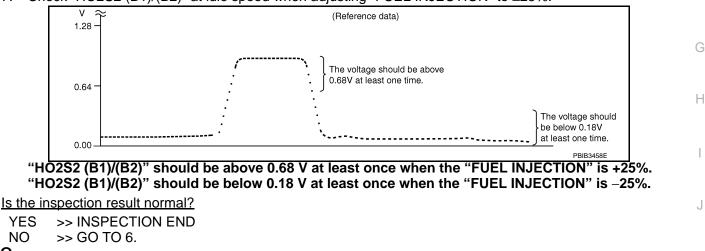
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
- 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

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

3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.

4. Let engine idle for 1 minute.

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

| | ECM | | | |
|-----------|---------------------------|----------|--|---|
| Connector | + | - | Condition | Voltage |
| CONNECTOR | Terminal | Terminal | | |
| F102 | 76 [HO2S2 (bank 1)] | 84 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.68 V at least once during this procedure. |
| FTUZ | 80 [HO2S2 (bank 2)] | - 04 | least 10 times | 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 terminals under the following condition.

P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| | ECM | | | |
|-----------|---------------------------|----------|---------------------------------------|---|
| Connector | + | _ | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| F102 | 76 [HO2S2 (bank 1)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.68 V at least once during this procedure. |
| FIUZ | 80 [HO2S2 (bank 2)] | 04 | | The voltage should be below 0.18 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

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

| | ECM | | | |
|-----------|---------------------------|----------|---|---|
| Connector | + | - | Condition | Voltage |
| CONNECTOR | Terminal | Terminal | | |
| F102 | 76 [HO2S2 (bank 1)] | 84 | Coasting from 80 km/h (50 MPH) in D po- | The voltage should be above 0.68 V at least once during this procedure. |
| F 102 | 80 [HO2S2 (bank 2)] | 04 | sition (A/T), 4th gear position (M/T) | The voltage should be below 0.18 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0138, P0158 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic

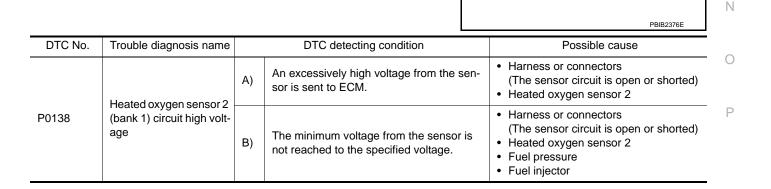


The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/ F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. **MALFUNCTION A**

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



Holder

Heater pad

OK

OK

1.2V

1V

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0.18V 0V А

EC

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F

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M

[VQ37VHR]





NG

PBIB1848F

NG

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| DTC No. Trouble diagnosis name | | DTC detecting condition | Possible cause | |
|--------------------------------|--|-------------------------|--|---|
| | | A) | An excessively high voltage from the sen- sor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 |
| P0158 | Heated oxygen sensor 2 (bank 2) circuit high volt- age | B) | The minimum voltage from the sensor is not reached to the specified voltage. | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 Fuel pressure Fuel injector |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

Is 1st trip DTC detected?

- YES >> Go to EC-240, "Diagnosis Procedure".
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 5.

 $\mathbf{3}.$ PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

NOTE:

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

- 1. Select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
- 9. Open engine hood.
- 10. Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 11. Start engine and follow the instruction of CONSULT display. **NOTE:**
- It will take at most 10 minutes until "COMPLETED" is displayed.
- 12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-240, "Diagnosis Procedure".

CON NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| CTC/C | IRCUIT D | IAGNOSI | S > | | [VQ3/VHR] | |
|---|---|---|---|---|---|---|
| . Perf | orm DTC co | onfirmatio | n proced | ure again. | | |
| | >> GO TO | 3. | | | | |
| D. PERF | | IPONENT | FUNCT | ION CHECK FOR MALFUNCTION | В | } |
| | component | function | check. Re | efer to EC-239, "Component Function | on Check". | |
| check, a | ponent fun 1st trip DT spection res | C might n | ot be con | | oxygen sensor 2 circuit. During this | |
| - | >> INSPE(| | | Procedure". | | |
| | onent Fur | | - | <u></u> | INF0ID:00000008156308 | |
| | | | | | 191 OL2.000000008130308 | |
| | | _ | FUNCT | ION CHECK-I | | |
| | | | | | | |
| 9 | ut CONSU | | up to the | normal operating temperature. | | |
| Í. Start 2. Turn | t engine and ignition sw | d warm it /itch OFF | and wait | normal operating temperature. at least 10 seconds. | for at least 1 minute under no load | |
| I. Start 2. Turn 3. Start | t engine and ignition sw | d warm it /itch OFF d keep the | and wait e engine s | at least 10 seconds. | n for at least 1 minute under no load. | |
| I. Start 2. Turn 3. Start 4. Let e | t engine an i ignition sw t engine an engine idle | d warm it vitch OFF d keep the for 1 minu | and wait e engine s ute. | at least 10 seconds. | | |
| I. Start 2. Turn 3. Start 4. Let e | t engine an i ignition sw t engine an engine idle | d warm it vitch OFF d keep the for 1 minu age betwee | and wait e engine s ute. | at least 10 seconds. speed between 3,500 and 4,000 rpm | | |
| Start Start Turn Start Start Let Chee | t engine an i ignition sw t engine an engine idle | d warm it vitch OFF d keep the for 1 minu age betwee ECM | and wait e engine s ute. | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t | he following condition. | |
| I. Start 2. Turn 3. Start 4. Let e | t engine an i ignition sw t engine an engine idle | d warm it vitch OFF d keep the for 1 minu age betwee | and wait e engine s ute. | at least 10 seconds. speed between 3,500 and 4,000 rpm | | |
| Start Start Turn Start Start Let Chee | t engine and i ignition switt engine idle ck the volta | d warm it vitch OFF d keep the for 1 minu age betwee ECM + | and wait e engine s ite. en ECM f - Terminal | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition | he following condition. Voltage | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC | t engine and i ignition switt t engine and engine idle ck the volta | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal | and wait e engine s ute. en ECM h | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t | he following condition. | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC P0138 P0158 | t engine and i ignition switt engine idle ck the volta | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 | and wait e engine s ite. en ECM f | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at | he following condition. Voltage The voltage should be below 0.18 V at | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC P0138 P0158 <u>s the ins</u> YES | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 sult norma | and wait e engine s ute. en ECM f Terminal 84 | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at | he following condition. Voltage The voltage should be below 0.18 V at | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC P0138 P0158 <u>s the ins</u> YES NO | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 sult norma CTION EN 2. | and wait e engine s ite. en ECM f Terminal 84 ND | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at least 10 times | he following condition. Voltage The voltage should be below 0.18 V at | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC DTC P0138 P0158 <u>s the ins</u> YES NO 2.PERF | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 Sult norma CTION EN 2. IPONENT | and wait e engine s ite. en ECM f - Terminal 84 ND T FUNCTI | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at least 10 times | he following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC DTC P0138 P0158 <u>s the ins</u> YES NO 2.PERF | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 Sult norma CTION EN 2. IPONENT | and wait e engine s ite. en ECM f - Terminal 84 ND T FUNCTI | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at least 10 times | he following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC DTC P0138 P0158 <u>s the ins</u> YES NO 2.PERF | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 Sult norma CTION EN 2. IPONENT | and wait e engine s ite. en ECM f - Terminal 84 ND T FUNCTI | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at least 10 times | he following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. | |
| I. Start 2. Turn 3. Start 4. Let e 5. Chee DTC DTC P0138 P0158 <u>s the ins</u> YES NO 2.PERF | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO CORM COM he voltage b | d warm it vitch OFF d keep the for 1 minu age betwee ECM + Terminal 76 80 Sult norma CTION EN 2. MPONENT petween E | and wait e engine s ite. en ECM f - Terminal 84 ND T FUNCTI | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under t Condition Revving up to 4,000 rpm under no load at least 10 times | he following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. | |
| I. Start 2. Turn 3. Start 4. Let e 5. Cher DTC P0138 P0158 S the ins YES NO 2.PERF Check th | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM | d warm it vitch OFF d keep the for 1 minu ge betwee ECM + Terminal 76 80 Sult norma CTION EN 2. MPONENT between E | and wait e engine s ite. en ECM f - Terminal 84 ND F FUNCTI | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under the Condition Revving up to 4,000 rpm under no load at least 10 times ION CHECK-II ess connector terminals under the form | he following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. Dllowing condition. | |
| I. Start 2. Turn 3. Start 4. Let e 5. Cher DTC P0138 P0158 S the ins YES NO 2.PERF Check th | t engine and i ignition switt engine idle ck the volta Connector F102 >> INSPEC >> GO TO CORM COM he voltage b | d warm it vitch OFF d keep the for 1 minu age between ECM + Terminal 76 80 Sult norma CTION EN 2. MPONENT petween E ECM + | and wait e engine s ite. en ECM f Terminal 84 al? ND F FUNCTI | at least 10 seconds. speed between 3,500 and 4,000 rpm harness connector terminals under the Condition Revving up to 4,000 rpm under no load at least 10 times ION CHECK-II ess connector terminals under the form | he following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. Dllowing condition. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

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

| DTC | Connector | + – | | Condition | Voltage | |
|-----------|-----------|----------|----------|---|---|--|
| Connector | | Terminal | Terminal | | | |
| P0138 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) in D po- | The voltage should be below 0.18 V at least once during this procedure. | |
| P0158 | 1102 | 80 | 04 | sition (A/T), 4th gear position (M/T) | | |

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- <u>Is the inspection result normal?</u> YES >> INSPECTION END
- NO >> Go to <u>EC-240, "Diagnosis Procedure"</u>.

Diagnosis Procedure

INFOID:000000008156309

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-237, "DTC Logic".

Which malfunction is detected?

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

2. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

$\mathbf{3.}$ CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0158 | 2 | F53 | 1 | F102 04 | | LAISteu |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | | HO2S2 | | EC | Continuity | | |
|-------|----------------|-------|----------|-----------|------------|------------|--|
| DIC | Bank Connector | | Terminal | Connector | Terminal | Continuity | |
| P0138 | 1 | F54 | 4 | F102 | 76 | Existed | |
| P0158 | 2 | F53 | 4 | 1102 | 80 | LAISIGU | |

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

| DTC | | HO2S2 | Ground | Continuity | |
|-------|------|-----------|----------|------------|-------------|
| | Bank | Connector | Terminal | Cibulia | Continuity |
| P0138 | 1 | F54 | 4 | Ground | Not existed |
| P0158 | 2 | F53 | 4 | Giouna | |

| DTC | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Ground | |
| P0138 | 1 | F102 | 76 | Ground | Not existed |
| P0158 | 2 | 1102 | 80 | | |

P0138, P0158 HO2S2

| Also check harness for short to power. <u>Is the inspection result normal?</u> YES >> GO TO 5. |
|---|
| |
| |
| |
| NO >> Repair open circuit, short to ground or short to power in harness or connectors. 5.CHECK H02S2 CONNECTOR FOR WATER |
| J. CHECK HU252 CONNECTOR FOR WATER |
| Check connectors for water. |
| Water should not exist. |
| Is the inspection result normal? |
| YES >> GO TO 6. |
| NO >> Repair or replace harness or connectors. 6.CHECK HEATED OXYGEN SENSOR 2 |
| |
| Refer to <u>EC-242, "Component Inspection"</u> . <u>Is the inspection result normal?</u> |
| |
| NO $>>$ GO TO 7. |
| 7.REPLACE HEATED OXYGEN SENSOR 2 |
| Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View". |
| CAUTION: • Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 |
| in) onto a hard surface such as a concrete floor; use a new one. |
| • Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor |
| Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubri- cant (commercial service tool). |
| |
| >> INSPECTION END |
| 8. CHECK INTERMITTENT INCIDENT |
| Refer to GI-42, "Intermittent Incident". |
| |
| >> INSECTION LIND |
| 9.CHECK GROUND CONNECTION |
| 1. Turn ignition switch OFF. |
| Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>. <u>Is the inspection result normal?</u> |
| YES >> GO TO 10. |
| NO >> Repair or replace ground connection. |
| 10. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE |
| 1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE |
| CLEAR : Special Repair Requirement". |
| Run engine for at least 10 minutes at idle speed. <u>Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?</u> |
| YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to <u>EC-262, "DTC Logic"</u> . |
| NO >> GO TO 11. |
| 11.CHECK H02S2 GROUND CIRCUIT FOR OPEN AND SHORT |
| Turn ignition switch OFF. Disconnect heated oxygen sensor 2 harness connector. |

3. Disconnect ECM harness connector.

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

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| DTC | | HO2S2 | | EC | Continuity | |
|-------|----------------|-------|----------|-----------|------------|------------|
| DIC | Bank Connector | | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0158 | 2 F53 | | 1 | 1102 | 04 | Existed |

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

Is the inspection result normal?

YES >> GO TO 12.

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

12. CHECK H02S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | | HO2S2 | | EC | Continuity | | |
|-------|---------|-----------|----------|-----------|------------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0138 | 1 | F54 | 4 | F102 | 76 | Existed | |
| P0158 | P0158 2 | | 4 | F102 | 80 | LAISICU | |

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

| DTC | HO2S2 | | | ECM | | Ground | Continuity |
|-------|-------|-----------|----------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Oround | Continuity |
| P0138 | 1 | F54 | 4 | F102 | 76 | Ground | Not existed |
| P0158 | 2 | F53 | 4 | 1 102 | 80 | Ground | NUL EXISIEU |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 13.

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

13.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-239, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 14.

14.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

INFOID:000000008156310

| ngine and wa | YGEN SEI | NSOR 2 | |
|---|--|---|--|
| GO TO 3. HEATED OX NSULT nition switch ngine and wa | | NSOR 2 | |
| NSULT Inition switch | | NSOR 2 | |
| nition switch | ON and se | | |
| | | lect "DATA MONITOR" mode with CC the normal operating temperature. | DNSULT. |
| ngine and ke gine idle for 1 "FUEL INJE ONSULT. | ep the engi I minute. CTION" in ' | ACTIVE TEST" mode, and select "H | om for at least 1 minute under no load. IO2S2 (B1)/(B2)" as the monitor item |
| |)/(B2)" at id | · · · · | CTION" to $\pm 25\%$. |
| 1.28 - | | The voltage should be above 0.68V at least one time. | |
| 0.00 | | · · · · · · · · · · · · · · · · · · · | The voltage should be below 0.18V at least one time. |
| 2 (B1)/(B2) <u>ection result r</u> INSPECTIC GO TO 6. | ' should be <u>normal?</u> DN END | e below 0.18 V at least once when th | |
| | KYGEN SEI | NSOR 2-1 | |
| ngine and wa nition switch ngine and ke gine idle for 1 the voltage k | OFF and we p the engined of the engined of the engined of the engine of the engine of the engine of the end of | vait at least 10 seconds. ne speed between 3,500 and 4,000 rp | |
| | _ | Condition | Voltage |
| Terminal | Terminal | Condition | volago |
| 76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)] | 84 | 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. |
| | "HO2S2 (B1 V 1.28 0.64 0.64 0.00 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 22 (B1)/(B2)' 23 (B1)/(B2)' 24 (B1)/(B2)' 25 (B1)/(B2)' 26 (B1)/(B2)' 26 (B1)/(B2)' 27 (B1)/(B2) | $ \begin{array}{c} "HO2S2 (B1)/(B2)" at id \\ V \\ 1.28 \\ 0.64 \\ 0.00 \\ \hline 0.00 \\ 0.00 \\ \hline 0.00 \\ \hline 0.00 \\ 0.00 \\ \hline 0.00 \\ $ | "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJE" V (Reference data) 1.28 (Reference data) 0.64 The voltage should be above 0.64 0.68V at least one time. 0.00 22 (B1)/(B2)" should be above 0.68 V at least once when the extreme time. 0.00 22 (B1)/(B2)" should be above 0.68 V at least once when the extreme time. 0.00 22 (B1)/(B2)" should be above 0.68 V at least once when the extreme time. 0.00 100 22 (B1)/(B2)" should be above 0.68 V at least once when the extreme time. 0.00 100 22 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least once when the extreme time. 20 (B1)/(B2)" should be below 0.18 V at least 10 seconds. 10 (B1) 84 ECM Condition terminal Terminal < |

4.CHECK HEATED OXYGEN SENSOR 2-II

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

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| | ECM | | | | |
|-------------|---------------------------|----------|---------------------------------------|--|--|
| Connector | + | _ | Condition | Voltage | |
| Connector - | Terminal | Terminal | | | |
| F102 - | 76 [HO2S2 (bank 1)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | 04 | | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

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

| ECM | | | | | |
|-----------|---------------------------|----|---|---|--|
| Connector | + – | | Condition | Voltage | |
| Connector | Terminal Terminal | | | | |
| F102 — | 76 [HO2S2 (bank 1)] | 84 | Coasting from 80 km/h (50 MPH) in D posi- | The voltage should be above 0.68 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | 04 | tion (A/T), 4th gear position (M/T) | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0139, P0159 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic



The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|--|---|--|
| P0139 | Heated oxygen sensor 2 (bank 1) circuit slow re- sponse | The switching time between rich and lean of a heated oxygen sensor 2 signal delays more | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 | |
| P0159 | Heated oxygen sensor 2 (bank 2) circuit slow re- sponse | than the specified time computed by ECM. | Fuel systemEVAP systemIntake air system | |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2. NO >> GO TO 7.

2. PRECONDITIONING

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

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

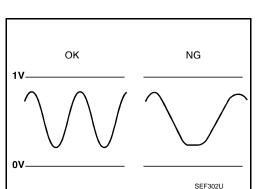
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

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

>> GO TO 3.

EC-245



Heater pad



Holder

SEF327R

INFOID:000000008156312

[VQ37VHR]

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EC

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3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- 9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed. CAUTION:

Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.

CAUTION:

- Enable the engine brake.
- Always drive carefully.
- Never apply brake when releasing the accelerator pedal.
- 11. Repeat step 9 and 10 at least 8 times.
- 12. Check the following item of "DATA MONITOR".

| | i. | | |
|-------|-------------------|--------|--|
| DTC | Data monitor item | Status | |
| P0139 | HO2 S2 DIAG1 (B1) | | |
| F0139 | HO2 S2 DIAG2 (B1) | CMPLT | |
| P0159 | HO2 S2 DIAG1 (B2) | GMFLI | |
| F0159 | HO2 S2 DIAG2 (B2) | | |

Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 6.

NO-1: "CMPLT" is not displayed on DIAG 1>>Perform DTC confirmation procedure again. NO-2: "CMPLT" is not displayed on DIAG 2>>GO TO 4.

4.PERFORM DTC WORK SUPPORT

- 1. Open engine hood.
- Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 3. Start engine and follow the instruction of CONSULT display. **NOTE:**

It will take at most 10 minutes until "COMPLETED" is displayed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 6.

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 3.

6.PERFORM SELF-DIAGNOSIS

With CONSULT

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to EC-248, "Diagnosis Procedure".

NO >> INSPECTION END

/.PERFORM COMPONENT FUNCTION CHECK

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Perform component function check. Refer to EC-247, "Component Function Check". NOTE: А 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? EC YES >> INSPECTION END NO >> Proceed to EC-248, "Diagnosis Procedure". Component Function Check INFOID:000000008156313 1.PERFORM COMPONENT FUNCTION CHECK-I D Without CONSULT Start engine and warm it up to the normal operating temperature. 1. 2. Turn ignition switch OFF and wait at least 10 seconds. E Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 3. 4. Let engine idle for 1 minute. Check the voltage between ECM harness connector terminals under the following condition. 5. F ECM DTC + Condition Voltage Connector Terminal Terminal P0139 76 Revving up to 4,000 rpm under no load at A change of voltage should be more than F102 84 least 10 times 0.24 V for 1 second during this procedure. P0159 80 Н Is the inspection result normal? >> INSPECTION END YES NO >> GO TO 2. 2.PERFORM COMPONENT FUNCTION CHECK-II Check the voltage between ECM harness connector terminals under the following condition. ECM DTC Condition + Voltage _ Κ Connector Terminal Terminal P0139 76 A change of voltage should be more than F102 84 Keeping engine at idle for 10 minutes L 0.24 V for 1 second during this procedure. P0159 80 Is the inspection result normal? YES >> INSPECTION END Μ NO >> GO TO 3. ${\it 3.}$ PERFORM COMPONENT FUNCTION CHECK-III Ν Check the voltage between ECM harness connector terminals under the following condition.

| | | | ECM | | | | |
|---|-------|-----------|----------|----------|---|--|---|
| | DTC | Connector | + | - | Condition | Voltage | 0 |
| | | Connector | Terminal | Terminal | | | |
| _ | P0139 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) in D po- | A change of voltage should be more than | Р |
| | P0159 | 1102 | 80 | 04 | sition (A/T), 4th gear position (M/T) | 0.24 V for 1 second during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-248, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

 Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement</u>".

2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-258, "DTC Logic"</u> or <u>EC-258, "DTC Logic"</u>.

NO >> GO TO 3.

 $\mathbf{3}$.check H02S2 ground circuit for open and short

1. Turn ignition switch OFF.

- 2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0139 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0159 | 2 | F53 | 1 | 1102 | 04 | LAISteu |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0139 | 1 | F54 | 4 | F102 | 76 | Existed |
| P0159 | 2 | F53 | 4 | FIUZ | 80 | Existed |

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

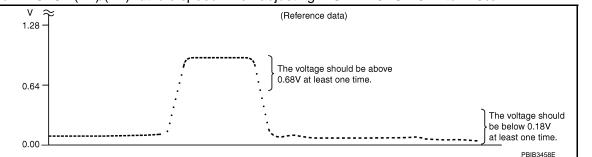
| DTC | | HO2S2 | | Ground | Continuity |
|-------|------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | | |
| P0139 | 1 | F54 | 4 | Ground | Not existed |
| P0159 | 2 | F53 | 4 | Cibulia | NUL EXISIEU |

< DTC/CIRCUIT DIAGNOSIS >

| | | ECM | | | | | А |
|-------------|-------------------------|-----------------------------|-------------|-------------|----------------------------|--|----|
| DTC | Bank | Connector | Terminal | Ground | Continuity | | |
| P0139 | 1 | | 76 | | | | |
| P0159 | 2 | F102 | 80 | Ground | Not existed | | EC |
| 3. Also c | heck h | arness for | short to po | ower. | l | | |
| Is the insp | | | nal? | | | | С |
| | > GO T > Repa | | cuit short | to around | or short to | oower in harness or connectors. | |
| 5.CHECK | | • | - | 0 | | | D |
| Refer to E | | | | | | | |
| Is the insp | | - | - | | | | Е |
| | > GO 1 > GO 1 | | | | | | |
| 6.REPLA | | | | | | | _ |
| | | | | | Refer to F | X-5, "Exploded View". | F |
| CAUTION | | • | | | | | |
| | | | | | has been d floor; use a | ropped from a height of more than 0.5 m (19.7 | G |
| Before i | nstalli | ng new he | eated oxy | gen sens | or, clean e | xhaust system threads using Oxygen Sensor | |
| | | r [comme cial servic | | ice tool (. | J-43897-18 | or J-43897-12)] and approved Anti-seize Lubri- | Н |
| cant (co | mmert | | e (001). | | | | |
| > | > INSP | ECTION E | ND | | | | 1 |
| 7.CHECK | | RMITTENT | INCIDEN | IT | | | |
| Refer to G | I-42, "I | ntermittent | Incident". | | | | |
| | | ECTION E | | | | | J |
| | - | | | | | | |
| Compon | entir | ispection | 1 | | | INFOID:000000008156315 | Κ |
| 1.INSPEC | CTION | START | | | | | |
| Do you ha | | | | | | | L |
| Do you ha | <u>ve COI</u> > GO T | | | | | | |
| | > GO 1 > GO 1 | | | | | | M |
| 2.CHECK | HEAT | ED OXYG | EN SENS | OR 2 | | | |
| (P)With CC | ONSUL | T | | | | | Ν |
| | | | | | | node with CONSULT. | |
| 3. Turn ig | gnition | switch OFI | and wait | at least 1 | perating ten 0 seconds. | | 0 |
| | | and keep th le for 1 mir | | speed bet | ween 3,500 | and 4,000 rpm for at least 1 minute under no load. | 0 |
| | "FUEL | | | CTIVE TES | ST" mode, a | nd select "HO2S2 (B1)/(B2)" as the monitor item | |
| with C | | | | | , | | |

< DTC/CIRCUIT DIAGNOSIS >





"HO2S2 (B1)/(B2)" should be above 0.68 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

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

| | ECM | | | |
|-----------|---------------------------|----------|---|--|
| Connector | + – | | Condition | Voltage |
| CONNECTOR | Terminal | Terminal | | |
| E102 | 76 [HO2S2 (bank 1)] | 94 | 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. |
| F102 | 80 [HO2S2 (bank 2)] | 84 | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

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

| | ECM | | Condition | Voltage |
|-----------|---------------------------|----------|---------------------------------------|---|
| Connector | + – | | | |
| | Terminal | Terminal | | |
| F102 - | 76 [HO2S2 (bank 1)] | 94 | Keeping angine at idle for 10 minutes | The voltage should be above 0.68 V at least once during this procedure. |
| | 80 [HO2S2 (bank 2)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | ECM | | | |
|-----------|--|------------|--|--|
| Connector | + | — | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| F102 | 76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)] | 84 | Coasting from 80 km/h (50 MPH) in D posi- tion (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. |
| | ection result i | | | |
| | > INSPECTIO > GO TO 6. | ON END | | |
| | CE HEATED | OXYGEN S | SENSOR 2 | |
| | | | gen sensor 2. Refer to EX-5, "Explod | ed View". |
| AUTION | : | - | | |
| in) onto | a hard surfa | ce such as | nsor which has been dropped from a concrete floor; use a new one. | - |
| Before i | nstalling ne | w heated o | oxygen sensor, clean exhaust syst ervice tool (J-43897-18 or J-43897-1 | |
| | mmercial se | | | |
| | | | | |
| | | | | |
| > | > INSPECTIO | ON END | | |
| > | > INSPECTIC | ON END | | |
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| > | > INSPECTIO | ON END | | |

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR

DTC Logic

INFOID:000000008497137

DTC DETECTION LOGIC

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

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause |
|---------|--|---|--|
| P014C | Air fuel ratio (A/F) sensor 1 (bank 1) | | |
| P014D | circuit slow response | | |
| P015A | Air fuel ratio (A/F) sensor 1 (bank 1) | • The response time of a Λ/E con | |
| P015B | circuit delayed response | The response time of a A/F sensor 1 signal delays more than the specified time computed by ECM. | Harness or connectors (The A/F sensor 1 circuit is open or shorted.) A/F sensor 1 |
| P014E | Air fuel ratio (A/F) sensor 1 (bank 2) | | |
| P014F | circuit slow response | | |
| P015C | Air fuel ratio (A/F) sensor 1 (bank 2) | | |
| P015D | circuit delayed response | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 6. Let engine idle for 1 minute.
- 7. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
- 8. Fully release accelerator pedal and then let engine idle for about 1 minute.
- 9. Check the items status of "DATA MONITOR" as follows.
 - NOTE:

If "PRSNT" changed to "ABSNT", refer to EC-223, "Component Function Check".

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| DTC | Data monitor item | Status | | / |
|---|--|-------------------------|--|---|
| P014CP014DP015AP015B | A/F SEN1 DIAG3 (B1) | PRSNT | | E |
| P014EP014FP015CP015D | A/F SEN1 DIAG3 (B2) | FROM | | (|
| ls "PRSNT" displ | laved on CONSULT screer | <u>1?</u> | | |
| YES >> GO NO >> GO | | | | l |
| 3. PERFORM D | TC CONFIRMATION PRO | CEDURE-2 | | |
| | LT nfirmation procedure-1 aga layed on CONSULT screer | | | |
| YES >> GO | | <u></u> | | |
| NO >> Refe | er to EC-223, "Component | Function Check". | | |
| 4. PERFORM D | TC CONFIRMATION PRO | CEDURE-2 | | (|
| | L T ut 20 seconds at idle. ems status of "DATA MONI | TOR" as follows. | | ŀ |
| - | changed to "INCMP", ref | er to <u>EC-223, "C</u> | omponent Function Check". | |
| DTC | Data monitor item | Status | | |
| P014CP014D | A/F SEN1 DIAG1 (B1) | | | , |
| P015AP015B | A/F SEN1 DIAG2 (B1) | CMPLT | | |
| • P014E | A/F SEN1 DIAG1 (B2) | | | |
| P014FP015CP015D | A/F SEN1 DIAG2 (B2) | | | |
| ls "CMPLT" displ | aved on CONSULT screer | <u> ?</u> | | |
| YES >> GO | | | | |
| _ | er to <u>EC-223, "Component</u> | Function Check". | | |
| | ELF-DIAGNOSIS | | | |
| With CONSU | L T F-DIAG RESULT". | | | |
| s any DTC deter | | | | |
| | xeed to <u>EC-254, "Diagnosis</u> | Procedure". | | |
| NO >> INSP | PECTION END | | | |
| 6. CHECK AIR-I | FUEL RATIO SELF-LEARN | NING VALUE | | |
| Select Serviol Calculate the | | | ture. ng term fuel trim" indications. | |
| ls the total perce YES >> GO NO >> GO | | | | |

< DTC/CIRCUIT DIAGNOSIS >

7. DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust das leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

8.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch OFF and wait at least 10 seconds. 1.
- Turn ignition switch ON. 2.
- Turn ignition switch OFF and wait at least 10 seconds. 3.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
- 7. Fully release accelerator pedal and then let engine idle for about 1 minute.
- Check 1st trip DTC. 8.

Is 1st trip DTC detected?

>> Proceed to EC-254, "Diagnosis Procedure". YES

NO >> INSPECTION END

Diagnosis Procedure

INFOID:00000008497138

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF. 1.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1

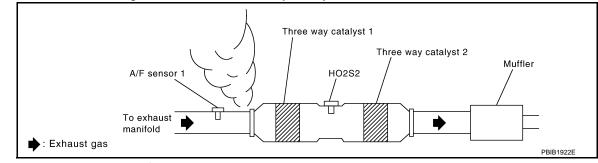
Loosen and retighten the A/F sensor 1. Refer to EM-34, "Exploded View".

>> GO TO 3.

3. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

Listen for an exhaust gas leak before three way catalyst 1. 2.



Is exhaust gas leak detected?

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

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| 4. CHECK | FOR IN | ITAKE AIR L | .EAK | | | | А |
|--|----------------------------------|---|----------------|-------------|-------------------------|--|-----|
| Listen for a | in intake | e air leak afte | er the mass | air flow se | ensor. | | 1.1 |
| <u>Is intake ai</u> | | | | | | | |
| | > Repair > GO TC | or replace. | | | | | EC |
| 5.CLEAR | THE MI | XTURE RAT | IO SELF-L | EARNING | VALUE | | 0 |
| | | ure ratio self ial Repair Re | | | r to <u>EC-24, "MIX</u> | TURE RATIO SELF-LEARNING VALUE | С |
| | | r at least 10 | | | | | |
| | | | | | | ficult to start engine? | D |
| YES >> | | m trouble dia 262, "DTC L | | DTC P017 | 1, P0174 or P01 | 72, P0175. Refer to <u>EC-258, "DTC Logic"</u> | |
| NO >> | > GO TC | | <u>.ogic</u> . | | | | Е |
| 6. CHECK | AIR FU | IEL RATIO (A | 4/F) SENSC | DR 1 POW | VER SUPPLY CII | RCUIT | |
| | | F sensor 1 h | arness conr | nector. | | | F |
| | | witch ON. age betweer | n A/F senso | r 1 harnes | s connector and | ground. | |
| | | 0 | | | | _ | G |
| DTC | | A/F sensor | 1 | Ground | Voltage | _ | 0 |
| | Bank | Connector | Terminal | | | - | |
| P014C P014D P015A P015B | 1 | F3 | 4 | Ground | Detter | | H |
| P014E P014F P015C P015D | 2 | F20 | 4 | - Ground | Battery voltage | | J |
| Is the inspe | ection re | sult normal? | | | | - | |
| - | > GO TC > GO TC | | | | | | K |
| - | | UNCTIONIN | IG PART | | | | IX. |
| Check the • Harness • IPDM E/F | following connect R harnes | g. ors E3, F1 ss connector | | | | | L |
| 15 A fuse Harness | | 6) n or short bet | tween A/F s | ensor 1 a | nd fuse | | M |
| | | | | | | | |
| • | - | or replace h | | | 3. T FOR OPEN AN | ND SHORT | Ν |
| 2. Discon | nect EC | witch OFF. M harness of tinuity betwe | | sor 1 harn | ess connector a | nd ECM harness connector. | 0 |
| | | - | | | | | |
| | | | | | | | Ρ |

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

| DTC | | A/F sensor | 1 | ECM | | Continuity |
|---|------|------------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| • P014C | | | 1 | | 57 | |
| P014DP015AP015B | 1 | F3 | 2 | F8 | 61 | Existed |
| • P014E | | | 1 | 10 | 65 | LAISIEU |
| P014FP015CP015D | 2 | F20 | 2 | | 66 | |

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

| DTC | A/F sensor 1 | | | Ground | Continuity |
|---|-------------------------|-----|--------|--------|-------------|
| DIC | Bank Connector Terminal | | Ground | | |
| • P014C | | | 1 | | |
| P014DP015AP015B | 1 | F3 | 2 | Ground | Not existed |
| • P014E | | | 1 | Giouna | NUL EXISTED |
| P014FP015CP015D | 2 | F20 | 2 | | |

| DTC | ECM | | | Ground | Continuity | |
|---|---------------------------------------|------|----------|--------|-------------|--|
| DIC | Bank Connector Ter | | Terminal | Ciouna | Continuity | |
| • P014C | | | 57 | Ground | Not existed | |
| P014DP015AP015B | 1 | F102 | 61 | | | |
| • P014E | | | 65 | Giouna | NUL EXISTED | |
| P014FP015CP015D | 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | 66 | - | | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

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

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

Refer to EC-174, "Component Inspection".

Is the inspection result normal?

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

NO >> GO IO I3.

10.CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2). Refer to <u>EC-183</u>, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning mass air flow sensor. Refer to <u>EM-27, "Exploded View"</u>.

11.CHECK PCV VALVE

Refer to EC-529, "Component Inspection".

Is the inspection result normal?

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| YES >> GO TO 12. NO >> Repair or replace PCV valve. Refer to <u>EM-46, "Exploded View"</u> . | А |
|---|----|
| 12. CHECK INTERMITTENT INCIDENT | |
| Perform <u>GI-42, "Intermittent Incident"</u> . | EC |
| Is the inspection result normal? | LC |
| YES >> GO TO 13. NO >> Repair or replace. | |
| 13. REPLACE AIR FUEL RATIO (A/F) SENSOR 1 | С |
| Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View". | |
| CAUTION: | D |
| • Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one. | |
| • Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool). | E |
| >> INSPECTION END | F |
| | G |
| | Н |
| | I |
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| | 0 |
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| | |

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000008156316

[VQ37VHR]

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator | |
|--------------|---|------------------------|---------------|--|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector | |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0171 | Fuel injection system too lean (bank 1) | | Intake air leaks A/F sensor 1 |
| P0174 | Fuel injection system too lean (bank 2) | Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | Fuel injector Exhaust gas leaks Incorrect fuel pressure Lack of fuel Mass air flow sensor Incorrect PCV hose connection |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to <u>EC-24, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>.

2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-259, "Diagnosis Procedure".

NO >> Check exhaust and intake air leak visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.

2. Check 1st trip DTC.

| P0171, P0174 FUEL INJECTION SYSTEM FUNCTION | |
|---|-------------------|
| < DTC/CIRCUIT DIAGNOSIS > [V | Q37VHR] |
| Is 1st trip DTC detected? | |
| YES >> Go to <u>EC-259, "Diagnosis Procedure"</u> . NO >> GO TO 5. | A |
| 5. PERFORM DTC CONFIRMATION PROCEDURE-III | 50 |
| 1. Turn ignition switch OFF and wait at least 10 seconds. | EC |
| Start engine. Maintain the following conditions for at least 10 consecutive minutes. | |
| Hold the accelerator pdal as steady as possible. | С |
| VHCL SPEED SE 50 - 120 km/h (31 - 75 MPH) | |
| VHCL SPEED SE 50 - 120 km/h (31 - 75 MPH) CAUTION: 50 - 120 km/h (31 - 75 MPH) | D |
| Always drive vehicle at a safe speed. | |
| 4. Check 1st trip DTC. | - |
| Is 1st trip DTC detected? | E |
| YES >> Go to <u>EC-259, "Diagnosis Procedure"</u> . NO >> INSPECTION END | |
| Diagnosis Procedure | D:000000008156317 |
| | 2:000000008136317 |
| 1. CHECK EXHAUST GAS LEAK | G |
| 1. Start engine and run it at idle. | |
| 2. Listen for an exhaust gas leak before three way catalyst 1. | _ |
| Three way catalyst 1 | Н |
| Three way catalyst 2 | |
| A/F sensor 1 HO2S2 Muffler | I |
| | |
| To exhaust | J |
| manifold | |
| PBIB1922E Is exhaust gas leak detected? | |
| YES >> Repair or replace. | K |
| NO >> GO TO 2. | |
| 2.CHECK FOR INTAKE AIR LEAK | L |
| Listen for an intake air leak after the mass air flow sensor. Check PCV hose connection. | |
| Is intake air leak detected? | M |
| YES >> Repair or replace. | |
| NO >> GO TO 3. | N |
| 3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT | N |
| Turn ignition switch OFF. Disconnect corresponding A/F sensor 1 harness connector. | |
| Disconnect corresponding A/F sensor 1 harness connector. Disconnect ECM harness connector. | 0 |

Disconnect ECM harness connector.
 Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 ECM | | CM | Continuity | | |
|--------|------------------|-----------|----------|------------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0171 | 1 F3 1 2 | F3 | 1 | | 57 | |
| FUITI | | | 2 | F102 | 61 | Existed |
| P0174 | 2 | F20 | 1 | FIUZ | 65 | EXISIEU |
| F 0174 | 2 | 120 | 2 | | 66 | |

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P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

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

| DTC | A/F sensor 1 | | | Ground | Continuity |
|---------|--------------|------------------------|---|---------|-------------|
| DIC | Bank | ank Connector Terminal | | Gibuliu | Continuity |
| P0171 | 1 | F3 | 1 | | Not existed |
| PUITI | I | гэ | 2 | Ground | |
| D0174 | 2 | E20 | 1 | Giouna | |
| P0174 2 | F20 | 2 | - | | |

| DTC | ECM | | | Ground | Continuity |
|-------|------|-----------|----------|----------|-------------|
| DIC | Bank | Connector | Terminal | Giouna | Continuity |
| P0171 | 1 | | 57 | | Not existed |
| P0171 | 1 | F102 | 61 | - Ground | |
| P0174 | 0 | FIUZ | 65 | | |
| | 2 | | 66 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-595, "Inspection".

2. Install fuel pressure gauge and check fuel pressure. Refer to EC-595, "Inspection".

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to FL-5. "Exploded View".

NO >> Repair or replace.

6.CHECK MASS AIR FLOW SENSOR

With CONSULT

- 1. Install all removed parts.
- 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT. For specification, refer to <u>EC-598, "Mass Air Flow Sensor"</u>.

With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to <u>EC-598, "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 <u>EC-188, "Diagnosis Procedure"</u>.

7.CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

1. Start engine.

[VQ37VHR]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

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

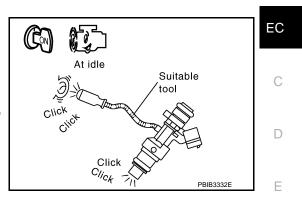
Without CONSULT

- 1. Start engine and let it idle.
- 2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>EC-507, "Diagnosis Procedure"</u>.



[VQ37VHR]

А

F

8. CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- 4. Remove fuel tube assembly. Refer to <u>EM-37</u>, "<u>Removal and Installation</u>". Keep fuel hose and all fuel injectors connected to fuel tube.
- 5. For DTC P0171, reconnect fuel injector harness connectors on bank 1. For DTC P0174, reconnect fuel injector harness connectors on bank 2.
- 6. Disconnect all ignition coil harness connectors.
- 7. Prepare pans or saucers under each fuel injector.
- Crank engine for about 3 seconds.
 For DTC P0171, make sure that fuel sprays out from fuel injectors on bank 1.
 For DTC P0171, make sure that fuel sprays out from fuel injectors on bank 1.

For DTC P0174, make sure that fuel sprays out from fuel injectors on bank 2.

Fuel should be sprayed evenly for each fuel injector.

Is the inspection result normal?

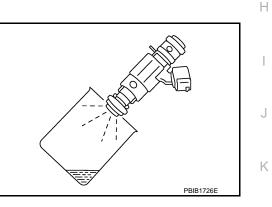
YES >> GO TO 9.

NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones. Refer to <u>EM-</u> <u>37, "Removal and Installation"</u>.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END



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P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000008156318

[VQ37VHR]

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator | |
|--------------|---|------------------------|---------------|--|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector | |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0172 | Fuel injection system too rich (bank 1) | Fuel injection system does not operate properly. | A/F sensor 1 Fuel injector |
| P0175 | Fuel injection system too rich (bank 2) | The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | Exhaust gas leaks Incorrect fuel pressure Mass air flow sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement</u>".
- 2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too. Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-263, "Diagnosis Procedure".

NO >> Remove spark plugs and check for fouling, etc.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 10 minutes.

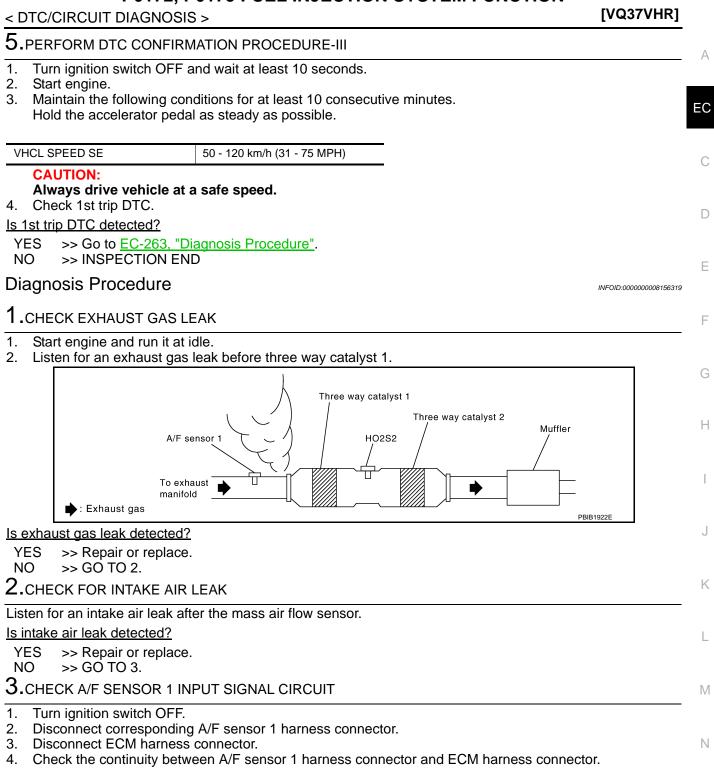
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-263, "Diagnosis Procedure".

NO >> GO TO 5.





| DTC | | A/F sensor | 1 | EC | Continuity | |
|-------|------|------------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0172 | 1 | F3 | 1 | | 57 | |
| 10172 | 2 | F102 | 61 | Existed | | |
| P0175 | 2 | E20 | 1 | FIUZ | 65 | EXISTED |
| F0175 | 2 | F20 - | F20 | 2 | 66 | |

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

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P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

| DTC | | A/F sensor | 1 | Ground | Continuity | |
|-------|-------------|--------------------|---|--------|-------------|--|
| DIC | Bank | Connector Terminal | | Gibunu | Continuity | |
| P0172 | 1 | F3 | 1 | | | |
| FUITZ | 1 | 15 | 2 | Ground | Not existed | |
| D0175 | 2 | E20 | 1 | Giouna | | |
| P0175 | 175 2 F20 - | | 2 | | | |

| DTC | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Giouna | Continuity |
| P0172 | 1 | | 57 | | Not existed |
| FUITZ | I | F102 | 61 | Ground | |
| P0175 | 2 | | 65 | Giouna | |
| P0175 | 2 | | 66 | - | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-595, "Inspection".

2. Install fuel pressure gauge and check fuel pressure. Refer to EC-595, "Inspection".

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace "fuel filter and fuel pump assembly". Refer to <u>FL-5, "Exploded View"</u>.

5.CHECK MASS AIR FLOW SENSOR

With CONSULT

- 1. Install all removed parts.
- 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT. For specification, refer to <u>EC-598, "Mass Air Flow Sensor"</u>.

With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in "Service \$01" with GST. For specification, refer to <u>EC-598, "Mass Air Flow Sensor"</u>.

Is the measurement value within the specification?

- YES >> GO TO 6.
- NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to <u>EC-188, "Diagnosis Procedure"</u>.

6.CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

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

Without CONSULT

1. Start engine and let it idle.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

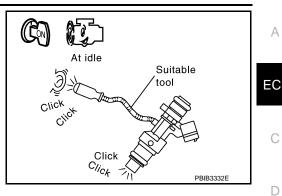
< DTC/CIRCUIT DIAGNOSIS >

2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>EC-507, "Diagnosis Procedure"</u>.



[VQ37VHR]

7. CHECK FUEL INJECTOR 1. Remove fuel injector assembly. Refer to EM-37, "Removal and Installation". Keep fuel hose and all fuel injectors connected to fuel tube. Ε 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle. Disconnect all fuel injector harness connectors. 3. 4. Disconnect all ignition coil harness connectors. 5. Prepare pans or saucers under each fuel injector. F 6. Crank engine for about 3 seconds. Make sure fuel that does not drip from fuel injector. Is the inspection result normal? YES >> GO TO 8. NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one. Refer to EM-37, "Removal and Installation". Н 8. CHECK INTERMITTENT INCIDENT Refer to GI-42, "Intermittent Incident". >> INSPECTION END Κ

Revision: 2012 July

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0.4 0.2 0.1

Resistance kΩ

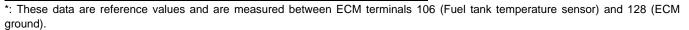
< DTC/CIRCUIT DIAGNOSIS >

P0181 FTT SENSOR

Description

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 |



DTC Logic

INFOID:000000008156321

SEF012P

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | | DTC detecting condition | Possible cause |
|---------|---|----|--|--|
| | FTT SENSOR | A) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor. | Harness or connectors (The FTT sensor circuit is open or shorted) FTT sensor |
| P0181 | [Fuel tank temperature (FTT) sensor circuit range/ performance] | B) | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/ lower than that of other temperature sensors when the engine is started with its cold state. | Harness or connectors (High or low resistance in the FTT sensor circuit) FTT sensor |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 7.

NO >> GO TO 2.

2. PRECONDITIONING

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

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-268, "Diagnosis Procedure".

INFOID:000000008156320

Acceptable

0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F)

2013 G Convertible

P0181 FTT SENSOR

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|---------------------------------|
| NO >> GO TO 4. | |
| 4. CHECK ENGINE COOLANT TEMPERATURE | |
| 1. Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT. | |
| Check "COOLAN TEMP/S" value. <u>"COOLAN TEMP/S" less than 60°C (140°F)?</u> | E |
| YES >> INSPECTION END | |
| NO $>>$ GO TO 5. | |
| 5.PERFORM DTC CONFIRMATION PROCEDURE-II | |
| 1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F). | |
| Wait at least 10 seconds. Check 1st trip DTC. | |
| Is 1st trip DTC detected? | |
| YES >> Go to EC-268, "Diagnosis Procedure". | |
| NO >> GO TO 6. | |
| 6 .PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B) | |
| Perform component function check. Refer to <u>EC-268, "Component Function Check"</u> . NOTE: | |
| Use the component function check to check the overall function of the FTT sensor circuit | t. During this check, a |
| 1st trip DTC might not be confirmed. | 0 |
| Is the inspection result normal? | |
| YES >> INSPECTION END NO >> Proceed to <u>EC-268, "Diagnosis Procedure"</u> . | |
| 7. PRECONDITIONING | |
| If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform | n the following proce- |
| dure before conducting the next test. Turn ignition switch OFF and wait at least 10 seconds. | |
| 2. Turn ignition switch ON. | |
| Turn ignition switch OFF and wait at least 10 seconds. TEST CONDITION: | |
| Before performing the following procedure, do not add fuel. | |
| Before performing the following procedure, check that fuel level is between 1/4 a Before performing the following procedure, confirm that battery voltage is 11 V or the following procedure. | and 4/4. |
| • Before performing the following procedure, commit that battery voltage is 11 v t | n more at luie. |
| >> GO TO 8. | |
| 8. PERFORM DTC CONFIRMATION PROCEDURE B | |
| 1. Start engine and let it idle for 60 minutes. | |
| 2. Move the vehicle to a cool place. | |
| NOTE: Cool the vehicle in an environment of ambient air temperature between –10°C (14°F | ⁻) and 35°C (95°F). |
| 3. Turn ignition switch OFF and soak the vehicle for 12 hours. | , , , , |
| CAUTION: Never turn ignition switch ON during soaking. | |
| NOTE: | |
| The vehicle must be cooled with the food open. | |
| Start engine and let it idle for 5 minutes or more. CAUTION: | |
| Never turn ignition switch OFF during idling. | |
| 5. Check 1st trip DTC. | |
| <u>Is 1st trip DTC detected?</u> YES >> Proceed to EC-268, "Diagnosis Procedure". | |
| YES >> Proceed to <u>EC-268, "Diagnosis Procedure"</u> . | |

NO >> INSPECTION END

P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Component Function Check

1.CHECK FUEL TANK TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (k Ω) | |
|-----------|-----------------------|--------------------------|-------------|
| 4 and 5 | Temperature [°C (°F)] | 20 (68) | 2.3 - 2.7 |
| 4 810 5 | | 50 (122) | 0.79 - 0.90 |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to <u>EC-268, "Diagnosis Procedure"</u>.

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-268, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-266, "DTC Logic".

Which malfunction is detected?

YES >> GO TO 2.

NO >> GO TO 7.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-36, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to <u>MWI-52, "Component Function Check"</u>.

3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect "fuel level sensor unit and fuel pump" harness connector.

3. Turn ignition switch ON.

4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

| | nsor unit and pump | Ground | Voltage (V) | |
|-----------|-----------------------|--------|-------------|--|
| Connector | Terminal | | | |
| B22 | 4 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors M7, B1

· Harness for open or short between ECM and "fuel level sensor unit and fuel pump"

EC-268

INFOID:000000008156322

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P0181 FTT SENSOR

[VQ37VHR]

| _ | - | • | | - | • | harness or cor CUIT FOR OPE | nnector. EN AND SHORT | А |
|--|----------------------------------|------------------------|--------------------|-----------------------------|-----------------------------------|--------------------------------|---------------------------|----------------|
| Disco Check | | ied meter | en "fuel le | | ss connector. unit and fuel pu | ımp" harness co | onnector and "unified met | EC ter C |
| | sensor unit el pump | Unified me an | ter and A/C np. | Continuity | | | | D |
| Connector | Terminal | Connector | Terminal | | | | | D |
| B22 | 5 | M67 | 58 | Existed | | | | |
| | | | • | nd and sho | t to power. | | | E |
| | > GO TO > GO TO | 7. | <u>'</u> | | | | | F |
| 6.DETEC | T MALFU | NCTIONIN | NG PART | | | | | |
| Check the • Harness • Harness | connecto | | tween "fue | el level sens | or unit and fuel | pump" and "un | ified meter and A/C amp | G |
| _ > | > Repair c | open circui | t, short to | ground or s | | harness or cor | | Η |
| | | | | E SENSOR | | | | |
| Refer to <u>E</u> Is the insp | | | | <u>Ľ</u> . | | | | I |
| YES > | > GO TO > Replace | 8. "fuel leve | l sensor ur | nit and fuel | oump". Refer to | EL-6, "Remova | al and Installation". | J |
| Refer to G | | | | | | | | |
| <u>_</u> | | | <u></u> . | | | | | K |
| > | > INSPEC | TION END | C | | | | | |
| Compor | nent Insp | pection | | | | | INFOID:0000000815 | 6324 |
| 1.CHECK | K FUFL TA | NK TEMP | | E SENSOR | | | | |
| 1. Turn i 2. Disco | gnition swi nnect "fuel | tch OFF. level sens | sor unit an | | " harness conn | ector. | | — M |
| 4. Check | | e between | "fuel leve | l sensor uni Is shown in | t and fuel pump the figure. |)" | \cap | N |
| T | | | | Destates | (1.0) | | | 0 |
| Terminals | | Condition | 20 (68) | Resistance 2.3 - 2. | | | | Ŭ |
| 4 and 5 | Temperatur | e [°C (°F)] | 50 (122) | 0.79 - 0.9 | | 1 | | |
| | Is the inspection result normal? | | | | | | | Р |
| YES >> INSPECTION END NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6, "Removal and Installation". | | | | | | | | |

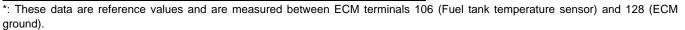
< DTC/CIRCUIT DIAGNOSIS >

P0182, P0183 FTT SENSOR

Description

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 |



DTC Logic

INFOID:000000008156326

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 perform the following procedure before conducting the next test.

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-270, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>.

Is the inspection result normal?

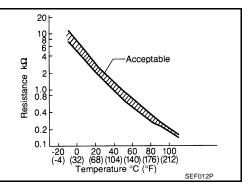
YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

[VQ37VHR]

INFOID:000000008156325



P0182, P0183 FTT SENSOR

| | | | FUI | 02, FUI | 03 FTT SENSUR | |
|-----------------------------|--------------------|-------------|-------------|--------------|---|-------------------------|
| < DTC/CIR | | AGNOSIS | > | | | [VQ37VHR] |
| Refer to M | WI-36, "CO | ONSULT F | unction (I | METER/M& | <u>&A)"</u> . | |
| Is the inspe | ection resu | ult normal? | 2 | | | |
| | GO TO 3 | | | | 21 1 1 | |
| - | | | | Function C | | |
| | | | ERATURI | = SENSOF | R POWER SUPPLY CIRCUIT | |
| | nition swit | | or unit on | d fuel pum | n" hornoog connector | |
| | inition swit | | or unit an | u iuei puili | np" harness connector. | |
| | | | n "fuel lev | el sensor u | unit and fuel pump" harness connector and | ground. |
| | | | | | | |
| Fuel level se | nsor unit and pump | | N / 1/ | 0.0 | | |
| Connector | Terminal | Ground | Voltage | (V) | | |
| B22 | 4 | Ground | Approx | . 5 | | |
| Is the inspe | | | | | | |
| • | > GO TO 5 | | <u> </u> | | | |
| | GO TO 4 | | | | | |
| 4.DETEC | T MALFUI | NCTIONIN | IG PART | | | |
| Check the f | following | | | | | |
| Harness | | s M7, B1 | | | | |
| Harness | for open o | or short be | tween EC | M and "fue | el level sensor unit and fuel pump" | |
| | | | | | | |
| _ | | • | | - | short to power in harness or connector. | |
| 5. CHECK | FUEL TA | NK TEMP | ERATURI | E SENSOF | R GROUND CIRCUIT FOR OPEN AND SH | ORT |
| 1. Turn ig | nition swi | tch OFF. | | | | |
| | | | | | ess connector. | al "waifi a al va ata r |
| | | arness col | | ever sensor | r unit and fuel pump" harness connector an | a unined meter |
| | • • • • • • • • • | | | | | |
| Fuel level s | ensor unit | Unified met | ter and A/C | | - | |
| and fuel | l pump | an | ıp. | Continuity | | |
| Connector | Terminal | Connector | Terminal | | _ | |
| B22 | 5 | M67 | 58 | Existed | _ | |
| 4. Also ch | neck harne | ess for sho | ort to grou | nd and sho | ort to power. | |
| Is the inspe | ection resu | ult normal? | 2 | | | |
| | GO TO 7 | | | | | |
| ^ | GO TO 6 | | | | | |
| 6. DETEC | i malfui | NCTIONIN | ig part | | | |
| Check the | | | | | | |
| Harness | | | tween "fu | | nsor unit and fuel pump" and "unified meter | and A/C amp " |
| - 110111655 | | | | | isor unit and ruer pump and unined meter | anu Avo amp. |
| | Renair o | nen circuit | short to | around or | short to power in harness or connector. | |
| 7. CHECK | - | - | | - | - | |
| | | | | | N | |
| Refer to EC | | | | <u>n"</u> . | | |
| Is the inspe | | | <u></u> | | | |
| YES >> | > GO TO 8 | 5. | | | | |

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump". Refer to <u>FL-6</u>, "<u>Removal and Installation</u>".

8. CHECK INTERMITTENT INCIDENT

< DTC/CIRCUIT DIAGNOSIS >

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000008156328

1.CHECK FUEL TANK TEMPERATURE SENSOR

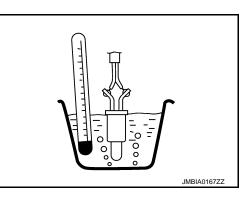
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit.
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (k Ω) | |
|-----------|-----------------------|--------------------------|-------------|
| 4 and 5 | Temperature [°C (°F)] | 20 (68) | 2.3 - 2.7 |
| 4 410 5 | | 50 (122) | 0.79 - 0.90 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump". Refer to <u>FL-6, "Removal and Installation"</u>.

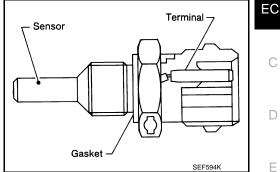


< DTC/CIRCUIT DIAGNOSIS >

P0196 EOT SENSOR

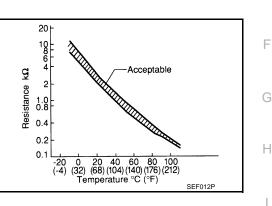
Description

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



<Reference data>

| Engine oil temperature [°C (°F)] | Voltage* (V) | Resistance ($k\Omega$) |
|-------------------------------------|--------------|--------------------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |
| 110 (230) | 0.6 | 0.143 - 0.153 |



*: These data are reference values and are measured between ECM terminals 78 (Engine oil temperature sensor) and 84 (Sensor ground).

DTC Logic

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DTC DETECTION LOGIC NOTE:

If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or K P0198. Refer to <u>EC-277, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | | Possible cause | L |
|---------|---|-------------------------|--|--|---|
| | EOT SENSOR | A) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | Harness or connectors (The EOT sensor circuit is open or shorted) EOT sensor | M |
| P0196 | [Engine oil temperature (EOT) sensor range/performance | B) | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the EOT sensor is higher/ lower than that of other temperature sensors when the engine is started with its cold state. | Harness or connectors (High or low resistance in the EOT sensor circuit) EOT sensor | N |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

| YES | >> GO TO 6. | |
|---------------|--------------|--|
| IES | >> GO TO 0. | |
| NO | >> GO TO 2. | |
| 2. PRE | CONDITIONING | |

[VQ37VHR]

P0196 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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

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

TESTING CONDITION:

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and let it idle for 5 minutes and 10 seconds.
- 6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-276, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Select "DATA MONITOR" mode with CONSULT.
- Check that "COOLAN TEMP/S" indicates above 80°C (176°F). If it is above 80°C (176°F), go to the following steps. If it is below 80°C (176°F), warm engine up until "COOLAN TEMP/S" indicates more than 80°C (176°F). Then perform the following steps.
- 3. Turn ignition switch OFF and soak the vehicle in a cool place.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Turn ignition switch ON.

NOTE: Do not turn ignition switch OFF until step 10.

- 7. Select "DATA MONITOR" mode with CONSULT.
- 8. Check the following.

| COOLAN TEMP/S | Below 40°C (104°F) |
|--|--------------------|
| INT/A TEMP SE | Below 40°C (104°F) |
| Difference between "COOLAN TEMP/S" and "INT/A TEMP SE" | Within 6°C (11°F) |

If they are within the specified range, perform the following steps.

If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.

NOTĚ:

• Do not turn ignition switch OFF.

- If it is supposed to need a long period of time, do not deplete the battery.
- 9. Start engine and let it idle for 5 minutes.
- 10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-276, "Diagnosis Procedure".

NO >> GO TO 5.

5.PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to EC-275, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

P0196 EOT SENSOR

| < DTC/CIR | CUIT DIAGNOSIS | > | | [VQ37VHR] |
|--|---|---|--|---|
| NO >> | Proceed to EC-276 | , "Diagnos | sis Procedure". | |
| 6.PRECO | NDITIONING | | | |
| dure before 1. Turn ig 2. Turn ig 3. Turn ig TEST CON • Before p • Before p | e conducting the nex nition switch OFF ar nition switch ON. nition switch OFF ar IDITION: erforming the follow erforming the follow | t test. nd wait at I nd wait at I wing proc wing proc | east 10 seconds. east 10 seconds. edure, do not add edure, check that f | uel level is between 1/4 and 4/4. |
| • Belore b | | wing proc | edure, comminita | t battery voltage is 11 V or more at idle. |
| | GO TO 7. | | | |
| 1.PERFO | RM DTC CONFIRM | ATION PR | OCEDURE B | |
| 2. Move t NOTE: | | place. | | |
| | nition switch OFF ar | | | ature between –10°C (14°F) and 35°C (95°F). s. |
| NOTE: The ve 4. Start er CAUTI | hicle must be cooled ngine and let it idle fo | I with the f or 5 minute | ood open. es or more. | |
| | 1st trip DTC. | | ing lainig. | |
| - | TC detected? | | | |
| | Proceed to <u>EC-276</u> INSPECTION END | | sis Procedure". | |
| | ent Function Ch | | | INFOID:00000008156331 |
| | ENGINE OIL TEMP | | E (EOT) SENSOR | IN CIL.0000000013331 |
| | nition switch OFF. | | | |
| | nect EOT sensor ha e EOT sensor. Refe | | | |
| 4. Check | resistance betweer | n EOT se | nsor terminals by I | neating |
| with ho | t water as shown in | the figure. | | |
| Terminals | Condition | | Resistance (kΩ) | |
| | | 20 (68) | 2.1 - 2.9 | |
| 1 and 2 | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 | |
| | | 90 (194) | 0.236 - 0.260 | |
| YES >> NO >> | ection result normal? • GO TO 2. • Proceed to <u>EC-276</u> | . "Diagnos | sis Procedure". | JMBIA0080ZZ |
| Z.CHECK | INTERMITTENT IN | CIDENT | | |
| | mittent incident. Ref | | 2, Intermittent Incide | ent". |
| • | ection result normal? | | | |
| | INSPECTION END Proceed to EC-276 | | sis Procedure". | |

P0196 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-276. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine oil temperature sensor.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK ENGINE OIL TEMPERATURE SENSOR

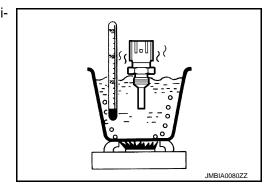
- 1. Turn ignition switch OFF.
- 2. Disconnect engine oil temperature sensor harness connector.
- 3. Remove engine oil temperature sensor.
- 4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



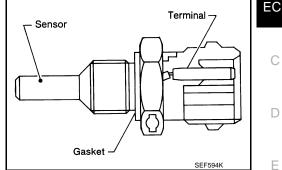
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< DTC/CIRCUIT DIAGNOSIS >

P0197, P0198 EOT SENSOR

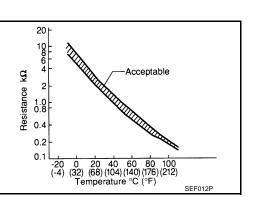
Description

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



<Reference data>

| Engine oil temperature [°C (°F)] | Voltage* (V) | Resistance (k Ω) |
|-------------------------------------|--------------|--------------------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |
| 110 (230) | 0.6 | 0.143 - 0.153 |



*: These data are reference values and are measured between ECM terminals 78 (Engine oil temperature sensor) and 84 (Sensor ground).

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause | Κ |
|---------|--|---|--|---|
| P0197 | Engine oil tempera- ture 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.) | L |
| P0198 | Engine oil tempera- ture sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | Engine oil temperature sensor | M |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 5 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

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P0197, P0198 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK EOT SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect engine oil temperature (EOT) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between EOT sensor harness connector and ground.

| EOT : | sensor | Ground | Voltage (V) | |
|--------------------|--------|--------|-------------|--|
| Connector Terminal | | | voltage (v) | |
| F38 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 3.

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

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

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

| EOT sensor | | ECM | | Continuity |
|------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F38 | 2 | F102 | 84 | Existed |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-278, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace engine oil temperature sensor.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK ENGINE OIL TEMPERATURE SENSOR

1. Turn ignition switch OFF.

- 2. Disconnect engine oil temperature sensor harness connector.
- 3. Remove engine oil temperature sensor.

EC-278

INFOID:000000008156336

P0197, P0198 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

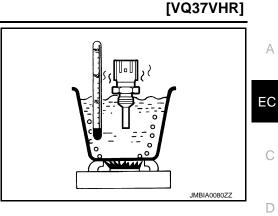
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



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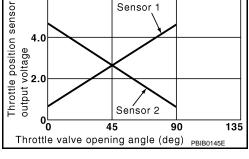
< DTC/CIRCUIT DIAGNOSIS >

P0222, P0223, P2132, P2133 TP SENSOR

Description

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

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



Throttle position sensor

6.0

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0222, P0223, P2132 or P2133 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-380, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0222 | Throttle position sensor 1 (bank 1) circuit low in- put | An excessively low voltage from the TP sensor 1 is sent to ECM. | |
| P0223 | Throttle position sensor 1 (bank 1) circuit high in- put | An excessively high voltage from the TP sensor 1 is sent to ECM. | Harness or connectors (TP sensor 1 circuit is open or shorted.) |
| P2132 | Throttle position sensor 1 (bank 2) circuit low in- put | An excessively low voltage from the TP sensor 1 is sent to ECM. | Electric throttle control actuator (TP sensor 1) |
| P2133 | Throttle position sensor 1 (bank 2) circuit high in- put | An excessively high voltage from the TP sensor 1 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-281, "Diagnosis Procedure".
- NO >> INSPECTION END

[VQ37VHR]



P0222, P0223, P2132, P2133 TP SENSOR

[VQ37VHR]

| DTC/CIRCU | | | - | | | | | |
|--|--|--|--|---|--|--|---|--|
| iagnosis I | roce | dure | | | | | | INFOID:000000008156340 |
| .CHECK GF | ROUNE | | TION | | | | | |
| . Turn igniti | | | | | | | | |
| - | | | /I95. Refe | r to Ground | Inspecti | on in <u>GI-45</u> | 5, "Circuit Inspect | <u>ion"</u> . |
| the inspecti | | | | | | | | |
| | O TO 2 epair o | z. r replace g | round con | nection | | | | |
| CHECK TH | • | • • | | | | PLY CIRC | UIT | |
| | | | | tuator harn | | | | <u>.</u> |
| . Turn igniti | | | control ac | | | 00101. | | |
| Check the | e voltag | je between | electric th | nrottle conti | rol actuat | or harness | connector and g | round. |
| | F last | ric throttle cor | | - | | | | |
| DTC | Bank | Connector | 1 | Ground | Voltage | e (V) | | |
| P0222, P0223 | 1 1 | F6 | 6 | 21 | | | | |
| P2132, P2133 | 2 | F27 | 1 | Ground | Appro | x. 5 | | |
| the inspecti | | | I | | | | | |
| | O TO 3 | | | | | | | |
| 120 //0 | | | | | | | | |
| NO >> R | epair o | pen circuit. | short to c | around or s | nort to do | wer in har | ness or connecto | ors. |
| CHECK TH Turn igniti Disconne Check the | IROTT on swi | LE POSITI tch OFF. I harness c | ON SENS | SOR 1 GRC | OUND CII | RCUIT FOI | ness or connecto R OPEN AND SH | |
| CHECK TH . Turn igniti . Disconne | IROTT on swi ct ECN e contir | LE POSITI tch OFF. I harness c nuity betwe | ON SENS onnector. en electric | SOR 1 GRC | DUND CI | RCUIT FOI | R OPEN AND SH | IORT |
| CHECK TH . Turn igniti . Disconne . Check the | IROTT on swi ct ECN e contir | LE POSITI tch OFF. I harness c | ON SENS onnector. en electric | SOR 1 GRC | DUND CI | RCUIT FOI | R OPEN AND SH | IORT |
| CHECK TH . Turn igniti . Disconned . Check the nector. DTC | IROTT on swi ct ECN contir | LE POSITI tch OFF. I harness c nuity betwe | ON SENS onnector. en electric | SOR 1 GRC | DUND CII | RCUIT FOI | R OPEN AND SH | IORT |
| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 | IROTT on swir ct ECM contir Electric Bank | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector | ON SENS onnector. en electric rol actuator Terminal | SOR 1 GRC | DUND CII | RCUIT FOI | R OPEN AND SH | IORT |
| CHECK TH Turn igniti Disconnee Check the nector. DTC P0222, P0223 P2132, P2133 | IROTT on swir ct ECN contir Electric Bank 1 2 | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 | ON SENS onnector. en electric rol actuator Terminal 3 4 | SOR 1 GRC c throttle co EC Connector F101 | DUND CII ontrol actor M Terminal 40 48 | CUIT FOI | R OPEN AND SH | IORT |
| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also chec | IROTT on swir ct ECN contir Bank 1 2 k harne | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho | ON SENS onnector. en electric rol actuator Terminal 3 4 | SOR 1 GRC | DUND CII ontrol actor M Terminal 40 48 | CUIT FOI | R OPEN AND SH | IORT |
| CHECK TH Turn igniti Disconnee Check the nector. DTC P0222, P0223 P2132, P2133 Also chect the inspecti YES >> G | IROTT on swir ct ECW contir Bank 1 2 k harne on resu O TO 4 | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho ult normal? 4. | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour | SOR 1 GRC c throttle co Connector F101 - | DUND CII pontrol actor M Terminal 40 48 rt to powe | CUIT FOI uator harne Continuity Existed er. | R OPEN AND SH ess connector an - | IORT |
| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also chect the inspective YES >> G NO >> R | IROTT on swir ct ECW contir Bank 1 2 k harne on resu 0 TO 4 epair o | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho ult normal? 4. pen circuit, | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g | SOR 1 GRC c throttle cc Connector F101 nd and shor | DUND CII pontrol actor M Terminal 40 48 rt to powe hort to po | Continuity Existed Existed | R OPEN AND SH ess connector an - - ness or connecto | HORT |
| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also chect the inspectiv YES >> G NO >> R | IROTT on swir ct ECW contir Bank 1 2 k harne on resu 0 TO 4 epair o | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho ult normal? 4. pen circuit, | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g | SOR 1 GRC c throttle cc Connector F101 nd and shor | DUND CII pontrol actor M Terminal 40 48 rt to powe hort to po | Continuity Existed Existed | R OPEN AND SH ess connector an - | HORT |
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| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also chect the inspectiv YES >> G NO >> R CHECK TH Check the | IROTT on swir ct ECN e contir Bank 1 2 k harne on resu 0 TO 4 epair o IROTT e contir | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho <u>alt normal?</u> 4. pen circuit, LE POSITI nuity betwe | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric | SOR 1 GRC C throttle cc EC Connector F101 and and shor ground or si SOR 1 INPL c throttle cc | DUND CII ontrol actor M Terminal 40 48 rt to powe hort to powe JT SIGN/ ontrol actor | Continuity Existed Existed Existed Continuity | R OPEN AND SH ess connector an - - ness or connecto IT FOR OPEN AN | HORT d ECM harness con- ors. ND SHORT |
| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also chect the inspectiv YES >> G NO >> R CHECK TH Check the | IROTT on swir ct ECW contir Bank 1 2 k harne on resu O TO 4 epair o IROTT contir | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho <u>ult normal?</u> 4. pen circuit, LE POSITI nuity betwe | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric | SOR 1 GRC c throttle cc Connector F101 nd and shor ground or si SOR 1 INPL c throttle cc EC | DUND CII pontrol active M Terminal 40 48 rt to powe hort to powe bort to powe DT SIGN/ pontrol active M | Continuity Existed Existed Existed Continuity | R OPEN AND SH ess connector an - - ness or connecto IT FOR OPEN AN | HORT d ECM harness con- ors. ND SHORT |
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| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also chection Also chection YES >> G NO >> R CHECK TH Check the nector. | IROTT on swir ct ECW contir Bank 1 2 k harne on resu on resu on resu O TO 4 epair o IROTT contir Electric Bank 1 1 2 t harne on resu on swir contir | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho <u>ult normal?</u> 4. pen circuit, LE POSITI nuity betwe c throttle cont Connector F6 | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric rol actuator Terminal 4 | SOR 1 GRC c throttle cc Connector F101 nd and shor ground or si SOR 1 INPL c throttle cc EC | DUND CII pontrol actor M Terminal 40 48 rt to powe hort to powe hort to powe DT SIGN/ pontrol actor M Terminal 30 | CUIT FOI uator harne Continuity Existed er. | R OPEN AND SH ess connector an - - ness or connecto IT FOR OPEN AN | HORT d ECM harness con- ors. ND SHORT |
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| CHECK TH Turn igniti Disconner Check the nector. DTC P0222, P0223 P2132, P2133 Also check the inspection YES >> G NO >> R CHECK TH Check the nector. | IROTT on swir ct ECW contir Bank 1 2 k harne on resu O TO 4 epair o IROTT contir Electric Bank 1 2 k harne contir | LE POSITI tch OFF. I harness c nuity betwe c throttle cont Connector F6 F27 ess for sho Jlt normal? 4. pen circuit, LE POSITI nuity betwe c throttle cont Connector F6 F27 ess for sho | ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric rol actuator Terminal 4 2 | SOR 1 GRC Connector F101 and and shor ground or si SOR 1 INPL c throttle co EC Connector | DUND CII ontrol actor M Terminal 40 48 rt to powe hort to powe JT SIGN/ ontrol actor M Terminal 30 31 | CONTINUITY Continuity Existed er. Newer in harn AL CIRCUI uator harne Continuity Existed | R OPEN AND SH ess connector an - - ness or connecto IT FOR OPEN AN | HORT d ECM harness con- ors. ND SHORT |

 $5. {\sf CHECK \ THROTTLE \ POSITION \ SENSOR}$

Refer to EC-282, "Component Inspection".

P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.Replace electric throttle control actuator

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Exploded View".
- 2. Go to EC-282, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000008156341

1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform EC-19, "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 terminals under the following conditions.

| ECM | | | | | |
|-----------|---------------------------|----|-------------------|-----------------|----------------|
| Connector | + | _ | Condition | | Voltage (V) |
| Connector | Terminal | | | | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | Fully released | More than 0.36 |
| | | 40 | - | Fully depressed | Less than 4.75 |
| | | 48 | | Fully released | More than 0.36 |
| F101 | 31 [TP sensor 1 (bank 2)] | | Accelerator pedal | Fully depressed | Less than 4.75 |
| FIUI | 34 [TP sensor 2 (bank 1)] | 40 | | Fully released | Less than 4.75 |
| | | | | Fully depressed | More than 0.36 |
| | | 48 | | Fully released | Less than 4.75 |
| | 35 [TP sensor 2 (bank 2)] | | | Fully depressed | More than 0.36 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Exploded View".

2. Go to EC-282, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156342

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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< DTC/CIRCUIT DIAGNOSIS >

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic

INFOID:000000008156343

[VQ37VHR]

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input signal to ECM | ECM function |
|----------------------------------|---------------------|-------------------------------|
| Crankshaft position sensor (POS) | Engine speed | On board diagnosis of misfire |

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)

On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.

When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.

When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off. If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink. When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain illumi-

nating.

If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.

2. Two Trip Detection Logic (Exhaust quality deterioration)

For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.

A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-------------------------------------|-----------------------------|---|
| P0300 | Multiple cylinder misfires detected | Multiple cylinders misfire. | Improper spark plug |
| 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 short- |
| P0305 | No. 5 cylinder misfire detected | No. 5 cylinder misfires. | ed • Lack of fuel |
| P0306 | No. 6 cylinder misfire detected | No. 6 cylinder misfires. | Signal plate A/F sensor 1 Incorrect PCV hose connection |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart engine and let it idle for about 15 minutes.
- 6. Check 1st trip DTC.



P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Is 1st trip DTC detected? А YES >> Go to EC-285, "Diagnosis Procedure". NO >> GO TO 3. 3.PERFORM DTC CONFIRMATION PROCEDURE-II EC 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. 3. Turn ignition switch OFF and wait at least 10 seconds. 4. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below. Hold the accelerator pedal as steady as possible. Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at D the same time. **CAUTION:** Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when Е driving.

| Engine speed Engine speed in the freeze frame data ± 400 rpm | | F |
|--|--|---|
| Vehicle speed | Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH) | Г |
| Base fuel schedule | Base fuel schedule in the 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). | G |
| 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). | Н |

Driving time varies according to the engine speed in the freeze frame data.

| Engine speed | Time |
|------------------------|---------------------------|
| Around 1,000 rpm | Approximately 10 minutes |
| Around 2,000 rpm | Approximately 5 minutes |
| More than 3,000 rpm | Approximately 3.5 minutes |
| 5. Check 1st trip DTC. | |

Is 1st trip DTC detected?

YES >> Go to EC-285, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE M 1. Start engine and run it at idle speed. 2. Listen for the sound of the intake air leak. 3. Check PCV hose connection. Ν 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. Ρ Is the inspection result normal? YES-1 >> With CONSULT: GO TO 3. YES-2 >> Without CONSULT: GO TO 4. >> Repair or replace it. NO

3.PERFORM POWER BALANCE TEST

With CONSULT

1. Start engine.

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< DTC/CIRCUIT DIAGNOSIS >

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

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 4.

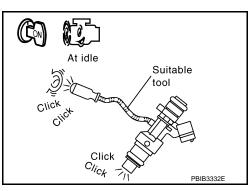
4.CHECK FUNCTION OF FUEL INJECTOR-I

- 1. Start engine and let it idle.
- 2. Listen to each fuel injector operation sound.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>EC-507, "Diagnosis Procedure"</u>.



[VQ37VHR]

5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

- 1. Turn ignition switch OFF.
- Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

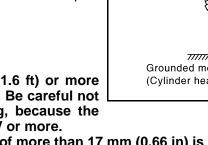
CAUTION:

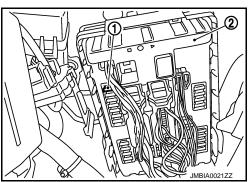
- During the operation, always stay 0.5 m (1.6 ft) or more away from the spark plug and ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

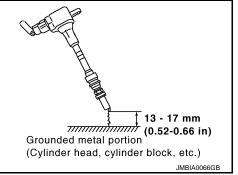
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

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







< DTC/CIRCUIT DIAGNOSIS >

6.CHECK FUNCTION OF IGNITION COIL-II

- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

YES >> GO TO 7.

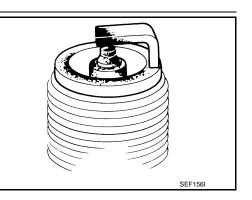
NO >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-518</u>, "Diagnosis Procedure".

7.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-17</u>, "Inspection".
- NO >> Repair or clean spark plug. Then GO TO 8.



8.CHECK FUNCTION OF IGNITION COIL-III

- 1. Reconnect the initial spark plugs.
- 2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

| Is the | inspection | result | normal? |
|--------|------------|--------|---------|
| | nopeouon | 10001 | nonnai. |

- YES >> INSPECTION END
- NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-16, "Removal</u> <u>and Installation"</u>.

9.CHECK COMPRESSION PRESSURE

| Check compression pressure. Refer to EM-23, "Inspection". | L |
|--|---|
| Is the inspection result normal? | |
| YES >> GO TO 10. NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets. | M |
| 10.CHECK FUEL PRESSURE | |
| Install all removed parts. Release fuel pressure to zero. Refer to <u>EC-595, "Inspection"</u>. Install fuel pressure gauge and check fuel pressure. Refer to <u>EC-595, "Inspection"</u>. | N |
| At idle: Approximately 350 kPa (3.57 kg/cm ² , 51 psi) | 0 |
| Is the inspection result normal? | |
| YES >> GO TO 12. NO >> GO TO 11. | Р |
| | |

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to <u>FL-6, "Removal and Installation"</u>.

NO >> Repair or replace.

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

12. CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to <u>EC-14, "BASIC INSPECTION : Special Repair Requirement"</u>. For specification, refer to <u>EC-598, "Idle Speed"</u> and <u>EC-598, "Ignition Timing"</u>.

Is the inspection result normal?

YES >> GO TO 13.

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

13. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect corresponding A/F sensor 1 harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| A/F sensor 1 | | | EC | Continuity | | |
|--------------|-----------|----------|-----------|------------|------------|---------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| 1 | F3 | 1 | | 57 | | |
| | | 15 | 2 | F102 | 61 | Existed |
| 2 | F20 | E20 | 1 | | 65 | LAISIEU |
| | | 2 | | 66 | | |

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

| A/F sensor 1 | | | Ground | Continuity |
|--------------|-----------|----------|--------|-------------|
| Bank | Connector | Terminal | Ground | Continuity |
| 1 | F3 | 1 | Ground | Not existed |
| | | 2 | | |
| 2 | F20 | 1 | | |
| | | 2 | | |

| | ECM | Ground | Continuity | |
|------|-----------|----------|------------|-------------|
| Bank | Connector | Terminal | Giouna | Continuity |
| 1 | F102 | 57 | Ground | Not existed |
| | | 61 | | |
| 2 | | 65 | | |
| | | 66 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.

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

14.CHECK A/F SENSOR 1 HEATER

Refer to EC-174, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace (malfunctioning) A/F sensor 1. Refer to EM-34, "Exploded View".

15.CHECK MASS AIR FLOW SENSOR

With CONSULT

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT.

For specification, refer to EC-598, "Mass Air Flow Sensor".

With GST

EC-288

D0200 D0204 D0202 D0202 D0204 D0205 D0206 MISSIDE

| P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE | |
|---|-------------------|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to <u>EC-598, "Mass Air Flow Sensor"</u> . | A |
| Is the measurement value within the specification? | |
| YES >> GO TO 16. NO >> Check connectors for rusted terminals or loose connections in the mass air flow sen ground. Refer to <u>EC-188, "Diagnosis Procedure"</u>. | sor circuit or EC |
| 16.CHECK SYMPTOM TABLE | |
| Check items on the rough idle symptom in EC-583, "Symptom Table". | С |
| Is the inspection result normal? | |
| YES >> GO TO 17. | D |
| 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 <u>EC-134, "On Best Struction"</u> or <u>EC-138, "CONSULT Function"</u> . | E Dard Diagno- |
| | F |
| >> GO TO 18. | |
| 18. CHECK INTERMITTENT INCIDENT | |
| Refer to GI-42, "Intermittent Incident". | G |
| | |
| >> INSPECTION END | Н |
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< DTC/CIRCUIT DIAGNOSIS >

P0327, P0328, P0332, P0333 KS

Description

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

DTC Logic

INFOID:000000008156346

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detected condition | Possible cause |
|---------|---|---|--|
| P0327 | Knock sensor (bank 1) circuit low input | An excessively low voltage from the sensor is sent to ECM. | |
| P0328 | Knock sensor (bank 1) circuit high input | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) |
| P0332 | Knock sensor (bank 2) circuit low input | An excessively low voltage from the sensor is sent to ECM. | Knock sensor |
| P0333 | Knock sensor (bank 2) circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

- YES >> Go to EC-290, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

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INFOID:00000008156345

P0327, P0328, P0332, P0333 KS

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| DTC | | Knock sense | or | EC | M | Continuit | |
|--|--|--|----------------------------------|-------------|------------|-------------|-------------------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0327, P0328 | 1 | F203 | 2 | F102 | 72 | Eviated | |
| P0332, P0333 | 2 | F202 | 2 | F 102 | 12 | Existed | |
| 3. Also chec | k harne | ess for shor | t to powe | r. | | | |
| s the inspection | | | | | | | |
| | O TO 4 | | | | | | |
| NO >> G 3. DETECT M | | | | | | | |
| | | | PARI | | | | |
| Check the follo Harness cor | | s F9. F201 | | | | | |
| Harness for | | | veen kno | ck sensor a | and ECM | | |
| | | | | | | | |
| | • | pen circuit (| | • | | | |
| 4.CHECK KN | IOCK S | SENSOR IN | IPUT SIG | NAL CIRC | UIT FOR | OPEN AN | RT |
| 1. Check the | contin | uity betwee | en knock | sensor har | ness conr | ector and | arness connector. |
| | | | | | 1 | | |
| DTC | | Knock sens | - | EC | | Continuity | |
| | Bank | Connector | Terminal | Connector | Terminal | | |
| P0327, P0328 | 1 | F203 | 1 | F102 | 73 | Existed | |
| P0332, P0333 | 2 | F202 | 1 | | 69 | | |
| | | ess for shor | t to grour | nd and sho | rt to powe | r. | |
| s the inspecti | | | | | | | |
| | О ТО 6 О ТО 5 | | | | | | |
| 5.DETECT M | | | G PART | | | | |
| Check the follo | | | | | | | |
| Harness cor | nector | | | | | | |
| | open o | r short betv | veen ECN | /I and knoo | k sensor | | |
| Harness for | | | | | | | |
| | | | 1 | | | | |
| >> R | | • | short to g | pround or s | hort to po | wer in harr | connectors. |
| 6.CHECK KN | | SENSOR | | | hort to po | wer in harr | connectors. |
| >> R 6.CHECK KN Refer to <u>EC-2</u> | IOCK 8 | SENSOR | | | hort to po | wer in harr | connectors. |
| >> R 6.CHECK KN Refer to <u>EC-2</u> Is the inspection | IOCK S 91, "Co on resu | SENSOR | | | hort to po | wer in harr | connectors. |
| >> R 6.CHECK KN Refer to <u>EC-2</u> Is the inspection YES >> G | IOCK S 91, "Co on resu O TO 7 | SENSOR omponent Ir ult normal? | nspection | - - | | | |
| >> R 6.CHECK KN Refer to EC-2 Is the inspection YES >> G NO >> R | OCK S 91. "Co on resu O TO 7 eplace | SENSOR omponent Ir ult normal? 7 malfunctior | nspection | - - | | | |
| >> R $\mathbf{\hat{0}}$.CHECK KN Refer to <u>EC-2</u> is the inspection YES >> G NO >> R $\mathbf{\hat{0}}$.CHECK IN | IOCK S 91. "Co on resu O TO 7 eplace TERMI | SENSOR <u>omponent Ir</u> <u>ult normal?</u> 7. malfunctior TTENT INC | nspection ning knoc CIDENT | - - | | | |
| >> R 6.CHECK KN Refer to EC-2 Is the inspection YES >> G NO >> R 7.CHECK IN | IOCK S 91. "Co on resu O TO 7 eplace TERMI | SENSOR <u>omponent Ir</u> <u>ult normal?</u> 7. malfunctior TTENT INC | nspection ning knoc CIDENT | - - | | | |
| >> R 6.CHECK KN Refer to <u>EC-2</u> Is the inspection YES >> G NO >> R 7.CHECK IN Refer to <u>GI-42</u> | NOCK S 91, "Co on resu O TO 7 eplace TERMI | SENSOR omponent Ir ult normal? 7 malfunctior TTENT INC mittent Inci | nspection ning knoc CIDENT | - - | | | |
| >> R 6.CHECK KN Refer to <u>EC-2</u> Is the inspection YES >> G NO >> R 7.CHECK IN Refer to <u>GI-42</u> >> IN | NOCK S 91. "Co on resu O TO 7 eplace TERMI c, "Inter | SENSOR pmponent Ir ult normal? 7. malfunctior TTENT INC mittent Inci- TION END | nspection ning knoc CIDENT | - - | | | View". |
| >> R 6.CHECK KN Refer to <u>EC-2</u> Is the inspection YES >> G NO >> R 7.CHECK IN Refer to <u>GI-42</u> >> IN | NOCK S 91. "Co on resu O TO 7 eplace TERMI c, "Inter | SENSOR pmponent Ir ult normal? 7. malfunctior TTENT INC mittent Inci- TION END | nspection ning knoc CIDENT | - - | | | |
| >> R 6.CHECK KN Refer to <u>EC-2</u> Is the inspection YES >> G NO >> R 7.CHECK IN Refer to <u>GI-42</u> | IOCK S 91, "Co on resu O TO 7 eplace TERMI TERMI ISPEC ISPEC | SENSOR mponent Ir ult normal? malfunctior TTENT INC mittent Inci TION END pection | nspection ning knoc CIDENT | - - | | | View". |

2. Disconnect knock sensor harness connector.

3. Check resistance between knock sensor terminals as per the following. **NOTE:**

< DTC/CIRCUIT DIAGNOSIS >

It is necessary to use an ohmmeter which can measure more than 10 M $\!\Omega.$

| Terminals | Posistones (I/O) |
|-----------|------------------------------------|
| Terminais | Resistance ($k\Omega$) |
| 1 and 2 | Approx. 532 - 588 [at 20°C (68°F)] |

CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning knock sensor. Refer to <u>EM-111, "Exploded View"</u>.

< DTC/CIRCUIT DIAGNOSIS >

P0335 CKP SENSOR (POS)

Description

The crankshaft position sensor (POS) is located on the cylinder block facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

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

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

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

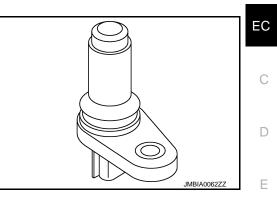
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.

Camshaft position sensor (PHASE)

Crankshaft position

sensor (POS)



720

(bank 1) Camshaft position sensor (PHASE) (bank 2)

DTC Logic

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DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0335 | Crankshaft position sen- sor (POS) circuit | The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. The crankshaft position sensor (POS) signal is not in the normal pattern during engine run- ning. | Harness or connectors [CKP sensor (POS) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) Crankshaft position sensor (POS) Accelerator pedal position sensor EVAP control system pressure sensor Refrigerant pressure sensor Brake booster pressure sensor Signal plate |

NOTE: Camshaft position sensor (PHASE) signal timing varies with intake valve timing control.

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

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< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000008156351

>> 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-294, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

- 1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between CKP sensor (POS) harness connector and ground.

| CKP sen | sor (POS) | Ground | Voltage (V) |
|-----------|-----------|---------|-------------|
| Connector | Terminal | Giodila | voltage (v) |
| F2 | 1 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

${f 3.}$ CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch ON.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sens | or (POS) | EC | Continuity | |
|-----------|----------|-----------|------------|---------|
| Connector | Terminal | Connector | Continuity | |
| F2 | 1 | F101 | 46 | Existed |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

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

| E | CM | Sensor | | |
|-----------|----------|-------------------------------|-----------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 |
| 1 101 | 46 | CKP sensor (POS) | F2 | I |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | CM | | | Sensor | | | |
|---|---|--|--|---|-------------------------|-------------------|------------------------|
| Connector | Terminal | | Name | | Connector | Terminal | |
| | 103 | APP senso | ſ | | E112 | 6 | |
| M107 | 407 | EVAP contr | ol system pressure | sensor | B30 | 3 | |
| | 107 | Refrigerant | pressure sensor | | E77 | 3 | |
| Is the insp | ection res | ult normal? | | l | | | |
| | > GO TO > Repair s | | und or short to j | power in h | arness or | connectors | |
| 5.снеск | | NENTS | | | | | |
| EVAP co Refrigeration Is the inspective | ooster pres ontrol syste ant pressu ection res | em pressur re sensor (<u>ult normal?</u> | or (Refer to <u>EC-</u> e sensor (Refer Refer to <u>EC-53</u> | r to <u>EC-330</u> | 0, "Compo | nent Inspe | ction".) |
| NO >: | • | malfunctio | ning componer | nt. | | | |
| 6.CHECK | | | | | | | |
| | | | nspection". | | | | |
| | | ult normal? | | | | | |
| | > GO TO [•] > GO TO [•] | | | | | | |
| _ | | | | | | | |
| | | | PEDAL ASSEN | | | | |
| | | | assembly. Refe pair Requireme | | <u>3, "Explod</u> | <u>ed View"</u> . | |
| 2. 6010 | <u>LU-404,</u> | <u>opecial Ne</u> | <u>ball Requireme</u> | <u>III.</u> . | | | |
| > | > INSPEC | | 1 | | | | |
| • | | | S) GROUND C | | | | 9Т |
| | | | o) oncome of | | | | |
| | gnition swi | 1 harness of | connector. | | | | |
| | | | | [,] (POS) ha | rness con | nector and | ECM harness connector. |
| | | | | | | | |
| | sor (POS) | | | | | | |
| CKP sens | | EC | | | | | |
| CKP sens | Terminal | EC Connector | M Terminal Conti | inuity | | | |
| | . , | | Conti | | | | |
| Connector F2 | Terminal 2 | Connector F101 | Terminal | sted | power. | | |
| Connector F2 4. Also c | Terminal 2 heck harn | Connector F101 | Terminal Conti 47 Exis rt to ground and | sted | power. | | |
| Connector F2 4. Also c Is the inspective YES >: | Terminal 2 heck harn ection rest | Connector F101 ess for sho ult normal? 9. | Terminal Conti 47 Exis rt to ground and | d short to p | | | |
| Connector F2 4. Also c Is the inspo YES >: NO >: | Terminal 2 heck harn ection resi > GO TO > Repair c | Connector F101 ess for shc <u>ult normal?</u> 9. pen circuit | Terminal 47 Exis rt to ground and , short to groun | d short to p | to power i | | |
| Connector F2 4. Also c Is the inspo YES >: NO >: | Terminal 2 heck harn ection resi > GO TO > Repair c | Connector F101 ess for shc <u>ult normal?</u> 9. pen circuit | Terminal Conti 47 Exis rt to ground and | d short to p | to power i | | |
| Connector F2 4. Also c Is the insp YES >: NO >: 9.CHECK | Terminal 2 heck harn ection res > GO TO > Repair of CKP SEI | Connector F101 ess for sho <u>ult normal?</u> 9. open circuit NSOR (PO | Terminal 47 Exis rt to ground and , short to ground S) INPUT SIGN | d short to p d or short t | to power i JIT FOR (| PEN AND | SHORT |
| Connector F2 4. Also c Is the insp YES >: NO >: 9.CHECK | Terminal 2 heck harn ection res > GO TO > Repair of CKP SEI | Connector F101 ess for sho <u>ult normal?</u> 9. open circuit NSOR (PO | Terminal 47 Exis rt to ground and , short to ground S) INPUT SIGN | d short to p d or short t | to power i JIT FOR (| PEN AND | |
| Connector F2 4. Also c Is the insp YES >: NO >: 9.CHECK | Terminal 2 heck harn ection rest > GO TO 9 > Repair c CKP SEI the contin | Connector F101 ess for sho <u>ult normal?</u> 9. open circuit NSOR (PO | Terminal 47 Exis rt to ground and , short to ground S) INPUT SIGN en CKP sensor | d short to p d or short t IAL CIRCL (POS) ha | to power i JIT FOR (| PEN AND | SHORT |

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

37

F101

Is the inspection result normal?

3

YES >> GO TO 10.

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

Existed

F2

EC-295

< DTC/CIRCUIT DIAGNOSIS >

10.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-296. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace crankshaft position sensor (POS). Refer to <u>EM-111, "Exploded View"</u>.

11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace the signal plate. Refer to <u>EM-50, "Removal and Installation"</u>.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

>> INSPECTION END

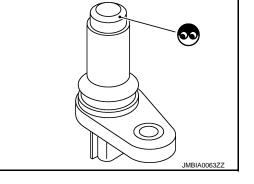
Component Inspection

1.CHECK CRANKSHAFT POSITION SENSOR (POS)-I

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

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace crankshaft position sensor (POS). Refer to <u>EM-</u> 50, "Removal and Installation".



[VQ37VHR

INFOID:00000008156352

2. CHECK CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as follows.

| Terminals (Polarity) | Resistance (Ω) |
|----------------------|---------------------------------------|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS). Refer to EM-50, "Removal and Installation".

S.

< DTC/CIRCUIT DIAGNOSIS >

P0340, P0345 CMP SENSOR (PHASE)

Description

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.

Crankshaft angle Camshaft position sensor (PHASE) (bank 1) Camshaft position sensor (PHASE) (bank 2)

Crankshaft position sensor (POS)

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 or P0345 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-380, "DTC Logic"</u>.

NOTE: Camshaft position sensor (PHASE) signal timing varies with intake valve timing control.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|--|---|---|
| P0340 | Camshaft position sen- sor (PHASE) (bank 1) circuit | The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. The cylinder No. signal is not sent to ECM | Harness or connectors [CMP sensor (PHASE) (bank 1) circuit is open or shorted.] Camshaft position sensor (PHASE) (bank 1) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery | L |
| P0345 | Camshaft position sen- sor (PHASE) (bank 2) circuit | during engine running. The cylinder No. signal is not in the normal pattern during engine running. | Harness or connectors [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] Camshaft position sensor (PHASE) (bank 2) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery | C |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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



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< DTC/CIRCUIT DIAGNOSIS >

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

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

 Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-298, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Maintaining engine speed at more than 800 rpm for at least 5 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-298, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.

NO >> Check starting system. (Refer to <u>EC-9, "Work Flow"</u>.)

2. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

 $\mathbf{3.}$ CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.

2. Turn ignition switch ON.

3. Check the voltage between CMP sensor (PHASE) harness connector and ground.

| DTC | С | MP sensor (P | HASE) | Ground | Voltage (V) |
|-------|------|--------------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Giouna | vollage (v) |
| P0340 | 1 | F5 | 1 | Ground | Approx. 5 |
| P0345 | 2 | F18 | 1 | Ground | Applox. 5 |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

${f 4.}$ CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

EC-298

INFOID:000000008156355

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | C | /IP sensor (Pl | HASE) | EC | CM | | |
|-----------------|------------------|----------------------|-------------|----------------|-------------|-----------------|--|
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0340 | 1 | F5 | 2 | | 96 | | |
| P0345 | 2 | F18 | 2 | F102 | 92 | Existed | |
| 4. Also c | heck ha | arness for s | short to gi | round and | short to po | ower. | |
| | | esult norm | - | | | | |
| - | > GO T | | | | | | |
| - | • | ir or replac | | • | | | |
| D. CHECK | CMP | SENSOR (| PHASE) I | NPUT SIG | | CUIT FOR | OPEN AND SHORT |
| . Check | the co | ntinuity bet | ween CM | IP sensor (| (PHASE) ł | harness coi | nnector and ECM harness connector. |
| | i | | | 1 | | | |
| DTC | CN | /IP sensor (Pl | HASE) | EC | CM | Continuity | |
| - | Bank | Connector | Terminal | Connector | Terminal | | |
| P0340 | 1 | F5 | 3 | F102 | 59 | Existed | |
| P0345 | 2 | F18 | 3 | | 63 | | |
| | | arness for s | - | round and | short to po | ower. | |
| - | | esult norm | <u>al?</u> | | | | |
| | > GO T > Rena | O 6. ir or replac | a arror-de | stacted nor | te | | |
| | • | - | | • | | | |
| | | | | | TASE) | | |
| | | Compone | - | <u>tion"</u> . | | | |
| | > GO T | esult norm | <u>ar:</u> | | | | |
| | | | ctioning c | amshaft po | osition ser | nsor (PHAS | E). Refer to <u>EM-49, "Exploded View"</u> . |
| - | | HAFT (IN | | | | , | |
| heck the | | • | , | | | | |
| Accumul | ation of | debris to t | | | amshaft fro | ont end | |
| 11 0 | • | plate of ca | | ont end | | | 22 N Querra |
| | | esult norm | <u>al?</u> | | | | A M ON Z |
| | > GO T > Rem(| | and clea | n the sign | al nlate of | f camshaft | |
| NO 2. | | | | | | o <u>EM-84.</u> | JMBIA0962ZZ |
| | | oded View' | | | | | |
| | | | | | | | |
| | | | | | | | and the second |
| 、 | | | | | | | JMBIA0962ZZ |
| S.CHECK | INTE | RMITTENT | INCIDEN | IT | | | |
| efer to G | I-42, "Ir | ntermittent | Incident". | | | | |
| | | | | | | | |
| | > INSP | ECTION E | ND | | | | |
| >: | | | | | | | |
| | ent Ir | spectior | ۱ | | | | INFOID:00000008156356 |
| Compon | | SPECtion | | | ομασει-ι | | INFOID:00000008156356 |

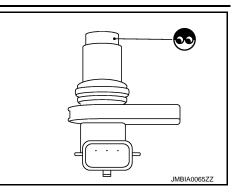
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor (PHASE) harness connector.
- 4. Remove the sensor.



< DTC/CIRCUIT DIAGNOSIS >

5. Visually check the sensor for chipping.

- Is the inspection result normal?
- YES >> GO TO 2.
- NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to <u>EM-49, "Exploded View"</u>.



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

| Terminals (Polarity) | Resistance (Ω) |
|----------------------|---------------------------------------|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-49, "Exploded View".

< DTC/CIRCUIT DIAGNOSIS >

P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

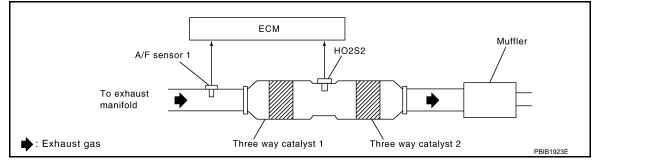
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[VQ37VHR]

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2. A three way catalyst 1 with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst 1 malfunction is diagnosed.



| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | - |
|---------|---|---|--|---|
| P0420 | Catalyst system efficiency below threshold (bank 1) | Three way catalyst (manifold) does not op- | Three way catalyst (manifold)Exhaust tube | Н |
| P0430 | Catalyst system efficiency below threshold (bank 2) | erate properly.Three way catalyst (manifold) does not have enough oxygen storage capacity. | Intake air leaks Fuel injector Fuel injector leaks Spark plug Improper ignition timing | I |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2. NO >> GO TO 7.

2. PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

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

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< DTC/CIRCUIT DIAGNOSIS >

- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F). 9. Open engine hood.
- 10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT.
- 11. Rev engine up to about 2,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
- 12. Check the indication of "CATALYST".

Which is displayed on CONSULT screen?

CMPLT >> GO TO 6. INCMP >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Wait 5 seconds at idle.

 Rev engine up to about 2,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).

Does the indication change to "CMPLT"?

YES >> GO TO 6.

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).

2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

6.PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-303, "Diagnosis Procedure".

NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-302, "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-303, "Diagnosis Procedure".

Component Function Check

INFOID:000000008156358

1.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | ECM | | | |
|-------------------------|--------------------------------|--|----------------------|--|--|
| DTC | | + | - | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0420 | F102 | 76 [HO2S2 (bank 1)] 80 | - 84 | Keeping engine speed at 2,500 rpm constant under no load | The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: $0.6 - 1.0 \rightarrow 0 - 0.3 \rightarrow 0.6 - 1.0$ |
| P0430 | | [HO2S2 (bank 2)] | | | |
| Is the in | spection re | sult normal? | • | | · · · · · · · · · · · · · · · · · · · |
| YES NO | | CTION END | | oduro" | |
| | osis Proc | <u>EC-303, "Dia</u> 2014 - 2015 - 2 | | edure | |
| | | | | | INFOID:00000008156359 |
| 1. CHE | CK EXHAU | IST SYSTEM | Л | | |
| - | | aust tubes ai | | r dents. | |
| <u>Is the in</u> YES | <u>spection re</u> >> GO TC | sult normal? | | | |
| NO | >> Repair | or replace. | | | |
| 2.сне | CK EXHAU | IST GAS LE | AK | | |
| | | nd run it at id | | | |
| 2. List | ten for an ex | knaust gas le | eak before th | he three way catalyst 1. | |
| | ➡: Exhaust | A/F sen To exhau manifold gas | | Three way catalyst 1 HO2S2 | Atalyst 2 Muffler PBIB1922E |
| <u>Is exha</u> | ust gas leak | detected? | | | , SISTOLL |
| YES NO | >> Repair >> GO TC | or replace. | | | |
| _ | | AIR LEAK | | | |
| | | | r the mass a | air flow sensor. | |
| | e air leak de | | | | |
| YES NO | >> Repair >> GO TC | or replace. | | | |
| | | PEED AND I | IGNITION T | MING | |
| - | | | | PECTION : Special Repair Requ | uirement". |
| For spe | cification, re | efer to EC-59 | <u>98, "Idle Spe</u> | ed" and EC-598, "Ignition Timin | |
| | | <u>sult normal?</u> | | | |
| YES NO | >> GO TC >> Follow | | <u>'BASIC</u> INSI | PECTION : Special Repair Requ | uirement". |
| 5. CHE | | VJECTORS | | | |
| | | d then turn i | anition switc | h ON. | |

1. Stop engine and then turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals as per the following.

< DTC/CIRCUIT DIAGNOSIS >

| ECM | | | | | |
|----------|--|---|---|--|--|
| F | _ | | Voltage | | |
| Terminal | Connector | Terminal | | | |
| 81 | | 128 | Battery voltage | | |
| 82 | - M107 | | | | |
| 85 | | | | | |
| 86 | | | | | |
| 89 | | | | | |
| 90 | | | | | |
| | + Terminal 81 82 85 86 89 | + Connector 81 82 85 86 89 | Terminal Connector Terminal 81 82 85 86 | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform EC-507, "Diagnosis Procedure".

6.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

- Turn ignition switch OFF. 1.
- Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pres-2. sure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 -0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

• During the operation, always stay 0.5 m (1.6 ft) or more away from the sparke plug and ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.

 It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

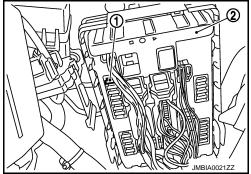
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

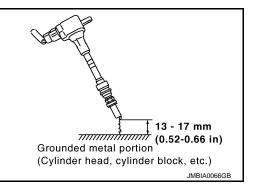
Is the inspection result normal?

>> GO TO 10. YES NO >> GO TO 7.

7.CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.





< DTC/CIRCUIT DIAGNOSIS >

- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and A the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

YES >> GO TO 8.

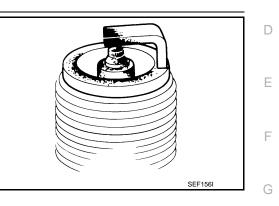
NO >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-518</u>, "Diagnosis Procedure".

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 <u>EM-17, "Inspection"</u>.
- NO >> Repair or clean spark plug. Then GO TO 9.



9. 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 | Н |
|---|-----|
| 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 <u>EM-16, "Removal</u> <u>and Installation"</u> . | J |
| 10. CHECK FUEL INJECTOR | |
| 1. Turn ignition switch OFF. | Κ |
| Remove fuel injector assembly. Refer to <u>EM-37, "Removal and Installation"</u>. | |
| Keep fuel hose and all fuel injectors connected to fuel tube. | L |
| Disconnect all ignition coil harness connectors. Reconnect all fuel injector harness connectors disconnected. | |
| 5. Turn ignition switch ON. | M |
| 6. Check that fuel does not drip from fuel injector. | IVI |
| Does fuel drip from fuel injector? | |
| YES >> Replace the fuel injector(s) from which fuel is dripping. Refer to EM-37, "Removal and Installa- | Ν |
| NO $>>$ GO TO 11. | |
| 11. CHECK INTERMITTENT INCIDENT | |
| | 0 |
| Refer to <u>GI-42, "Intermittent Incident"</u> . | |
| Is the inspection result normal? | P |
| YES >> Replace three way catalyst assembly. Refer to EM-34, "Exploded View". | Ρ |

NO >> Repair or replace harness or connector.

[VQ37VHR]

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< DTC/CIRCUIT DIAGNOSIS >

P0441 EVAP CONTROL SYSTEM

DTC Logic

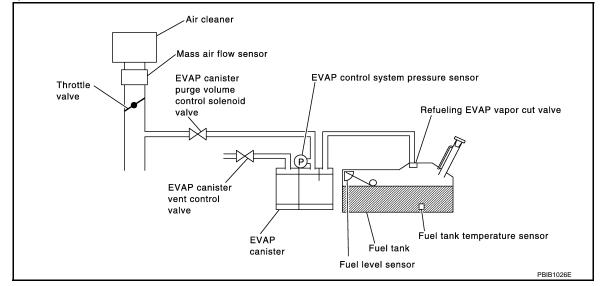
DTC DETECTION LOGIC

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 proper- ly, EVAP control system has a leak between in- take manifold and EVAP control system pressure sensor. | EVAP canister purge volume control solenoid valve stuck closed EVAP control system pressure sensor and the circuit Loose, disconnected or improper connection of rubber tube Blocked rubber tube Cracked EVAP canister EVAP canister purge volume control solenoid valve circuit Accelerator pedal position sensor Blocked purge port EVAP canister vent control valve |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2. PRECONDITIONING

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

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

EC-306

INFOID:000000008156360

P0441 EVAP CONTROL SYSTEM [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. А **TESTING CONDITION:** Always perform test at a temperature of 5°C (41°F) or more. EC >> GO TO 3. 3. perform dtc confirmation procedure-i With CONSULT 1. Start engine and warm it up to normal operating temperature. Turn ignition switch OFF and wait at least 10 seconds. 2. D 3. Turn ignition switch ON. 4. Turn ignition switch OFF and wait at least 10 seconds. 5. Start engine and let it idle for at least 70 seconds. 6. Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CON-E SULT. Touch "START". 7. Is "COMPLETED" displayed on CONSULT screen? F YES >> GO TO 5. NO >> GO TO 4. 4.PERFORM DTC CONFIRMATION PROCEDURE-II When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.) Н Selector lever Suitable position VHCL SPEED SE 32 - 120 km/h (20 - 75 mph) ENG SPEED 500 - 3,000 rpm **B/FUEL SCHDL** 1.3 - 9.0 msec COOLAN TEMP/S More than 0°C (32°F) **CAUTION:** Always drive vehicle at a safe speed. Is "COMPLETED" displayed on CONSULT screen? Κ YES >> GO TO 5. NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3. 5. PERFORM DTC CONFIRMATION PROCEDURE-III L Touch "SELF-DIAG RESULTS". Which is displayed on CONSULT screen? M OK >> INSPECTION END NG >> Go to EC-308, "Diagnosis Procedure". **6.**PERFORM COMPONENT FUNCTION CHECK Ν Perform component function check. Refer to EC-307, "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? Ρ YES >> INSPECTION END NO >> Go to EC-308, "Diagnosis Procedure". Component Function Check INFOID:000000008156361 **1.**PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Lift up drive wheels.

< DTC/CIRCUIT DIAGNOSIS >

- 2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and wait at least 70 seconds.
- 7. Set voltmeter probes to ECM harness connector terminals as per the following.

| ECM | | | | |
|-----------|---|----------|--|--|
| Connector | + | - | | |
| Connector | Terminal | Terminal | | |
| M107 | 102 (EVAP control system pressure sensor signal) | 112 | | |

8. Check EVAP control system pressure sensor value at idle speed and note it.

9. Establish and maintain the following conditions for at least 1 minute.

| Air conditioner switch | ON |
|-----------------------------|-----------------------------------|
| Headlamp switch | ON |
| Rear window defogger switch | ON |
| Engine speed | Approx. 3,000 rpm |
| Gear position | Any position other than P, N or R |

10. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 8) for at least 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-308, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000008156362

1.CHECK EVAP CANISTER

- 1. Turn ignition switch OFF.
- 2. Check EVAP canister for cracks.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 2.
- YES-2 >> Without CONSULT: GO TO 3.

NO >> Replace EVAP canister. Refer to <u>FL-14. "Removal and Installation"</u>.

2. CHECK PURGE FLOW

With CONSULT

- Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port.
- 2. Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
- Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check vacuum existence.

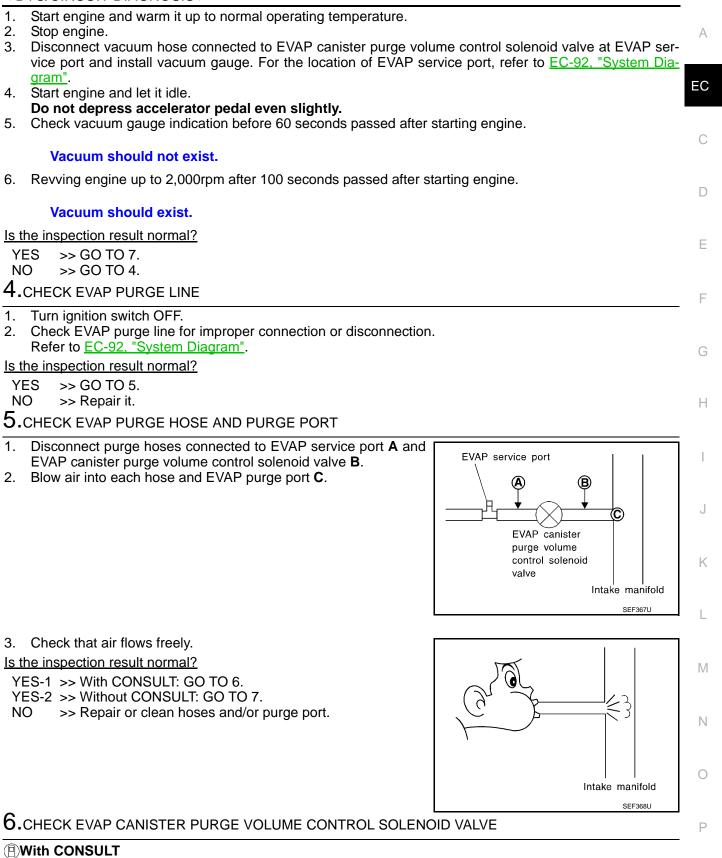
| Vacuum |
|-------------|
| Existed |
| Not existed |
| |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 4. **3.**CHECK PURGE FLOW

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



1. Start engine.

2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-314, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14</u>, "Exploded View".

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-331, "DTC Logic" for DTC P0452, EC-336, "DTC Logic" for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u>.

10.CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Clean the rubber tube using an air blower.

11.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-321, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-14</u>, "Exploded View".

12.CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to EC-92, "System Diagram".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace it.

13.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

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

DTC Logic

DTC DETECTION LOGIC

DTC No. DTC detecting condition Possible cause Trouble diagnosis name · EVAP control system pressure sensor · EVAP canister purge volume control solenoid valve The canister purge flow is detected during the EVAP canister purge (The valve is stuck open.) specified driving conditions, even when EVAP · EVAP canister vent control valve P0443 volume control solenoid canister purge volume control solenoid valve is valve EVAP canister completely closed. Hoses (Hoses are connected incorrectly or clogged.) DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING If DTC Confirmation Procedure has been previously conducted, always perform the following procedure Κ before conducting the next test. 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. L **TESTING CONDITION:** Always perform test at a temperature of 5°C (41°F) or more. Do you have CONSULT M YES >> GO TO 2. NO >> GO TO 3. 2. PERFORM DTC CONFIRMATION PROCEDURE Ν

(P)With CONSULT

- 1. 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. 3.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- 6. Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 7. Touch "START".
- Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take approxi-8 mately 10 seconds.)
 - If "TESTING" is not displayed after 5 minutes, retry from step 2.
- Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

EC-311

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P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

OK >> INSPECTION END NG >> Go to <u>EC-312, "Diagnosis Procedure"</u>.

3.PERFORM DTC CONFIRMATION PROCEDURE

With GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and let it idle for at least 20 seconds.
- 6. Check 1st trip DTC.

Is 1st trip DTC displayed?

YES >> Go to EC-312, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

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[VQ37VHR]

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| EVAP canister purge volum | Ground | Voltage | |
|---------------------------|--------|---------|-----------------|
| Connector | Ground | | |
| F7 | 1 | Ground | Battery voltage |

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| EVAP canister purge volum | EC | Continuity | | |
|---------------------------|----------|------------|----------|---------|
| Connector | Terminal | Connector | Terminal | |
| F7 | 2 | F101 | 21 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|----------------|
| Check the following. | |
| Harness connectors F104, F105 Harness for open or short between EVAP canister purge volume control solenoid valve and E | CM A |
| Thankss for open of short between E vitre canister parge volume control solehold valve and E | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. | EC |
| 5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR | |
| 1. Disconnect EVAP control system pressure sensor harness connector. | C |
| 2. Check connectors for water. | |
| Water should not exist. | |
| Is the inspection result normal? | D |
| YES >> GO TO 6. | |
| NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u> . | E |
| 6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR | |
| Refer to <u>EC-330, "Component Inspection"</u> . | F |
| <u>Is the inspection result normal?</u> YES-1 >> With CONSULT: GO TO 7. | I |
| YES-2 >> Without CONSULT: GO TO 8. | |
| NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u> . | C |
| .CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE | |
| | ŀ |
| Turn ignition switch OFF. Reconnect harness connectors disconnected. | |
| 3. Start engine. | |
| Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine according to the valve opening. | e speed varies |
| Does engine speed vary according to the valve opening? | |
| YES >> GO TO 9. | |
| NO >> GO TO 8. | |
| 8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE | ŀ |
| Refer to EC-314. "Component Inspection". | |
| Is the inspection result normal? | |
| YES >> GO TO 9. NO >> Replace EVAP canister purge volume control solenoid valve. | L |
| 9. CHECK RUBBER TUBE FOR CLOGGING | |
| Disconnect rubber tube connected to EVAP canister vent control valve. | |
| 2. Check the rubber tube for clogging. | |
| Is the inspection result normal? | Γ |
| YES >> GO TO 10. | 1 |
| NO >> Clean the rubber tube using an air blower. | |
| 10.CHECK EVAP CANISTER VENT CONTROL VALVE | (|
| Refer to <u>EC-321, "Component Inspection"</u> . | |
| <u>Is the inspection result normal?</u> YES >> GO TO 11. | F |
| NO >> Replace EVAP canister vent control valve. Refer to <u>FL-14, "Exploded View"</u> . | |
| 11.CHECK IF EVAP CANISTER IS SATURATED WITH WATER | |
| 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pr | ressure sensor |

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

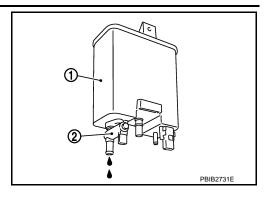
P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

- 2. Check if water will drain from EVAP canister (1).
 - 2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 12. NO >> GO TO 14.



[VQ37VHR]

12.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-14, "Removal and Installation".

14. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

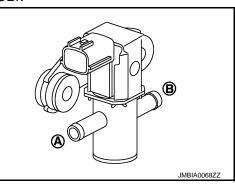
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1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Turn ignition switch ON.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
- Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|--|
| 100% | Existed |
| 0% | Not existed |



Without CONSULT

- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE [VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following 4. conditions.

| Condition | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |

Is the inspection result normal?

>> INSPECTION END YES

NO >> Replace EVAP canister purge volume control solenoid valve EC

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P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

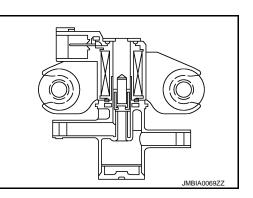
[VQ37VHR]

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P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

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



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DTC Logic

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 so- lenoid 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 so- lenoid valve |

DTC CONFIRMATION PROCEDURE

1.CONDITIONING

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

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- **TESTING CONDITION:**

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 13 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-316, "Diagnosis Procedure".
- NO >> INSPECTION END

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.
- 3. Turn ignition switch ON.

EC-316

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the voltage between EVAP canister purge volume control solenoid valve harness connector and 4 ground. А EVAP canister purge volume control solenoid valve EC Ground Voltage Connector Terminal F7 1 Ground Battery voltage Is the inspection result normal? YES >> GO TO 3. NO >> GO TO 2. D 2.DETECT MALFUNCTIONING PART Check the following. Harness connectors E106, M6 Е Harness connectors M116, F103 Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R Harness for open or short between EVAP canister purge volume control solenoid valve and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. Н Disconnect ECM harness connector. 2. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and 3. ECM harness connector. EVAP canister purge vol-ECM ume control solenoid valve Continuity Terminal Connector Connector Terminal 2 F101 F7 21 Existed 4. Also check harness for short to ground and short to power. Κ Is the inspection result normal? YES-1 >> With CONSULT: GO TO 5. YES-2 >> Without CONSULT: GO TO 6. NO >> GO TO 4. 4. DETECT MALFUNCTIONING PART Check the following. Μ Harness connectors F104, F105 Harness for open or short between EVAP canister purge volume control solenoid valve and ECM Ν >> Repair open circuit, short to ground or short to power in harness or connectors. 5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION With CONSULT Reconnect all harness connectors disconnected. 1. 2. Start engine. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies Ρ 3. according to the valve opening. Does engine speed vary according to the valve opening? YES >> GO TO 7. NO >> GO TO 6. **O**.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-318, "Component Inspection".

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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<u>Is the inspection result normal?</u> YES >> GO TO 7.

NO >> Replace EVAP canister purge volume control solenoid valve.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

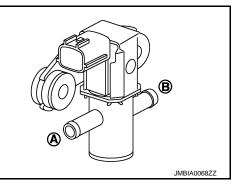
Component Inspection

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Turn ignition switch ON.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
- Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|--|
| 100% | Existed |
| 0% | Not existed |



Without CONSULT

- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve

< DTC/CIRCUIT DIAGNOSIS >

P0447 EVAP CANISTER VENT CONTROL VALVE

Description

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

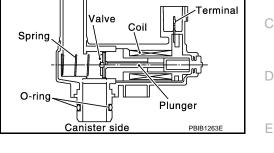
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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



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| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | G |
|---------|--|---|---|---|
| P0447 | EVAP canister vent con- trol 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 | Н |
| | | | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

Start engine and wait at least 8 seconds. 1.

Check 1st trip DTC. 2.

Is 1st trip DTC detected?

YES >> Go to EC-319, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YFS >> GO TO 2. NO >> GO TO 3.

 ${
m 2.}$ CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

(P)With CONSULT

1. Turn ignition switch OFF and then ON.

2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

EC-319

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[VQ37VHR]

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< DTC/CIRCUIT DIAGNOSIS >

- 3. Touch "ON/OFF" on CONSULT screen.
- 4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect EVAP canister vent control valve harness connector.

- 3. Turn ignition switch ON.
- 4. Check the voltage between EVAP canister vent control valve harness connector and ground.

| EVAP canister vent con- trol valve | | Ground | Voltage |
|---------------------------------------|----------|--------|-----------------|
| Connector | Terminal | | |
| B31 | 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 E3, F1

• Harness connectors F103, M116

- Harness connectors M7, B1
- Harness for open or short between EVAP canister vent control valve and IPDM E/R

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

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 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 | |
| B31 | 2 | M107 | 121 | Existed |

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1, M7

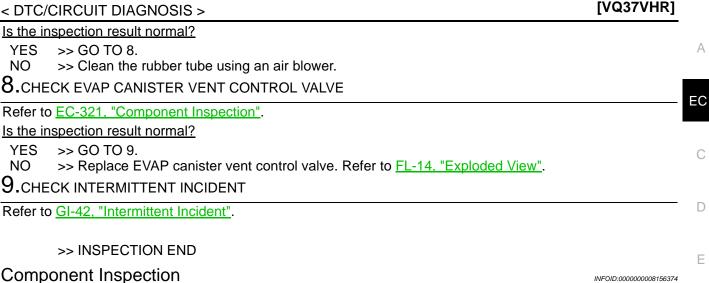
Harness for open or short between EVAP canister vent control valve and ECM

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

7.CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

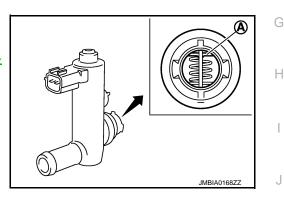


1.CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister.
- 3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to <u>FL-</u> <u>14, "Exploded View"</u>.
- NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT

- 1. Reconnect harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- 4. Check air passage continuity and operation delay time. Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

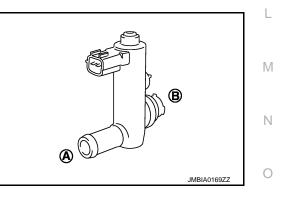
- 1. Disconnect EVAP canister vent control valve harness connector.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |
| | |

Operation takes less than 1 second.

Is the inspection result normal?





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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- YES >> GO TO 3.
- NO >> Replace EVAP canister vent control valve. Refer to <u>FL-14, "Exploded View"</u>.

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- 3. Check air passage continuity and operation delay time. Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

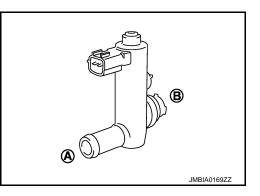
| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-14</u>, "Exploded View".



< DTC/CIRCUIT DIAGNOSIS >

P0448 EVAP CANISTER VENT CONTROL VALVE

Description

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

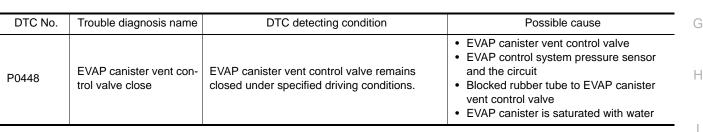
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid value 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 CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

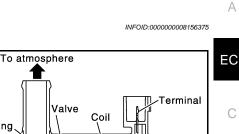
>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and let it idle for at least 1 minute.
- 4. Repeat next procedures five times.
- Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes.
- Fully released accelerator pedal and keep engine idle for about 5 seconds.
- 5. Repeat next procedure 27 times.
- Quickly increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 25 to 30 seconds.
 - Ρ

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Spring

O-ring

Canister side



PBIB1263E

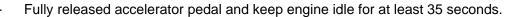
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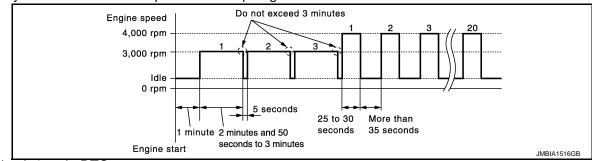
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< DTC/CIRCUIT DIAGNOSIS >





6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-324, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156377

[VQ37VHR]

1.CHECK RUBBER TUBE

- 1. Turn ignition switch OFF.
- 2. Disconnect rubber tube connected to EVAP canister vent control valve.
- 3. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Clean rubber tube using an air blower.

2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

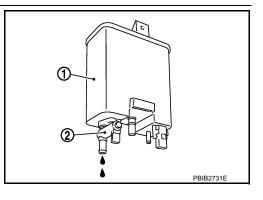
NO >> Replace EVAP canister vent control valve. Refer to FL-14, "Exploded View".

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

- Remove EVAP canister with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.
- 2. Check if water will drain from the EVAP canister (1).

Does water drain from EVAP canister?

YES >> GO TO 4. NO >> GO TO 6.



4. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.

EVAP canister for damage

• EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

P0448 EVAP CANISTER VENT CONTROL VALVE

| P0448 EVAP CANISTER VENT CONTROL VALVE | | |
|--|------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| >> Repair hose or replace EVAP canister. Refer to <u>FL-14, "Removal and Installation"</u> . | | |
| 6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR | | А |
| 1. Disconnect EVAP control system pressure sensor harness connector. | | |
| 2. Check connectors for water. | | EC |
| Water should not exist. | | |
| Is the inspection result normal? | | С |
| YES >> GO TO 7. NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u> . | | |
| 7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR | | D |
| Refer to EC-330, "Component Inspection". | | D |
| Is the inspection result normal? | | |
| YES >> GO TO 8. | | E |
| NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u> . | | |
| | | F |
| Refer to GI-42, "Intermittent Incident". | | |
| >> INSPECTION END | | G |
| Component Inspection | INFOID:000000008156378 | |
| | | Н |
| 1.CHECK EVAP CANISTER VENT CONTROL VALVE-I | | |
| Turn ignition switch OFF. Remove EVAP canister vent control valve from EVAP canister. | | |
| 3. Check portion (A) of EVAP canister vent control valve for being | | |
| rusted. | | |
| <u>Is it rusted?</u> YES >> Replace EVAP canister vent control valve. Refer to <u>FL-</u> | | J |
| 14, "Exploded View". | | |
| NO >> GO TO 2. | | 1Z |

2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT

- 1. Reconnect harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- 4. Check air passage continuity and operation delay time. Make sure that new O-ring is installed properly.

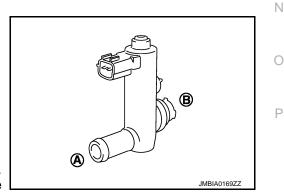
| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

- T. Disconnect EVAP canister vent control valve harness connector.
- Check air passage continuity and operation delay time under the following conditions.
 Make sure that new O-ring is installed properly.

Make sure that new O-ring is installed properly.



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P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Condition | Air passage continuity between (A) and (B) |
|------------------------------------|--|
| 12 V direct current supply between | Not existed |

terminals 1 and 2

OFF

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.

Existed

- 2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- 3. Check air passage continuity and operation delay time. Make sure that new O-ring is installed properly.

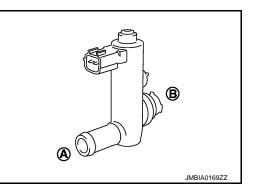
| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.



| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

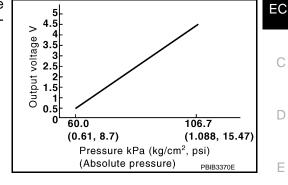
NO >> Replace EVAP canister vent control valve. Refer to <u>FL-14, "Exploded View"</u>.

< DTC/CIRCUIT DIAGNOSIS >

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

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 perfor- mance | ECM detects a sloshing signal from the EVAP control system pressure sensor | Harness or connectors (EVAP control system pressure sensor circuit is shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Refrigerant pressure sensor Brake booster pressure sensor |

DTC CONFIRMATION PROCEDURE

NOTE:

Never remove fuel filler cap during DTC confirmation procedure.

1.PRECONDITIONING

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

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

With CONSULT>>GO TO 2. Without CONSULT>>GO TO 5.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

() With CONSULT

- Start engine and let it idle for at least 40 seconds.
 NOTE:
- Do not depress accelerator pedal even slightly.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-328, "Diagnosis Procedure".

NO >> GO TO 3.



[VQ37VHR]

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< DTC/CIRCUIT DIAGNOSIS >

3.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

- 1. Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE".
- 2. Let it idle until "OFF" of "EVAP DIAG READY" changes to "ON". **NOTE:**
- It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".
- 3. Turn ignition switch OFF and wait at least 90 minutes.
- NOTE:

Never turn ignition switch ON during 90 minutes.

- 4. Turn ignition switch ON.
- 5. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ECM".
- 6. Check that "EVAP LEAK DIAG" indication.
- Which is displayed on CONSULT?

CMPLT>> GO TO 4.

YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.

2. GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-3

With CONSULT

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-328, "Diagnosis Procedure".

NO >> INSPECTION END

5.PERFORM DTC CONFIRMATION PROCEDURE-4

- With GST
- 1. Start engine and let it idle for at least 40 seconds. **NOTE:**

Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-328, "Diagnosis Procedure".

NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-5

With GST

- 1. Let it idle for at least 2 hours.
- 2. Turn ignition switch OFF and wait at least 90 minutes. **NOTE:**

Never turn ignition switch ON during 90 minutes.

- 3. Turn ignition switch ON.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-328, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156381

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor harness connector.

| | RCUIT DIA | GINOSIS | > | | | | [VQ37VHR] |
|--|--|---|---|---|--|------------------------|-----------|
| . Check | k sensor ha | rness conr | nector for water. | | | | |
| Wa | ater should | l not exist | | | | | |
| the insp | ection resu | lt normal? | | | | | |
| | > GO TO 3 | | | | | | |
| | • | | arness connector. | | | | |
| | | | YSTEM PRESSURE SI | ENSOR PO | WER SUP | | |
| | gnition swit k the voltage | | EVAP control system p | oressure ser | sor harnes | ss connector and | d ground. |
| | ontrol system ure sensor | Ground | Voltage (V) | | | | |
| Connector | Terminal | | voliago (v) | | | | |
| B30 | 3 | Ground | Approx. 5 | | | | |
| the insp | ection resu | It normal? | | | | | |
| | > GO TO 8 | | | | | | |
| | > GO TO 4 | | | | | | |
| | | | SUPPLY CIRCUIT | | | | |
| neck har | rness for sh | ort to pow | er and short to ground, | between the | e following | terminals. | |
| | | | | | | - | |
| | | | - | | | | |
| | CM | | Sensor | Connector | Terminel | _ | |
| | Terminal | Proke boost | Name | Connector | Terminal | - | |
| | Terminal 45 | | Name er pressure sensor | E48 | 1 | - - | |
| Connector | Terminal 45 46 | CKP sensor | Name er pressure sensor (POS) | E48 F2 | 1 | - - - | |
| F101 | Terminal 45 | CKP sensor APP sensor | Name er pressure sensor (POS) | E48 F2 E112 | 1 1 6 | - - - | |
| Connector | Terminal 45 46 | CKP sensor APP sensor EVAP contro | Name er pressure sensor (POS) DI system pressure sensor | E48 F2 | 1 1 6 3 | - - - - | |
| F101 M107 | Terminal 45 46 103 107 | CKP sensor APP sensor EVAP contro Refrigerant | Name er pressure sensor (POS) | E48 F2 E112 B30 | 1 1 6 | - - - - | |
| F101 M107 the insp | Terminal 45 46 103 | CKP sensor APP sensor EVAP contro Refrigerant It normal? | Name er pressure sensor (POS) DI system pressure sensor | E48 F2 E112 B30 | 1 1 6 3 | - - - - | |
| F101 F107 M107 the insp (ES > NO > | Terminal 45 46 103 107 -> Cection resu -> GO TO 5 -> Repair sh | CKP sensor APP sensor EVAP contro Refrigerant It normal? | Name er pressure sensor (POS) DI system pressure sensor | E48 F2 E112 B30 E77 | 1 1 6 3 3 | - - - - S. | |
| F101 F107 M107 the insp (ES > NO > | Terminal 45 46 103 107 - Dection resu | CKP sensor APP sensor EVAP contro Refrigerant It normal? | Name er pressure sensor (POS) ol system pressure sensor pressure sensor | E48 F2 E112 B30 E77 | 1 1 6 3 3 | - - - - S. | |
| F101 F101 M107 <u>the insp</u> (ES > VO > CHECH neck the | Terminal 45 46 103 107 -> ection resu >> GO TO 5 >> Repair sh < COMPON e following. | CKP sensor APP sensor EVAP contro Refrigerant It normal? hort to grou IENTS | Name er pressure sensor (POS) ol system pressure sensor pressure sensor | E48 F2 E112 B30 E77 harness or | 1 1 6 3 3 connectors | | |
| F101 F101 M107 the insp 'ES > VO > CHECP neck the Cranksh | Terminal 45 46 103 107 >> GO TO 5 >> Repair sh < COMPON a following. haft position | CKP sensor APP sensor EVAP contro Refrigerant It normal? hort to grou IENTS sensor (P | Name er pressure sensor (POS) ol system pressure sensor pressure sensor and or short to power in OS) (Refer to <u>EC-296.</u> | E48 F2 E112 B30 E77 harness or | 1 1 6 3 3 connectors | <u>n"</u> .) | |
| F101 F101 M107 the insp (ES > NO > CHECP neck the Cranksh Brake bo | Terminal 45 46 103 107 >> GO TO 5 >> Repair sh K COMPON afollowing. aft position ooster press | CKP sensor APP sensor EVAP contro Refrigerant It normal? nort to grou IENTS sensor (P sure sensor | Name er pressure sensor (POS) ol system pressure sensor pressure sensor | E48 F2 E112 B30 E77 harness or | 1 1 6 3 3 connectors <u>t Inspection</u> | <u>n"</u> .) | |
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| F101 F101 M107 <u>the insp</u> (ES > CHECP neck the Cranksh Brake bo Refriger the insp (ES > | Terminal 45 46 103 107 >> GO TO 5 >> Repair sh < COMPON a following. aft position ooster press ant pressur >> GO TO 6 | CKP sensor APP sensor EVAP contro Refrigerant It normal? ort to grou IENTS sensor (P sure sensor e sensor (I It normal? | Name er pressure sensor (POS) ol system pressure sensor pressure sensor and or short to power in OS) (Refer to <u>EC-296</u> , ' or (Refer to <u>EC-373</u> , "Co Refer to <u>EC-531</u> , "Diagr | E48 F2 E112 B30 E77 harness or | 1 1 6 3 3 connectors <u>t Inspection</u> | <u>n"</u> .) | |
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| F101 F101 M107 the insp (ES > CHECH heck the Cranksh Brake bo Refriger the insp (ES > NO > .CHECH | Terminal 45 46 103 107 >> GO TO 5 >> Repair sh < COMPON e following. aft position ooster press ant pressur pection resu >> GO TO 6 >> Replace | CKP sensor APP sensor EVAP contro Refrigerant It normal? nort to grou IENTS sensor (P sure sensor e sensor (I It normal? malfunctio SOR | Name er pressure sensor (POS) of system pressure sensor pressure sensor and or short to power in OS) (Refer to <u>EC-296.</u> or (Refer to <u>EC-373.</u> "Co Refer to <u>EC-531.</u> "Diago ning component. | E48 F2 E112 B30 E77 harness or | 1 1 6 3 3 connectors <u>t Inspection</u> | <u>n"</u> .) | |
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2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

$\mathbf{8}$.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-330, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to FL-14. "Exploded View".

9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000008156382

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.

- 2. Remove EVAP control system pressure sensor with its harness connector. Always replace O-ring with a new one.
- 3. Install a vacuum pump to EVAP control system pressure sensor.
- 4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

| | ECM | | Condition | | |
|-----------|----------|----------|--|-----------------------------------|--|
| Connector | + | - | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| M107 | 102 | 112 | Not applied | 1.8 - 4.8 | |
| IVI 107 | 102 | 112 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 lower than above value | |

CAUTION:

• Always calibrate the vacuum pump gauge when using it.

Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

YES >> INSPECTION END

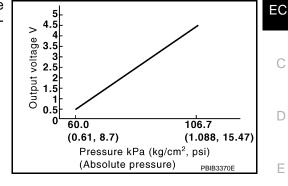
NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u>.

< DTC/CIRCUIT DIAGNOSIS >

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

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. DTC detecting condition Possible cause Trouble diagnosis name Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] Н (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is EVAP control system An excessively low voltage from the sensor is shorted.) P0452 pressure sensor low insent to ECM. (Brake booster pressure sensor circuit is put shorted) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Refrigerant pressure sensor · Brake booster pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- 6. Select "DATA MONITOR" mode with CONSULT.
- 7. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- 8. Start engine and wait at least 20 seconds.
- 9. Check 1st trip DTC.

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[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

With GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Set voltmeter probes to ECM harness connector terminals as per the following.

| ECM | | | | | | |
|-----------|--|--------------------|--|--|--|--|
| Connector | + | _ | | | | |
| Connector | Terminal | Terminal | | | | |
| M107 | 106 (Fuel tank temperature sensor signal) | 128 (ECM gound) | | | | |

3. Make sure that the voltage is less than 4.2 V.

4. Turn ignition switch OFF and wait at least 10 seconds.

- 5. Turn ignition switch ON.
- 6. Turn ignition switch OFF and wait at least 10 seconds.
- 7. Start engine and wait at least 20 seconds.
- 8. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-332, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.

2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| EVAP control system pressure sensor Connector Terminal | | Ground | Voltage (V) | |
|--|---|--------|-------------|--|
| | | | | |
| B30 | 3 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 4.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EC-332

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| EVAP con | trol system | | | | | | | A |
|-----------------|-----------------------|-------------------|-------------------------------|------------------------|--------------|---------------|--------------|-----|
| | e sensor | EC | M | Continuity | | | | |
| Connector | Terminal | Connector | Terminal | | | | | |
| B30 | 3 | M107 | 107 | Existed | | | | EQ |
| Is the insp | ection res | ult normal? | <u>)</u> | | | | | |
| | > GO TO | | | | | | | C |
| _ | > GO TO | | | | | | | |
| 5. DETEC | T MALFU | NCTIONIN | IG PART | | | | | |
| Check the | | | | | | | | C |
| Harness | | | CM and E | VAP control sy | etom proce | uro concor | | |
| | tor open i | | | VAP CONTO Sy | stem press | | | E |
| | - Renair d | pen circuit | | | | | | L |
| 6.CHECK | • | • | | | | | | |
| | | | | | | <u> </u> | | F |
| Check har | ness for s | hort to pow | er and sh | ort to ground, | between the | e following t | erminals. | |
| | 214 | | | C | | | | |
| | CM | | Num | Sensor | 0 | | | 0 |
| Connector | Terminal | Datate | Name | | Connector | Terminal | | |
| F101 | 45 | | Brake booster pressure sensor | | E48 | 1 | | F |
| | 46 | CKP sensor (POS) | | F2 | 1 | | | |
| | 103 | | APP sensor | | E112 | 6 | | |
| M107 | 107 | | | ressure sensor | B30 | 3 | | I |
| | | - | pressure se | ensor | E77 | 3 | | |
| | | ult normal? - | - | | | | | |
| | > GO TO > Repair s | | und or sh | ort to power in | harness or | connectors | | |
| 7.CHECK | • | - | | on to power in | namess of | Connectors | | |
| | | INEINI S | | | | | | k |
| Check the | | n sonsor (F | | er to <u>EC-296. '</u> | 'Componen | t Inspection | , ") | |
| | | | | to <u>EC-373, "Co</u> | | | / | |
| Refrigera | ant pressu | ire sensor | (Refer to | <u>EC-531, "Diagr</u> | nosis Proced | dure".) | | L |
| Is the insp | ection res | ult normal? | <u>-</u> | | | | | |
| | > GO TO | | | | | | | Ν |
| • | | e malfunctio | oning com | ponent. | | | | 1.0 |
| 8.CHECK | APP SEI | NSOR | | | | | | |
| Refer to E | <u>C-484, "C</u> | omponent | Inspectior | <u>ı"</u> . | | | | Ν |
| | | ult normal? | <u>-</u> | | | | | |
| | > GO TO | | | | | | | |
| • | > GO TO | | | | | | | C |
| 9. REPLA | CE ACCE | LERATOR | PEDAL A | SSEMBLY | | | | |
| | | | | . Refer to <u>ACC</u> | -3, "Explod | ed View". | | F |
| 2. Go to | <u>EC-484, "</u> | <u>Special Re</u> | pair Requ | <u>irement"</u> . | | | | I |
| | | | | | | | | |

>> INSPECTION END

10.check evap control system pressure sensor ground circuit for open and short

1. Turn ignition switch OFF.

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect ECM harness connector.

3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP cont pressure | , | EC | Continuity | |
|-----------------------|----------|-----------|------------|---------|
| Connector | Terminal | Connector | | |
| B30 | 1 | M107 | 112 | Existed |

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1. M7

Harness for open or short between EVAP control system pressure sensor and ECM

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

12. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP cont pressure | , | EC | CM | Continuity |
|-----------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| B30 | 2 | M107 | 102 | Existed |

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

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1, M7

Harness for open or short between EVAP control system pressure sensor and ECM

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

14. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace EVAP control system pressure sensor. Refer to FL-14, "Exploded View".

15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Revision: 2012 July

2013 G Convertible

INFOID:00000008156386

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.

- 2. Remove EVAP control system pressure sensor with its harness connector. Always replace O-ring with a new one.
- 3. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

| | ECM | | | | C |
|-----------|----------|----------|--|-----------------------------------|---|
| Connector | + | - | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| M107 | 102 | 112 | Not applied | 1.8 - 4.8 | D |
| IVI I 07 | 102 | 112 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 lower than above value | |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u>.
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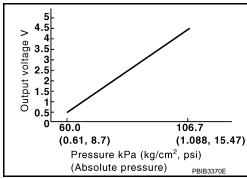
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< DTC/CIRCUIT DIAGNOSIS >

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

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

INFOID:000000008156388

[VQ37VHR]

INFOID:00000008156387

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0453 | EVAP control system pressure sensor high in- put | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Refrigerant pressure sensor Brake booster pressure sensor EVAP canister vent control valve EVAP canister Rubber hose from EVAP canister vent control valve to vehicle frame |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- 6. Select "DATA MONITOR" mode with CONSULT.

| | P0453 EVA | | ROL SY | | RESSURE | SENSOR | | |
|--|--|----------------------------|--------------------------|------------------|-------------------------|----------------|------------------------|----|
| < DTC/CIF | RCUIT DIAGNOSIS > | | | | | | [VQ37VHR] | |
| 8. Start e | sure that "FUEL T/TMF engine and wait at least t 1st trip DTC. | | | °C (32°F). | | | | А |
| 1. Start e | engine and warm it up t Itmeter probes to ECM | | | | | ng. | | EC |
| | E | СМ | | | _ | | | С |
| Connector | + | | | - | | | | C |
| Connector | Terminal | | Tei | rminal | _ | | | _ |
| M107 | 106 (Fuel tank temperature ser | nsor signal) | | 128 l ground) | | | | D |
| 4. Turn ig 5. Turn ig 6. Turn ig | sure that the voltage is gnition switch OFF and gnition switch ON. gnition switch OFF and | wait at lea wait at lea | st 10 seco st 10 seco | | _ | | | Е |
| | engine and wait at least a 1st trip DTC. | 20 second | ls. | | | | | F |
| | DTC detected? | | | | | | | |
| | > Go to <u>EC-337, "Diag</u> et > INSPECTION END | nosis Proce | edure". | | | | | G |
| | is Procedure | | | | | | | |
| | | | | | | | INFOID:000000008156389 | Н |
| | | ION | | | | | | |
| | gnition switch OFF. | 95. Refer to | Ground I | nspection ir | n <u>GI-45, "Circui</u> | t Inspection". | | |
| Is the insp | ection result normal? | | | • | | | | |
| | > GO TO 2. > Repair or replace gro | und conne | ction | | | | | J |
| ~ | CONNECTOR | | | | | | | |
| | nnect EVAP control sys | | | harness co | onnector. | | | Κ |
| | | | | | | | | |
| | ter should not exist. | | | | | | | |
| | ection result normal? > GO TO 3. | | | | | | | |
| NO > | > Repair or replace hai | | | | | | | M |
| 3.CHECK | EVAP CONTROL SY | STEM PRE | SSURE S | SENSOR PO | OWER SUPPLY | Y CIRCUIT | | |
| | gnition switch ON. the voltage between E | VAP contr | ol system | pressure se | ensor harness o | connector and | ground. | Ν |
| EVAP contr | ol system pressure sensor | Ground Vo | oltage (V) | | | | | 0 |
| Conne | | | | | | | | |
| B30 | _ | Ground A | pprox. 5 | | | | | D |
| YES > | ection result normal? > GO TO 10. > GO TO 4. | | | | | | | Ρ |
| 4 | EVAP CONTROL SY | STEM PRE | SSURE S | ENSOR PO | OWER SUPPLY | Y CIRCUIT-II | | |
| · · · · | | | | | | | | |

Turn ignition switch OFF.
 Disconnect ECM harness connector.

< DTC/CIRCUIT DIAGNOSIS >

 Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control syster | EC | М | Continuity | |
|---------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B30 | 3 | M107 | 107 | Existed |

Is the inspection result normal?

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

NO >> 00 10 3.

5.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors M7, B1

Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6.CHECK SENSOR POWER SUPPLY CIRCUIT

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

| ECM | | Sensor | | | | |
|-----------|----------|-------------------------------------|-----------|----------|--|--|
| Connector | Terminal | Name | Connector | Terminal | | |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 | | |
| 1 101 | 46 | CKP sensor (POS) | F2 | 1 | | |
| | 103 | APP sensor | E112 | 6 | | |
| M107 | 107 | EVAP control system pressure sensor | B30 | 3 | | |
| 111 | | Refrigerant pressure sensor | E77 | 3 | | |

Is the inspection result normal?

YES >> GO TO 7.

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

7. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-296, "Component Inspection".)
- Brake booster pressure sensor (Refer to <u>EC-373, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-531, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-484, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 20.

NO >> GO TO 9.

9.replace accelerator pedal assembly

- 1. Replace accelerator pedal assembly. Refer to ACC-3. "Exploded View".
- 2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

10.check evap control system pressure sensor ground circuit for open and short

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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- 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 | EC | М | Continuity | |
|---------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B30 | 1 | M107 | 112 | Existed |

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

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1, M7

Harness for open or short between EVAP control system pressure sensor and ECM

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

12.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND $\ ^{\rm G}$ short

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control syster | EC | M | Continuity | |
|---------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B30 | 2 | M107 | 102 | Existed |

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

Is the inspection result normal?

| YES | >> GO TO 14. |
|-----|--------------|
| | >> CO TO 12 |

NO >> GO IO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1, M7

Harness for open or short between EVAP control system pressure sensor and ECM

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

14.CHECK RUBBER TUBE

Disconnect rubber tube connected to EVAP canister vent control valve.
 Chask the nubber tube for elegating

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-321, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-14, "Exploded View"</u>.

16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-340, "Component Inspection".

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 17.

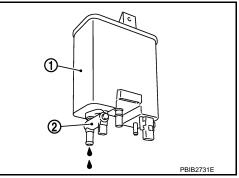
NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u>.

17. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

- 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- 2. Check if water will drain from the EVAP canister (1).
 - 2 : EVAP canister vent control valve

Does water drain from EVAP canister?

- YES >> GO TO 18.
- NO >> GO TO 20.



[VQ37VHR]

18.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 20.

NO >> GO TO 19.

19. DETECT MALFUNCTIONING PART

Check the following.

EVAP canister for damage

• EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-14, "Removal and Installation".

20. CHECK INTERMITTENT INCIDENT

Refer to <u>GI-42, "Intermittent Incident"</u>.

>> INSPECTION END

Component Inspection

INFOID:000000008156390

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Remove EVAP control system pressure sensor with its harness connector. Always replace O-ring with a new one.
- 3. Install a vacuum pump to EVAP control system pressure sensor.
- 4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

| | ECM | | ECM | | Condition | |
|-----------|----------|----------|--|-----------------------------------|-----------|--|
| Connector | + | - | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) | | |
| Connector | Terminal | Terminal | | | | |
| M107 | 102 | 112 | Not applied | 1.8 - 4.8 | | |
| 1017 | 102 | 112 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 lower than above value | | |

CAUTION:

· Always calibrate the vacuum pump gauge when using it.

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|----------------|
| Do not apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 km², 14.69 psi). | kPa (1.033 kg/ |
| Is the inspection result normal? | _ |
| YES >> INSPECTION END NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u> . | EC |
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| | C |
| | E |

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< DTC/CIRCUIT DIAGNOSIS >

P0456 EVAP CONTROL SYSTEM

DTC Logic

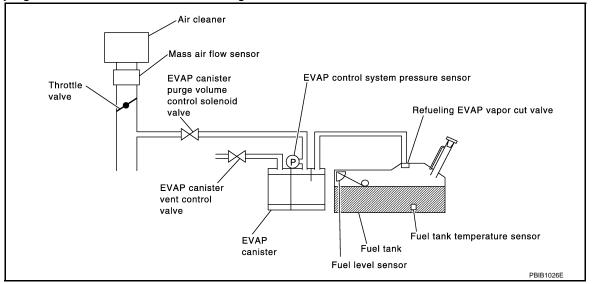
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[VQ37VHR]

DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.

If ECM judges that there are no leaks, the diagnosis will be OK.



| 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 canister vent control valve and the circuit Loose or disconnected rubber tube EVAP canister purge volume control solenoid valve and the circuit EVAP canister purge volume control solenoid valve and the circuit EVAP canister purge volume control solenoid valve and the circuit EVAP canister purge volume control valve is missing or damaged EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks Fuel level sensor and the circuit Foreign matter caught in EVAP canister purge volume control solenoid valve |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC CONFIRMATION PROCEDURE

< DTC/CIRCUIT DIAGNOSIS >

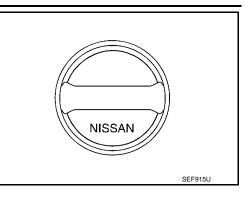
| 1.PRECONDITIONING | А |
|---|----|
| If DTC Confirmation Procedure has been previously conducted, always perform the following before conduct- | |
| ing the next test. Turn ignition switch OFF and wait at least 10 seconds. | |
| 2. Turn ignition switch ON. | EC |
| Turn ignition switch OFF and wait at least 10 seconds. <u>Do vou have CONSULT?</u> | |
| YES >> GO TO 2. | С |
| NO $>>$ GO TO 4. | |
| 2. PERFORM DTC CONFIRMATION PROCEDURE-I | D |
| With CONSULT | |
| Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode with CONSULT. Start engine and wait at idle until "OFF" of "EVAP DIAG READY" changes to "ON". NOTE: | E |
| It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON". | |
| Turn ignition switch OFF and wait at least 90 minutes. NOTE: | F |
| NOTE: Never turn ignition switch ON during 90 minutes. | 1 |
| 4. Turn ignition switch ON and select "EVAP LEAK DIAG" in "DATA MONITOR" mode with CONSULT. | |
| 5. Check that "EVAP LEAK DIAG" indication. | G |
| <u>Which is displayed on CONSULT?</u> CMPLT>> GO TO 3. | |
| YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1. | Н |
| 3.PERFORM COMPONENT FUNCTION CHECK-II | |
| Check 1st trip DTC. | |
| Is 1st trip DTC detected? | I |
| YES >> Go to <u>EC-343, "Diagnosis Procedure"</u> . NO >> INSPECTION END | J |
| 4. PERFORM DTC CONFIRMATION PROCEDURE | 0 |
| @With GST | |
| 1. Start engine and wait engine idle for at least 2 hours. | Κ |
| Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| Never turn ignition switch ON during 90 minutes. | L |
| 3. Turn ignition switch ON. | |
| Check 1st trip DTC. Is 1st trip DTC detected? | |
| YES >> Go to EC-343, "Diagnosis Procedure". | M |
| NO >> INSPECTION END | |
| Diagnosis Procedure | Ν |
| 1.CHECK FUEL FILLER CAP DESIGN | |
| 1. Turn ignition switch OFF. | 0 |
| | |

< DTC/CIRCUIT DIAGNOSIS >

2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace with genuine NISSAN fuel filler cap. Refer to <u>FL-11, "Exploded View"</u>.



[VQ37VHR]

2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten until ratcheting sound is heard.

3.CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-527, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one. Refer to <u>FL-11, "Exploded View"</u>.

5.CHECK FOR EVAP LEAK

Refer to EC-596, "Inspection".

Is there any leak in EVAP line?

YES >> Repair or replace.

NO >> GO TO 6.

 $\mathbf{6}$.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

• EVAP canister vent control valve is installed properly. Refer to <u>FL-14</u>, "<u>Removal and Installation</u>".

 EVAP canister vent control valve. Refer to <u>EC-321, "Component Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to <u>FL-14, "Exploded View"</u>.

7.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

1. Remove EVAP canister (1) with EVAP canister vent control $\int c$ valve (2) and EVAP control system pressure sensor attached. А Check if water will drain from EVAP canister. 2. Does water drain from the EVAP canister? ➀ >> GO TO 8. YES EC NO-1 >> With CONSULT: GO TO 10. NO-2 >> Without CONSULT: GO TO 11. С PBIB2731E D 8.CHECK EVAP CANISTER Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVAP control system pressure sensor attached. Е The weight should be less than 2.2 kg (4.9 lb). Is the inspection result normal? YES-1 >> With CONSULT: GO TO 10. F YES-2 >> Without CONSULT: GO TO 11. NO >> GO TO 9. 9. DETECT MALFUNCTIONING PART Check the following. EVAP canister for damage EVAP hose between EVAP canister and vehicle frame for clogging or poor connection Н >> Repair hose or replace EVAP canister. Refer to FL-14, "Removal and Installation". 10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION With CONSULT Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control sole-1 J noid valve from EVAP service port. Start engine and let it idle. 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%. 4. Κ 5. Check vacuum hose for vacuum. Vacuum should exist. Is the inspection result normal? YES >> GO TO 13. NO >> GO TO 12. M 11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION Without CONSULT Ν Start engine and warm it up to normal operating temperature. 1. 2. Stop engine. 3. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port. 4. Start engine and let it idle for at least 80 seconds. 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm. Ρ Vacuum should exist. Is the inspection result normal?

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

12.CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-92, "System Diagram".

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or reconnect the hose.

13.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-314, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Exploded View".

14.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-269, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel level sensor unit. Refer to <u>FL-5</u>, "Exploded View".

15.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-330, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-14, "Exploded View"</u>.

16.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-92, "System Diagram"</u>.

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or reconnect the hose.

17.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 18.

18.CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to <u>EC-524</u>, "<u>Description</u>".

Is the inspection result normal?

YES >> GO TO 19.

NO >> Repair or replace hoses and tubes.

19.CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 20.

NO >> Repair or replace hose, tube or filler neck tube.

20.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-527, "Component Inspection".

Is the inspection result normal?

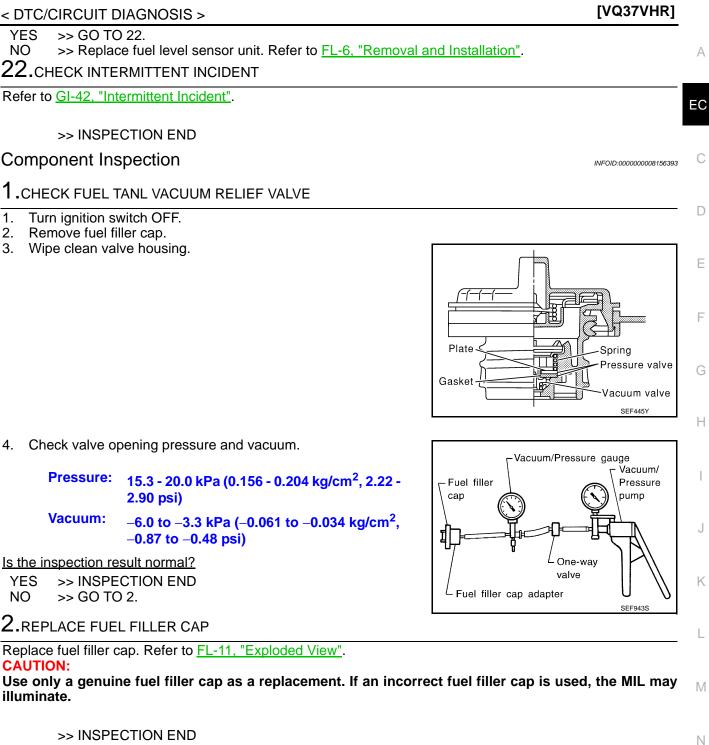
YES >> GO TO 21.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to <u>FL-11. "Removal and Installation"</u>.

21. CHECK FUEL LEVEL SENSOR

Refer to <u>MWI-53</u>, "Component Inspection". Is the inspection result normal?

Revision: 2012 July



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< DTC/CIRCUIT DIAGNOSIS >

P0460 FUEL LEVEL SENSOR

Description

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the "unified meter and A/C amp.". The "unified meter and A/C amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic

INFOID:00000008156395

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 <u>EC-379, "DTC Logic"</u>.

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------|---|---|
| P0460 | Fuel level sensor circuit noise | Even though the vehicle is parked, a signal be- ing varied is sent from the fuel level sensor to ECM. | Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (The sensor circuit is open or shorted) Unified meter and A/C amp. Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and wait maximum of 2 consecutive minutes.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-348, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-36, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to <u>MWI-52</u>, "Component Function Check".

2. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

INFOID:000000008156396

INFOID:00000008156394

| >> INSPECTION END |
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< DTC/CIRCUIT DIAGNOSIS >

P0461 FUEL LEVEL SENSOR

Description

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the "unified meter and A/C amp.". The "unified meter and A/C amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic

INFOID:00000008156398

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 <u>EC-379, "DTC Logic"</u>.

Driving long distances naturally affect fuel gauge level.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0461 | Fuel level sensor circuit range/performance | The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long dis- tance. | Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (The sensor circuit is open or shorted) Unified meter and A/C amp. Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-350, "Component Function Check"</u>. Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-351, "Diagnosis Procedure".

Component Function Check

INFOID:000000008156399

1.PRECONDITIONING

WARNING:

When performing the following procedure, always observe the handling of the fuel. Refer to <u>FL-6</u>, <u>"Removal and Installation"</u>.

TESTING CONDITION:

Before starting component function check, preparation of draining fuel and refilling fuel is required.

Do you have CONSULT?

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

2. PERFORM COMPONENT FUNCTION CHECK

With CONSULT

NOTE:

Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/ 8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.

INFOID:00000008156397

P0461 FUEL LEVEL SENSOR

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|------------------------|
| Release fuel pressure from fuel line, refer to <u>EC-595, "Inspection"</u>. Remove the fuel feed hose on the fuel level sensor unit. | |
| 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. | |
| Check "FUEL LEVEL SE" output voltage and note it. Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT. | E |
| Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it. Check "FUEL LEVEL SE" output voltage and note it. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal). | (|
| Check "FUEL LEVEL SE" output voltage and note it. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12. | Γ |
| <u>Is the inspection result normal?</u> YES >> INSPECTION END | |
| NO >> Go to <u>EC-351, "Diagnosis Procedure"</u> . 3.PERFORM COMPONENT FUNCTION CHECK | E |
| Without CONSULT NOTE: | |
| Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 Imp gal) in advance. | 3 US gal, 6-5/8 |
| Prepare a fuel container and a spare hose. Release fuel pressure from fuel line. Refer to <u>EC-595, "Inspection"</u>. Remove the fuel feed hose on the fuel level sensor unit. | (|
| Connect a spare fuel hose where the fuel feed hose was removed. Turn ignition switch ON. | ŀ |
| 6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment. 7. Confirm that the fuel gauge indication varies. | |
| 8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal). 9. Confirm that the fuel gauge indication varies. | |
| Is the inspection result normal? YES >> INSPECTION END | |
| NO >> Go to <u>EC-351. "Diagnosis Procedure"</u> . Diagnosis Procedure | INFOID:000000008156400 |
| 1. CHECK DTC WITH "UNIFIED METER AND A/C AMP." | |
| Refer to MWI-36, "CONSULT Function (METER/M&A)". | |
| Is the inspection result normal? | |
| YES >> GO TO 2. NO >> Go to <u>MWI-52, "Component Function Check"</u> . | Ν |
| 2. CHECK INTERMITTENT INCIDENT | I. |
| Refer to GI-42, "Intermittent Incident". | 1 |
| >> INSPECTION END | |
| | (|

Ρ

< DTC/CIRCUIT DIAGNOSIS >

P0462, P0463 FUEL LEVEL SENSOR

Description

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the "unified meter and A/C amp.". The "unified meter and A/C amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic

INFOID:000000008156402

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 <u>EC-379, "DTC Logic"</u>.

| 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) Unified meter and A/C amp. Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-352, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to <u>MWI-36, "CONSULT Function (METER/M&A)"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to <u>MWI-52</u>, "Component Function Check".

2. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

INFOID:000000008156403

INFOID:00000008156401

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

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P0500 VSS A/T MODELS

A/T MODELS : Description

INFOID:000000008156404

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

A/T MODELS : DTC Logic

INFOID:000000008156405

DTC DETECTION LOGIC **NOTE**:

- If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0500 | VEH SPEED SEN/CIRC (Vehicle speed sensor) | At 20 km/h (13 MPH), ECM detects the follow- ing status continuously for 5 seconds or more: The difference between a vehicle speed cal- culated by a output speed sensor transmitted from TCM to ECM via CAN communication and the vehicle speed indicated on the com- bination meter exceeds 15km/h (10 MPH). | Harness or connector (The CAN communication line is open or shorted.) Combination meter ABS actuator and electric unit (control unit) Wheel sensor TCM Output speed sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine.
- 2. Shift the selector lever to D range and wait at least for 2 seconds.
- 3. Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.
 - CAUTION:

Always drive vehicle at a safe speed.

NOTÉ:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-354, "A/T MODELS : Diagnosis Procedure"</u>

NO >> INSPECTION END

A/T MODELS : Diagnosis Procedure

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to <u>TM-155, "CONSULT Function"</u>. Is the inspection result normal?

INFOID:000000008156406

P0500 VSS

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|---|------------------------|----|
| YES >> GO TO 2. NO >> Perform trouble shooting relevant to DTC indicated. | | ^ |
| 2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) | | A |
| | notion" | |
| Check DTC with ABS actuator and electric unit (control unit). Refer to <u>BRC-27, "CONSULT Fu</u> <u>Is the inspection result normal?</u> | <u>nction</u> . | EC |
| YES >> GO TO 3. | | |
| NO >> Perform trouble shooting relevant to DTC indicated. | | С |
| 3. CHECK DTC WITH COMBINATION METER | | 0 |
| Check DTC with combination meter. Refer to <u>MWI-36, "CONSULT Function (METER/M&A)"</u> . | | |
| Is the inspection result normal? | | D |
| YES >> GO TO 4. NO >> Perform trouble shooting relevant to DTC indicated. | | |
| NO >> Perform trouble shooting relevant to DTC indicated. 4.CHECK OUTPUT SPEED SENSOR | | Е |
| | | |
| Check output speed sensor. Refer to <u>TM-173, "DTC Logic"</u> . | | _ |
| <u>Is the inspection result normal?</u> YES >> GO TO 5. | | F |
| NO >> Replace or replace error-detected parts. | | |
| 5. CHECK WHEEL SENSOR | | G |
| Check wheel sensor. Refer to <u>BRC-112</u> , "FRONT WHEEL SENSOR : Removal and Install WHEEL SENSOR) or <u>BRC-113</u> , "REAR WHEEL SENSOR : Removal and Installation" (REAR SOR). | | Н |
| Is the inspection result normal? | | |
| YES >> Check intermittent incident. Refer to <u>GI-42, "Intermittent Incident"</u> . | | 1 |
| NO >> Replace or replace error-detected parts. M/T MODELS | | 1 |
| | | |
| M/T MODELS : Description | INFOID:00000008156407 | J |
| The vehicle speed signal is sent to the "unified meter and A/C amp." from the "ABS actuator a (control unit)" via the CAN communication line. The "unified meter and A/C amp." then sends ECM via the CAN communication line. | | K |
| M/T MODELS : DTC Logic | INFOID:000000008156408 | |
| | | L |
| DTC DETECTION LOGIC NOTE: | | |
| If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC to <u>EC-379, "DTC Logic"</u>. | | Μ |
| DTC No. Trouble diagnosis name DTC detecting condition Possible cause | | N |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | IN |
|---------|------------------------|--|---|----|
| P0500 | Vehicle speed sensor | The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven. | Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (The vehicle speed signal circuit is open or shorted) Wheel sensor Unified meter and A/C amp. ABS actuator and electric unit (control unit) | O |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 5.

2. PRECONDITIONING

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

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

>> GO TO 3.

3.CHECK VEHICLE SPEED SIGNAL

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

With CONSULT

- 1. Start engine (VDC switch OFF).
- 2. Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT. The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to EC-357, "M/T MODELS : Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Select "DATA MONITOR" mode with CONSULT.
- 2. Warm engine up to normal operating temperature.
- 3. Maintain the following conditions for at least 50 consecutive seconds.
- CAUTION: Always drive vehicle at a safe speed.

| ENG SPEED | 1,800 - 6,000 rpm |
|----------------|-------------------------|
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | 5.0 - 31.8 msec |
| Selector lever | Except Neutral position |
| PW/ST SIGNAL | OFF |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-357, "M/T MODELS : Diagnosis Procedure".
- NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-356</u>, "<u>M/T MODELS</u>: <u>Component Function Check</u>". 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-357, "M/T MODELS : Diagnosis Procedure".

M/T MODELS : Component Function Check

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.

INFOID:000000008156409

P0500 VSS

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|---|------------------------|---|
| The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotat suitable gear position. | | 4 |
| Is the inspection result normal? | | |
| YES >> INSPECTION END NO >> Go to <u>EC-357, "M/T MODELS : Diagnosis Procedure"</u> . | E | С |
| M/T MODELS : Diagnosis Procedure | INFOID:000000008156410 | |
| 1. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)" | (| С |
| Refer to BRC-27, "CONSULT Function". | | |
| Is the inspection result normal? | [|) |
| YES >> GO TO 2. NO >> Repair or replace. | | |
| 2. CHECK DTC WITH "UNIFIED METER AND A/C AMP." | E | _ |
| Refer to MWI-36, "CONSULT Function (METER/M&A)". | | |
| >> INSPECTION END | F | _ |
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< DTC/CIRCUIT DIAGNOSIS >

P0506 ISC SYSTEM

Description

INFOID:000000008156411

[VQ37VHR]

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:000000008156412

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 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 actuatorIntake air leak |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

If the idle speed is out of the specified value, perform <u>EC-20, "IDLE AIR VOLUME LEARNING : Special</u> <u>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.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart engine and run it for at least 1 minute at idle speed.
- 6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>EC-358, "Diagnosis Procedure"</u>. NO >> INSPECTION END

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.

Is intake air leak detected?

INFOID:000000008156413

P0506 ISC SYSTEM

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > YES >> Discover air leak location and repair. >> GO TO 2. 2.REPLACE ECM Stop engine. Replace ECM. 3. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".

>> INSPECTION END

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< DTC/CIRCUIT DIAGNOSIS >

P0507 ISC SYSTEM

Description

INFOID:000000008156414

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:000000008156415

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 sys- tem RPM higher than expected | The idle speed is more than the target idle speed by 200 rpm or more. | Electric throttle control actuatorIntake air leakPCV system |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

If the idle speed is out of the specified value, perform <u>EC-20, "IDLE AIR VOLUME LEARNING : Special</u> <u>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.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and run it for at least 1 minute at idle speed.
- 6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>EC-360</u>, "<u>Diagnosis Procedure</u>". NO >> INSPECTION END

Diagnosis Procedure

1.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.

INFOID:00000008156416

AFAT ISC SVETEM

| P0507 ISC SYSTEM | |
|--|--------------|
| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR | I |
| NO >> Repair or replace. | - |
| 2. CHECK INTAKE AIR LEAK | А |
| Start engine and let it idle. Listen for an intake air leak after the mass air flow sensor. | EC |
| Is intake air leak detected? | 20 |
| YES >> Discover air leak location and repair. NO >> GO TO 3. | |
| 3. REPLACE ECM | С |
| | _ |
| Stop engine. Replace ECM. Go to <u>EC-17. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repa</u><u>Requirement"</u>. | D |
| >> INSPECTION END | E |
| | F |
| | G |
| | |
| | Η |
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| | 0 |
| | Ρ |

P050A, P050E COLD START CONTROL

Description

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

NOTE:

DTC DETECTION LOGIC

If DTC P050A or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P050A | Cold start idle air control system performance | ECM does not control engine idle speed properly when engine is started with pre-warming up condition. | Lack of intake air volume |
| P050E | Cold start engine exhaust temperature too low | The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition. | Fuel injection systemECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Select "DATA MONITOR" mode with CONSULT.
- 4. Check the indication of "COOLAN TEMP/S".

With GST

Follow the procedure "With CONSULT" above.

Is the value of "COOLAN TEMP/S" between 4°C (39°F) and 36°C (97°F)?

YES >> GO TO 3.

NO-1 [If it is below 15°C (59°F)]>>Warm up the engine until the value of "COOLAN TEMP/S" reaches 15°C (59°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

(B) With CONSULT

- 1. Set the select lever in N range.
- Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between -10°C (14°F) and 40°C (104°F) for more than 15 seconds.
- 3. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Go to EC-363, "Diagnosis Procedure".
- NO >> INSPECTION END

INEOID:000000008156418

P050A, P050E COLD START CONTROL

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > **Diagnosis** Procedure INFOID:000000008156419 А **1.**PERFORM IDLE AIR VOLUME LEARNING Perform EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement". EC 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 D Intake air passage clogging Clogging of throttle body Is the inspection result normal? Е YES >> GO TO 3. >> Repair or replace malfunctioning part NO $\mathbf{3}.$ check fuel injection system function F Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-258, "DTC Logic". Is the inspection result normal? YES >> GO TO 4. NO >> Go to EC-259, "Diagnosis Procedure" for DTC P0171, P0174. **4.** PERFORM DTC CONFIRMATION PROCEDURE Н 1. Turn ignition switch ON. Erase DTC. 2. Perform DTC Confirmation Procedure. See EC-362, "DTC Logic". Is the 1st trip DTC P050A or P050E displayed again? YES >> GO TO 5. NO >> INSPECTION END **5.**REPLACE ECM Κ Replace ECM. Refer to EC-38, "Component Parts Location". 1 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement". L >> INSPECTION END Μ Ν

Ρ

P0524 ENGINE OIL PRESSURE

< DTC/CIRCUIT DIAGNOSIS >

P0524 ENGINE OIL PRESSURE

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0524 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to <u>EC-178, "DTC Logic"</u>

| DTC No. | Trouble diagnosis name | Detecting condition | Possible cause |
|---------|--------------------------------|--|---|
| P0524 | Engine oil pressure too low | Engine oil pressure is low because there is a gap between angle of target and phase-control angle. | Engine oil pressure or level too low Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Intake valve control solenoid valve Accumulation of debris to the signal pick-up portion of the camshaft Timing chain installation Foreign matter caught in the oil groove for intake valve timing control |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-I

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-7, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to <u>LU-7, "Inspection"</u>.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Select "DATA MONITOR" mode with CONSULT.

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

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

CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>EC-365. "Diagnosis Procedure"</u> NO >> INSPECTION END INFOID:000000008156420

1.CHECK OIL PRESSURE WARNING LAMP

Diagnosis Procedure

[VQ37VHR]

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1. Start engine. EC 2. Check oil pressure warning lamp and confirm it is not illuminated. Is oil pressure warning lamp illuminated? YES >> Go to LU-7, "Inspection". NO >> GO TO 2. D Ε PBIA8559J 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE Refer to EC-170, "Component Inspection". F Is the inspection result normal? YES >> GO TO 3. NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-49, "Exploded View". **3.**CHECK CRANKSHAFT POSITION SENSOR (POS) Н Refer to EC-296, "Component Inspection". Is the inspection result normal? YES >> GO TO 4. NO >> Replace crankshaft position sensor (POS). Refer to EM-111, "Exploded View". **4.**CHECK CAMSHAFT POSITION SENSOR (PHASE) Refer to EC-299, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. Κ NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-49, "Exploded View". **5.**CHECK CAMSHAFT (INTAKE) Check the following. L Accumulation of debris to the signal plate of camshaft front end · Chipping signal plate of camshaft front end Is the inspection result normal? M YES >> GO TO 6. NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-85, "Disas-Ν sembly and Assembly". 00 manne JMBIA0962ZZ 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-50, "Removal and Installation".

7.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-94, "Inspection".

P0524 ENGINE OIL PRESSURE

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000008156422

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

| Terminals | Resistance (Ω) |
|-------------------|--|
| 1 and 2 | 7.0 - 7.7 [at 20°C (68°F)] |
| 1 or 2 and ground | $_\infty^\infty$ (Continuity should not exist) |

Is the inspection result normal?

YES >> GO TO 2.

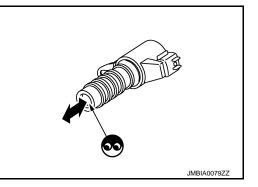
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-49</u>, "<u>Exploded</u> <u>View</u>".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

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

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve. NOTE:

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



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-49</u>, "<u>Exploded</u> <u>View</u>".

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P0550 PSP SENSOR

Description

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a EC power steering load.

This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

DTC Logic

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DTC DETECTION LOGIC

NOTE: If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-380, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | F |
|----------------------------|---|--|---|---|
| P0550 | Power steering pressure sensor circuit | An excessively low or high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted) Power steering pressure sensor | |
| DTC CONFIRMATION PROCEDURE | | | | G |

I.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

| Start engine and let it idle for at least 5 seconds. Check 1st trip DTC. | K |
|---|---|
| Is 1st trip DTC detected? | |
| YES >> Go to <u>EC-367, "Diagnosis Procedure"</u> . NO >> INSPECTION END | L |
| Diagnosis Procedure | |
| 1. CHECK GROUND CONNECTION | Μ |
| Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>. | Ν |
| Is the inspection result normal? | |
| YES >> GO TO 2. NO >> Repair or replace ground connection. | 0 |

2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure (PSP) sensor harness connector.

- Turn ignition switch ON. 2.
- Check the voltage between PSP sensor harness connector and ground. 3.

| PSP : | sensor | Ground | Voltage (V) |
|--------------------|--------|---------|-------------|
| Connector Terminal | | Giodila | voltage (v) |
| F35 | 3 | Ground | Approx. 5 |

INFOID:000000008156423

Is the inspection result normal?

YES >> GO TO 3.

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

 $\mathbf{3}$.check PSP sensor ground circuit for open and short

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between PSP sensor harness connector and ECM harness connector.

| PSP sensor | | ECM | | Continuity |
|------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F35 | 1 | F102 | 96 | Existed |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| PSP sensor | | ECM | | Continuity |
|------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F35 | 2 | F102 | 87 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK PSP SENSOR

Refer to EC-368, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace PSP sensor. Refer to <u>ST-43, "Exploded View"</u>.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK POWER STEERING PRESSURE SENSOR

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

- 3. Start engine and let it idle.
- 4. Check the voltage between ECM harness connector terminals under the following conditions.

| | ECM | | _ | | |
|-----------|----------|----------|----------------|------------------|-------------|
| Connector | + | - | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| F102 | 87 | 96 | Steering wheel | | 0.5 - 4.5 |
| 1 102 | 07 | 90 | Steering wheel | Not being turned | 0.4 - 0.8 |

Is the inspection result normal?



INFOID:000000008156426

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS > YES >> INSPECTION END

NO >> Replace power steering pressure sensor. Refer to <u>ST-43, "Exploded View"</u>.

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< DTC/CIRCUIT DIAGNOSIS >

P0555 BRAKE BOOSTER PRESSURE SENSOR

Description

Brake booster pressure sensor is connected to brake booster by a hose. It detects brake booster pressure and sends the voltage signal to the ECM. The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0555 | Brake booster pressure sensor circuit | An excessively low voltage from the sensor is sent to ECM. An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Brake booster pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor EVAP control system pressure sensor Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 10 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to <u>EC-370, "Diagnosis Procedure"</u>. NO >> INSPECTION END

NO >> INSPECTION EN

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>.

Is the inspection result normal?

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Revision: 2012 July

EC-370

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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EC

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

2.CHECK BRAKE BOOSTER PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect brake booster pressure sensor harness connector.
- 2. Turn ignition switch ON.

3. Check the voltage between brake booster pressure sensor harness connector and ground.

| | booster pres | sure sensor | | a . | | | |
|--|---------------------------------------|--|---|----------------|---------------------------------|-----------------------|----------------------------|
| Conne | ctor | Terminal | | Ground | Voltage (V) | | |
| E48 | 3 | 1 | | Ground | Approx. 5 | | |
| <u>s the insp</u> | ection res | ult normal? | <u>)</u> | | | | |
| | > GO TO 9 | | | | | | |
| - | > GO TO (| | | | | | T 11 |
| | | | PRESSU | RE SENSOR | POWER SU | | 1-11 |
| | gnition swi nnect ECN | | connector | | | | |
| 3. Check | k the contir | | | | sure sensor | harness conne | ector and ECM harness con- |
| nector | ſ. | | | | | | |
| Brake bor | oster pres- | | | | | | |
| | sensor | EC | M | Continuity | | | |
| Connector | Terminal | Connector | Terminal | | | | |
| E48 | 1 | F101 | 45 | Existed | | | |
| | ection resu | |) _ | | | | |
| | > GO TO { > GO TO 4 | | | | | | |
| 4 | T MALFU | | | | | | |
| | | | | | | | |
| | following. | s F1, E3 | | | | | |
| | | | CM and b | rake booster p | ressure sen | sor | |
| | | | | | | | |
| _ | > Repair o | • | | | | | |
| | K SENSOF | | | | | | |
| Check har | ness for sl | nort to pow | er and sh | ort to ground, | between the | e following tern | ninals. |
| | | | | Sensor | | | |
| E | | | | 3611301 | | | |
| EC | Terminal | | Name | | Connector | Terminal | |
| E0 Connector | Terminal 45 | Brake boos | Name | | Connector E48 | Terminal 1 | |
| | Terminal 45 46 | | ter pressure | | Connector E48 F2 | Terminal 1 1 | |
| Connector | 45 | Brake boos CKP senso APP senso | ter pressure r (POS) | | E48 F2 | 1 | |
| Connector | 45 46 103 | CKP senso APP senso | ter pressure r (POS) r | | E48 | 1 | |
| Connector F101 | 45 46 | CKP senso APP senso EVAP contr | ter pressure r (POS) r | e sensor | E48 F2 E112 | 1 1 6 | |
| Connector F101 M107 | 45 46 103 | CKP senso APP senso EVAP contr Refrigerant | ter pressure r (POS) r rol system p pressure se | e sensor | E48 F2 E112 B30 | 1 1 6 3 | |
| Connector F101 M107 s the insp YES > | 45 46 103 107 | CKP senso APP senso EVAP contr Refrigerant ult normal? | ter pressure r (POS) r rol system p pressure se | e sensor | E48 F2 E112 B30 | 1 1 6 3 | |
| Connector F101 M107 S the insp YES > NO > | 45 46 103 107 ection resu | CKP senso APP senso EVAP contri Refrigerant ult normal? 6. hort to gro | r (POS) r ol system p pressure se | e sensor | E48 F2 E112 B30 E77 | 1 1 6 3 3 | |

Check the following.

Crankshaft position sensor (POS) (Refer to <u>EC-296. "Component Inspection"</u>.)

• EVAP control system pressure sensor (Refer to EC-330, "Component Inspection".)

EC-371

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

• Refrigerant pressure sensor (Refer to EC-531, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-484, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 8.

 ~ 3 GO 10 8.

8.Replace accelerator pedal assembly

1. Replace accelerator pedal assembly. Refer to ACC-3, "Exploded View".

2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

9.CHECK BRAKE BOOSTER PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between brake booster pressure sensor harness connector and ECM harness connector.

| Brake booster | pressure sensor | E | Continuity | |
|---------------|-----------------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E48 | 3 | F101 | 36 | Existed |

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

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

• Harness for open or short between brake booster pressure sensor and ECM

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

11. CHECK BRAKE BOOSTER PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between brake booster pressure sensor harness connector and ECM harness connector.

| Brake booster | pressure sensor | E | Continuity | |
|---------------|-----------------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E48 | 2 | F101 | 39 | Existed |

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

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F1, E3

Harness for open or short between brake booster pressure sensor and ECM

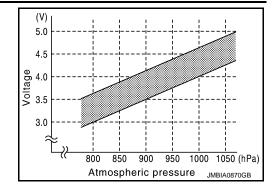
EC-372

| COTC/CIRCUIT DI | | BOOSTER | PRESSURE SENSOR [VQ37VHR] |
|---|------------------------|---------------------------------------|---|
| | | around or short to | power in harness or connectors. |
| · • · | E BOOSTER PRESS | - | power in namess of connectors. |
| | omponent Inspection | | |
| s the inspection res | | <u> </u> | |
| YES >> GO TO | | | |
| | | sure sensor. Refe | r to BR-34, "Removal and Installation". |
| 4. CHECK INTER | MITTENT INCIDEN | Г | |
| Refer to <u>GI-42, "Inte</u> | rmittent Incident". | | |
| NODEC | | | |
| >> INSPEC | | | |
| Component Insp | pection | | INFOID:00000008156430 |
| CHECK BRAKE | BOOSTER PRESSU | RE SENSOR-I | |
| I. Turn ignition swi | | | · · · · · · · · · · · · · · · · · · · |
| Start engine and | d warm it up to norma | al operating temp | erature. |
| 3. Turn ignition swi | itch OFF, wait at leas | t 5 seconds and | hen turn ON. |
| . Check the voltage | ge between ECIVI ha | rness connector t | erminals as per the following. |
| | ECM | | |
| _ | + | _ | |
| Connector | Terminal | Terminal | |
| F101 | 39 | 36 | |
| NOTE: | | | |
| | fluence of intake ma | nifold vacuum, ch | eck the voltage 1 or more minutes past after engine |
| is stopped. Because the s | ensor is absolute pre | essure sensor, ou | tput value may differ depends on atmospheric pres- |
| sure and altitu | de. | , | ······································ |
| Measure the atn NOTE: | nospheric pressure. | | |
| | eric pressure descri | bed on the synor | tic chart is the value at sea level, compensate the |
| | e following chart. | , , , , , , , , , , , , , , , , , , , | |
| | - | | |
| Altitude (m) | Compensated pr | essure (hPa) | |
| 0 | 0 | | |
| 200 | -24 | | |
| 400 | -47 | | |
| 600 | -70 | | |
| 800 | -92 | | |
| 1000 | -114 | <u>ا</u> | |
| 1500 | -168 | | |
| 2000 | -218 | | |
| Check the manif | fold absolute pressu | e sensor value co | prresponding to the atmospheric pressure. |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Atmospheric pressure (hPa) | Voltage (V) |
|----------------------------|-------------|
| 800 | 3.1 – 3.7 |
| 850 | 3.3 – 3.9 |
| 900 | 3.5 – 4.1 |
| 950 | 3.8 - 4.3 |
| 1000 | 4.0 - 4.6 |
| 1050 | 4.2 - 4.8 |



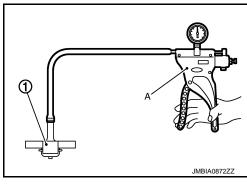
Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace brake booster pressure sensor. Refer to <u>BR-34, "Removal and Installation"</u>.

2.CHECK BRAKE BOOSTER PRESSURE SENSOR-II

- 1. Turn ignition switch OFF.
- 2. Remove brake booster pressure sensor with its harness connected.
- 3. Connect the hose of vacuum pump (A) to brake booster pressure sensor (1).
- 4. Turn ignition switch ON.



5. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | | |
|-----------|----------|-----------|----------|--|--|--|
| | + | - | | | | |
| Connector | Terminal | Connector | Terminal | | | |
| F101 | 39 | F101 | 36 | | | |

6. Check that the difference of the voltage when engine is stopped and that when negative pressure is applied with vacuum pump is within the following limits.

| Vacuum | Voltage difference (V) |
|---------------------|------------------------|
| -40kPa (-300mmHg) | 1.5 – 2.0 |
| -53.3kPa (-400mmHg) | 2.0 - 2.6 |
| -66.7kPa (-500mmHg) | 2.6 - 3.2 |
| -80kPa (-600mmHg) | 3.2 - 3.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace brake booster pressure sensor. Refer to <u>BR-34, "Removal and Installation"</u>.

P0603 ECM POWER SUPPLY

Description

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.

DTC Logic

DTC No.

DTC DETECTION LOGIC

Trouble diagnosis name

 P0603
 ECM power supply circuit
 ECM back up RAM system does not function properly.
 • Harness or connectors [ECM power supply (back up) circuit is open or shorted.]

 DTC CONFIRMATION PROCEDURE
 • ECM back up RAM system does not function properly.
 • ECM power supply (back up) circuit is open or shorted.]

DTC detecting condition

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 second.
- Turn ignition switch OFF and wait at least 5 minutes.
 Turn ignition switch ON and wait at least 10 second.
- Turn ignition switch ON and wait at lea
 Repeat steps 2 and 3 for five times.
- Repeat steps 2 and 3 for five times.
 Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-375. "Diagnosis Procedure".
- NO >> INSPECTION END

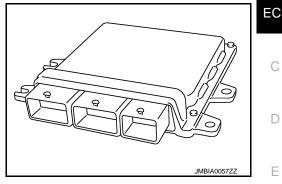
Diagnosis Procedure

1.CHECK ECM POWER SUPPLY

- 1. Turn ignition switch \overline{OFF} .
- 2. Disconnect ECM harness connector.
- 3. Check the voltage between ECM harness connector terminals as per the following.



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Possible cause

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INFOID:000000008156433

P0603 ECM POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

| | + | - | _ | Voltage |
|-----------|----------|-----------|----------|-----------------|
| Connector | Terminal | Connector | Terminal | * |
| F102 | 93 | M107 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E3, F1
- 15 A fuse (No. 50)
- IPDM E/R harness connector E7
- · Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace harness or connectors.

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-375, "DTC Logic"</u>.
- Is the 1st trip DTC P0603 displayed again?
- YES >> GO TO 5.
- NO >> INSPECTION END

5.REPLACE ECM

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

>> INSPECTION END

P0605 ECM

Description

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 | | DTC detecting condition | | Possible cause | G |
|---------|------------------------|-------------------------|---|-------------------------|-----|----------------|---|
| | | A) | ECM calculation function is malfunctioning. | | _ 0 | | |
| P0605 | Engine control module | B) | ECM EEP-ROM system is malfunctioning. | • ECM | | | |
| | | C) | ECM self shut-off function is malfunctioning. | | Н | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

| If DTC | Confirmation | Procedure | has been | previously | conducted, | always | perform | the follo | wing | procedure |
|--|--------------|-----------|----------|------------|------------|--------|---------|-----------|------|-----------|
| If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test. | | | | | | | | | | |
| . Turn invition switch OFF and wait at least 10 accords | | | | | | | | | | |

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

>> GO TO 2.

- 2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A Turn ignition switch ON. 1. Check 1st trip DTC. 2. Is 1st trip DTC detected? YES >> Go to EC-378, "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. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON. 2. 3. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-378, "Diagnosis Procedure". NO >> GO TO 4. 4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C
- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- Repeat step 2 for 32 times. 3.
- Check 1st trip DTC. 4.

Is 1st trip DTC detected?

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YES >> Go to EC-378, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-377, "DTC Logic"</u>.

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

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

>> INSPECTION END

INFOID:000000008156436

[VQ37VHR]

P0607 ECM

Description

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle mul-EC tiplex 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

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DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|-------------------------|--|--|---------------------------------------|
| P0607 | CAN communication bus | When detecting error during the initial diagno- sis of CAN controller of ECM. | • ECM |
| DTC CON | FIRMATION PROCED | URE | |
| 1. PERFOR | RM DTC CONFIRMATIO | N PROCEDURE | |
| 1. Turn ig 2. Check | nition switch ON. | | |
| Is DTC dete | | | |
| YES >> | Go to EC-379, "Diagnos | sis Procedure". | |
| NO >> | INSPECTION END | | |
| Diagnosi | s Procedure | | INFOID:000000008156439 |
| 1.INSPEC | TION START | | |
| 1. Turn ig | nition switch ON. | | |
| 2. Erase [| DTC. | | |
| | n DTC Confirmation Proc C-379, "DTC Logic". | cedure. | |
| 4. Check | - | | |
| | P0607 displayed again? GO TO 2. | | |
| | INSPECTION END | | |
| 2.REPLAC | CE ECM | | |
| 1. Replac | e ECM. | | |
| 2. Go to <u>Require</u> | | ERVICE WHEN REPLACING CONTR | <u>OL UNIT (ECM) : Special Repair</u> |
| Require | ement. | | |
| >> | INSPECTION END | | |
| | | | |
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P0643 SENSOR POWER SUPPLY

DTC Logic

INFOID:000000008156440

[VQ37VHR]

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------------|---|---|
| P0643 | Sensor power supply circuit short | ECM detects that the voltage of power source for sensor is excessively low or high. | Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 1) circuit is shorted.] [Manifold absolute pressure (MAP) sensor circuit is shorted.] (PSP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 2) circuit is shorted.] [Battery current sensor circuit is shorted.] Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE) (bank 1) Manifold absolute pressure (MAP) sensor Power steering pressure sensor Camshaft position sensor (PHASE) (bank 2) Battery current sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-380, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156441

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between APP sensor harness connector and ground.

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

| a | sensor | Ground | Voltage (V) | | | | | |
|---|--|--|---|--|---|---|----|--|
| Connector | Terminal | _ | | | | | | |
| E112 | 5 | Ground | Approx. 5 | | | | | |
| | ection resu | | | | | | | |
| | > GO TO 7 > GO TO 3 | | | | | | | |
| | | | SUPPLY CIRCUITS | | | | | |
| | | | er and short to ground, I | otwoon the | following | torminala | | |
| HECK Hall | | | er and short to ground, r | | lonowing | lemmais. | | |
| EC | M | | Sensor | | | | | |
| Connector | Terminal | | Name | Connector | Terminal | | | |
| | 43 | Electric thro | ottle control actuator (bank 2) | F27 | 1 | | | |
| F101 | 44 | Electric thro | ottle control actuator (bank 1) | F6 | 6 | | | |
| | | CMP senso | r (PHASE) (bank 1) | F5 | 1 | | | |
| | 60 | | solute pressure (MAP) sen- | F50 | 1 | | | |
| F102 | - | PSP senso | r | F35 | 3 | | | |
| | 0.4 | CMP senso | r (PHASE) (bank 2) | F18 | 1 | | | |
| | 64 | Battery curr | ent sensor | E21 | 1 | | | |
| M407 | 00 | | | E440 | 5 | | | |
| YES >> NO >> | 99 ection resu > GO TO 4 > Repair sh COMPON | l. hort to gro | | E112 harness or | | i. | | |
| s the inspe YES >> NO >> I.CHECK | ection resu > GO TO 4 > Repair sh COMPON | Ilt normal? I. hort to gro | | | | i. | | |
| s the inspe YES >> NO >> LCHECK Check the f | ection resu > GO TO 4 > Repair sł COMPON following. t position s | It normal? I. hort to grou NENTS sensor (PH | und or short to power in HASE) (bank 1) (Refer to | harness or <u>EC-299, "(</u> | | Inspection" | .) | |
| s the inspe YES >> NO >> LCHECK Check the f Camshaf Manifold | ection resu > GO TO 4 > Repair sh COMPON following. t position s absolute p | It normal? I. hort to gro VENTS sensor (PH pressure (N | und or short to power in IASE) (bank 1) (Refer to IAP) sensor (Refer to <u>E</u> | harness or <u>EC-299, "(</u> C-194, "Cor | connectors | Inspection" spection".) | .) | |
| s the inspe YES >> NO >> CHECK Check the the Camshaf Manifold Power sto | ection resu > GO TO 4 > Repair sh COMPON following. t position s absolute p eering pres | It normal? I. hort to gro VENTS sensor (PH pressure (N ssure sens | und or short to power in HASE) (bank 1) (Refer to | harness or <u>EC-299, "(</u> C-194, "Cor omponent I | connectors Component nponent In nspection" | Inspection" spection".) | , | |
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| the inspense YES >> NO >> CHECK heck the Camshaf Manifold Power ste Camshaf Battery co s the inspense | ection resu GO TO 4 Repair sh COMPON following. t position s absolute p eering pres t position s urrent sens ection resu | It normal? I. NENTS Sensor (PH Dressure (N Ssure sens Sensor (PH Sor (Refer It normal? | IASE) (bank 1) (Refer to IASE) (bank 1) (Refer to IAP) sensor (Refer to <u>EC-368, "C</u> IASE) (bank 2) (Refer to to <u>EC-430, "Component</u> | harness or <u>EC-299, "(</u> <u>C-194, "Cor</u> omponent I <u>EC-299, "(</u> | connectors | Inspection" spection".) | , | |
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| s the inspective YES >> NO >> I.CHECK Check the f Camshaf Manifold Power ste Camshaf Battery cr Sthe inspective YES >> NO >> NO >> I.CHECK Refer to EC Sthe inspective YES >> NO >> NO >> I.REPLAC . Replace | COMPON GO TO 4 Repair sh COMPON following. t position s absolute p eering pression s urrent sension GO TO 5 Replace TP SENS C-211, "Constant sension" GO TO 9 GO TO 6 CE ELECT ce electric | Ilt normal? I. hort to grou VENTS Sensor (Phoressure (N ssure sensor sensor (Phoressure (N ssure sensor (Refer Ilt normal? 5. malfunctic SOR mponent I Ilt normal? 5. TRIC THRO throttle con | und or short to power in IASE) (bank 1) (Refer to IAP) sensor (Refer to <u>EC</u> sor (Refer to <u>EC-368, "C</u> IASE) (bank 2) (Refer to to <u>EC-430, "Component</u> oning component. <u>INSPECTION</u> | harness or EC-299, "(C-194, "Cor omponent I EC-299, "(Inspection | connectors | Inspection" spection".) Inspection" | , | |
| a the inspective YES NO NO NO CHECK Check the inspective Camshaf Manifold Power ster Camshaf Battery cr a the inspective YES NO Cefer to EC a the inspective YES NO NO NO NO REPLAC Replac Go to E State of the inspective | COMPON GO TO 4 Repair sh COMPON following. t position s absolute p eering pression s urrent sension GO TO 5 Replace TP SENS C-211, "Construction results GO TO 9 GO TO 9 GO TO 6 CE ELECT ce electric fec-211, "S INSPEC | Ilt normal? I. hort to grou VENTS Sensor (Phoressure (N ssure sensor sor (Refer Ilt normal? 5. malfunctic SOR mponent I Ilt normal? 5. TRIC THRO throttle com Special Rep TION END | Und or short to power in HASE) (bank 1) (Refer to MAP) sensor (Refer to <u>EC-368, "C</u> HASE) (bank 2) (Refer to to <u>EC-430, "Component</u> oning component. Introl component. | harness or EC-299, "(C-194, "Cor omponent I EC-299, "(Inspection | connectors | Inspection" spection".) Inspection" | , | |
| s the inspective YES NO NO NO CHECK Check the inspective Camshaf Manifold Power ster Camshaf Battery cr S the inspective YES NO NO NO NO REPLAC Replac S Go to I | Con result GO TO 4 Repair sh COMPON following. t position stabsolute pering pression stabsolute pering pression statement sense GO TO 5 Replace TP SENS C-211, "Construction result GO TO 9 GO TO 6 CE ELECT ce electric EC-211, "Statement sense | Ilt normal? I. hort to grou VENTS Sensor (Phoressure (N ssure sensor sor (Refer Ilt normal? 5. malfunctic SOR mponent I Ilt normal? 5. TRIC THRO throttle com Special Rep TION END | Und or short to power in HASE) (bank 1) (Refer to MAP) sensor (Refer to <u>EC-368, "C</u> HASE) (bank 2) (Refer to to <u>EC-430, "Component</u> oning component. Introl component. | harness or EC-299, "(C-194, "Cor omponent I EC-299, "(Inspection | connectors | Inspection" spection".) Inspection" | , | |

Is the inspection result normal? YES >> GO TO 9.

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly. Refer to <u>ACC-3, "Exploded View"</u>.
 Go to <u>EC-484, "Special Repair Requirement"</u>.

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

P0850 PNP SWITCH

Description

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM.(A/ T models)

When the selector lever position is Neutral position, park/neutral position (PNP) switch is ON.(M/T models) ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:000000008156443

DTC DETECTION LOGIC

| | Trouble diagnosis nome | DTC detecting condition | Dessible source |
|---|---|--|---|
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
| P0850 | Park/neutral position switch | The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started. | Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] Park/neutral position (PNP) switch (M/T models) TCM (A/T models) |
| TC CON | FIRMATION PROC | CEDURE | |
| INSPE | CTION START | | |
| Do you ha | ve CONSULT? | | |
| <u>)o you ha</u> | ve CONSULT? | | |
| | > GO TO 2. | | |
| | > GO TO 5. | | |
| | ONDITIONING | | |
| | onfirmation Procedure iducting the next test. | | d, always perform the following procedure |
| | | d wait at least 10 seconds. | |
| | gnition switch ON. | durait at lagat 10 accords | |
| . Tum i | gnillion switch OFF an | d wait at least 10 seconds. | |
| | | | |
| | | | |
| • | > GO TO 3. (PNP SWITCH SIGN | IAL (M/T) OR TRANSMISSION R | ANGE SWITCH SIGNAL (A/T) |
| B.CHECK | (PNP SWITCH SIGN | IAL (M/T) OR TRANSMISSION RA | ANGE SWITCH SIGNAL (A/T) |
| | (PNP SWITCH SIGN | IAL (M/T) OR TRANSMISSION RA | ANGE SWITCH SIGNAL (A/T) |
| With CO With CO Turn ig | (PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "D | DATA MONITOR" mode with CON | ANGE SWITCH SIGNAL (A/T) SULT. Then check the "P/N POSI SW" signal |
| With Co With Co Turn ig | (PNP SWITCH SIGN DNSULT gnition switch ON. | DATA MONITOR" mode with CON | |
| With CO With CO Turn ig Select under | (PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "D | DATA MONITOR" mode with CON | |
| CHECK With CO . Turn ig . Select under Positi | C PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) | DATA MONITOR" mode with CONS ns. Known-good signal | |
| B.CHECK With CO Turn ig Select under Positi N or P posi Neutral pos | C PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) | DATA MONITOR" mode with CONS ns. Known-good signal ON | |
| B.CHECK With CO Turn ig Select under Positi N or P posi Neutral posi Except abo | C PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) ition (M/T) ve position | DATA MONITOR" mode with CONS ns. Known-good signal | |
| B.CHECK With CO Turn ig Select under Positi Nor P posi Neutral pos Except abo | (PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? | DATA MONITOR" mode with CONS ns. Known-good signal ON | |
| B.CHECK With CO Turn ig Select under Positi Nor P posi Neutral pos Except abo s the insp YES > | A PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? > GO TO 4. | OATA MONITOR" mode with CONS ns. Known-good signal ON OFF | |
| CHECK With CO Turn ig Select under Positi Nor P posi Neutral posi Except abo the insp YES > NO > | C PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? > GO TO 4. > Go to <u>EC-384, "Dia</u> | DATA MONITOR" mode with CONS ns. Known-good signal ON OFF gnosis Procedure". | |
| B.CHECK With CO Turn ig Select under Positi Nor P posi Neutral pos Except abo S the insp YES > NO > A.PERFC | A PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? > GO TO 4. > Go to <u>EC-384. "Dia</u> DRM DTC CONFIRMA | OATA MONITOR" mode with CONS ns. Known-good signal ON OFF gnosis Procedure". | |
| CHECK With CO Turn ig Select under Positi N or P posi Neutral pos Except abo the insp YES NO CHECK CH | A PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? > GO TO 4. > GO TO | DATA MONITOR" mode with CONS ns. Known-good signal ON OFF gnosis Procedure". ATION PROCEDURE mode with CONSULT. | SULT. Then check the "P/N POSI SW" signal |
| CHECK With CO Turn ig Select under Positi N or P posi Neutral pos Except abo Sthe insp YES > NO > LPERFC Select Start e | C PNP SWITCH SIGN DNSULT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? > GO TO 4. > GO TO | OATA MONITOR" mode with CONS ns. Known-good signal ON OFF gnosis Procedure". | SULT. Then check the "P/N POSI SW" signal |
| B.CHECK With CO Turn ig Select under Positi Nor P posi Neutral posi Except abo Sthe insp YES > NO > LPERFC Select Start e Start e Mainta | C PNP SWITCH SIGN pnsuLT gnition switch ON. t "P/N POSI SW" in "E the following condition on (Selector lever) tion (A/T) sition (M/T) ve position ection result normal? > GO TO 4. > GO to <u>EC-384. "Dia</u> DRM DTC CONFIRMA t "DATA MONITOR" m engine and warm it up ain the following cond | DATA MONITOR" mode with CONS ns. Known-good signal ON OFF gnosis Procedure". ATION PROCEDURE node with CONSULT. to normal operating temperature. itions for at least 50 consecutive s | SULT. Then check the "P/N POSI SW" signal |

INFOID:000000008156442

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| ENG SPEED | 1,400 - 6,375 rpm |
|----------------|----------------------------|
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | 2.0 - 31.8 msec |
| VHCL SPEED SE | More than 64 km/h (40 mph) |
| Selector lever | Suitable position |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-384, "Diagnosis Procedure".

NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-384, "Component Function Check".

NOTE:

Use component function check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-384, "Diagnosis Procedure".

Component Function Check

INFOID:000000008156444

1.PERFORM COMPONENT FUNCTION CHECK

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | | |
|-----------|----------|----------|----------------|-------------------------------|-----------------|--|
| Connector | + | _ | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| M107 | 109 | 128 | Selector lever | P or N (A/T) Neutral (M/T) | Battery voltage | |
| | | | | Except above | Approx. 0 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-384, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000008156445

1.INSPECTION START

Check which type of transmission the vehicle is equipped with.

Which type of transmission?

A/T >> GO TO 2. M/T >> GO TO 7. **2.**CHECK DTC WITH TCM

Refer to TM-154. "Diagnosis Description".

Refer to <u>IM-154, "Diagnosis Description"</u>

<u>Is the inspection result normal?</u> YES >> GO TO 3.

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

3. CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START. Does starter motor operate?

P0850 PNP SWITCH

| | GO TO Check E <u>NAL BU</u> | DTC with B | CM. Refe | r to <u>BCS-33, "SIGNAL BUFFER : CONSULT Function (BCN</u> | M - SIG- A |
|---|--|----------------------------------|---------------|--|------------|
| 4.СНЕСК | - | | ANGE SV | /ITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT | |
| Discon Discon | nect ECM | assembly h I harness o | connector. | nnector. sembly harness connector and ECM harness connector. | C |
| A/T ass | embly | EC | M | Continuity | |
| Connector | Terminal | Connector | Terminal | Continuity | D |
| F51 | 9 | M107 | 109 | Existed | |
| Is the inspective YES >>> | | ult normal? 6. | - | nd and short to power. | E |
| 5.DETEC | T MALFU | NCTIONIN | IG PART | | |
| Check the • Harness • Harness | connector connector | rs E106, M | | | G |
| | Repair of the second se Second second sec | pen circuit | , short to | assembly and ECM ground or short to power in harness or connectors. | Н |
| Refer to GI | | | | | |
| >> 7. CHECK | INSPEC | TION END ITCH POV tch OFF. |) VER SUPF | PLY CIRCUIT | J K |
| 3. Turn ig | nition swi | tch ON. | | P) switch harness connector. | L |
| Connector | switch Terminal | | Voltag | | Μ |
| F55 Is the inspe | 2 | Ground | Battery vo | | |
| YES >> | > GO TO 9 > GO TO 8 | 9. 8. | | | Ν |
| Check the • Harness • 10 A fuse • IPDM E/F | following. connector (No. 43) R harness | rs E3, F1 connector | E7 | P switch and fuse | P |
| • | - | - | | ground or short to power in harness or connectors. L CIRCUIT FOR OPEN AND SHORT | |

1. Turn ignition switch OFF.

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect ECM harness connector.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

3. Check the continuity between PNP switch harness connector and ECM harness connector.

| PNP switch | | EC | Continuity | |
|------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F55 | 1 | M107 | 109 | Existed |

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

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F103, M116

Harness for open or short between PNP switch and ECM

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

11.CHECK PNP SWITCH

Refer to TM-9, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace PNP switch.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace.

P100A, P100B VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

P100A, P100B VVEL SYSTEM

DTC Logic

INFOID:000000008156446

[VQ37VHR]

DTC DETECTION LOGIC

NOTE:

- If DTC P100A or P100B is displayed with DTC P1090 or P1093, first perform the trouble diagnosis for DTC P1090 or P1093. Refer to <u>EC-400, "DTC Logic"</u>.
- If DTC P100A or P100B is displayed with DTC P0101 or P010B, first perform the trouble diagnosis for DTC P0101 or P010B. Refer to <u>EC-181, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | D |
|---------|------------------------------------|--|--|---|
| P100A | VVEL response malfunction (bank 1) | | Harness or connectors (VVEL actuator motor circuit is open or shorted.) | _ |
| P100B | VVEL response malfunction (bank 2) | Actual event response to target is poor. | VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

| 1. | Start | engine. |
|----|-------|---------|
| | | |

2. Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.

- 3. Wait at idle for 5 seconds or more.
- 4. Repeat steps 2 to 3 for three times.
- 5. Check 1st trip DTC.

Is DTC detected?

YES >> Go to EC-387, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connections M95, E46. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.vvel actuator motor output signal circuit for open and short

1. Disconnect VVEL control module harness connector.

2. Disconnect VVEL actuator motor harness connector.

3. Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

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INFOID:000000008156447

P100A, P100B VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

| DTC No. | V | VEL control mode | le | VVEL actuator motor | | Continuity | |
|---------|------|------------------|----------|---------------------|----------|-------------|--|
| DIC NO. | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| | | | 12 | | 1 | Existed | |
| P100A | 1 | E15 | | F48 | 2 | Not existed | |
| FIUUA | I | | 25 | - Г40 | 1 | Not existed | |
| | | | | | 2 | Existed | |
| P100B | 2 | | 2 | | 1 | Existed | |
| | | | 2 | F49 | 2 | Not existed | |
| | | | 45 | Г49 | 1 | Not existed | |
| | | | 15 | | 2 | Existed | |

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

Harness for open or short between VVEL actuator motor and VVEL control module

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

4.CHECK VVEL ACTUATOR MOTOR

Refer to EC-389, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly.

2. Go to EC-390, "Special Repair Requirement".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace.

7.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to <u>EC-38</u>, "Component Parts Location".

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> GO TO 8.

8.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-387, "DTC Logic"</u>.

Is the DTC P100A or P100B displayed again?

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| | P100A, P100B | VVELSYSTEM | |
|--|-------------------------------------|------------------------------------|------------------------|
| < DTC/CIRCUIT DIAGNOSIS | S > | | [VQ37VHR] |
| YES >> GO TO 9. NO >> INSPECTION EN | D | | , |
| 9. CHECK VVEL ACTUATOR | SUB ASSEMBLY | | |
| Refer to EC-389, "Component | t Inspection (VVEL ACTL | JATOR SUB ASSEMBLY)". | |
| Is the inspection result norma | <u>l?</u> | | E |
| YES >> GO TO 11. | | | |
| NO >> GO TO 10. | | | (|
| 10.REPLACE VVEL ACTUA | | | |
| Replace VVEL actuator s Go to <u>EC-390</u>, "Special R | ub assembly. epair Requirement". | | I |
| >> INSPECTION EN | | | |
| 11.CHECK VVEL LADDER | ASSEMBLY | | 1 |
| Refer to EM-94, "Inspection". | | | |
| Is the inspection result norma | <u>l?</u> | | I |
| YES >> GO TO 13. NO >> GO TO 12. | | | |
| | IEAD, VVEL LADDER AS | SSEMBLY AND VVEL ACTUATOR SUB | ASSEMBLY |
| | | sembly and Assembly"), VVEL ladder | |
| VVEL actuator sub assen | nbly. | , , | |
| 2. Go to EC-390, "Special R | <u>epair Requirement</u> . | | |
| >> INSPECTION EN | D | | |
| 13.CHECK INTERMITTENT | | | |
| Refer to <u>GI-42</u> , "Intermittent Ir | | | |
| ittelei to <u>or-42, intermittent ir</u> | <u>icident</u> . | | |
| >> INSPECTION EN | D | | |
| Component Inspection | (VVEL ACTUATOR | MOTOR) | INFOID:00000008156448 |
| 1.CHECK VVEL ACTUATOR | , | , | INFOID:00000008130446 |
| 1. Turn ignition switch OFF. | | | |
| 2. Disconnect VVEL actuato | | | |
| 3. Check resistance betwee | n VVEL actuator motor te | erminals as follows. | |
| | | _ | l |
| VVEL actuator motor | Resistance | | |
| Terminal 1 and 2 | 16 Ω or less | - | |
| Is the inspection result norma | | - | |
| YES >> INSPECTION EN | | | |
| NO >> GO TO 2. | - | | (|
| 2.REPLACE VVEL ACTUAT | OR SUB ASSEMBLY | | |
| Replace VVEL actuator s Go to <u>EC-390, "Special R</u> | | | |
| >> INSPECTION EN | D | | |
| Component Inspection | | | |
| | | | INFOID:000000008156449 |
| 1. CHECK VVEL ACTUATOR | SUB ASSEMBLY | | |

P100A, P100B VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

- 1. Turn ignition switch OFF.
- 2. Remove VVEL actuator sub assembly. Refer to EM-85, "Disassembly and Assembly".
- 3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly.
- 2. Go to EC-390, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156450

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-22, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement".

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-20. "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

P1087, P1088 VVEL SYSTEM

DTC Logic

DTC DETECTION LOGIC

NOTE:

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If DTC P1087 or P1088 is displayed with DTC P1090 or P1093. Perform the trouble diagnosis for DTC P1090 or P1093. Refer to <u>EC-396, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|--|---|---|
| P1087 | VVEL small event angle malfunction (bank 1) | 5 | | D |
| P1088 | VVEL small event angle malfunction (bank 2) | The event angle of VVEL control shaft is always small. | open or shorted.) VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module | E |

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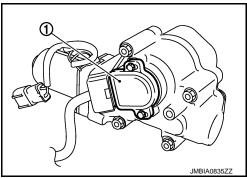
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< DTC/CIRCUIT DIAGNOSIS >

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

Description

VVEL control shaft position sensor (1) is placed on VVEL actuator sub assembly and detects the control shaft position angle. A magnet is pressed into the arm on the edge of control shaft. The magnetic field changes as the magnet rotates together with the arm resulting in the output voltage change of the sensor. VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.



[VQ37VHR]

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DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608. Refer to <u>EC-471, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1089 | VVEL control shaft position sensor (bank 1) circuit | • An excessively low voltage from the sensor is sent to VVEL control module. | |
| P1092 | VVEL control shaft position sensor (bank 2) circuit | An excessively high voltage from the sensor is sent to VVEL control module. Rationally incorrect voltage is sent to VVEL control module compared with the signals from VVEL control shaft po- sition sensor 1 and VVEL control shaft position sensor 2. | Harness or connectors (VVEL control shaft position sensor circuit is open or shorted.) VVEL control shaft position sensor VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-392, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connections M95, E46. Refer to Ground Inspection in GI-45, "Circuit Inspection".

EC-392

INFOID:000000008156454

| Is the inspecti | JIT DIAGNO | 212 > | | | | [VQ37VI | HR] |
|--|--|---|---|--|--|--------------------------------------|-------|
| | on result nor | mal? | | | | | |
| • | O TO 2. | | | | | | ŀ |
| NO >> R | epair or repla | ace ground con | nection. | | | | |
| 2.VVEL CON | ITROL SHAF | T POSITION S | SENSOR PO | WER SUPPLY | Y CIRCUIT | | |
| 1. Disconne | ct VVEL cont | rol shaft position | on sensor ha | rness connect | or. | | —— E(|
| 2. Turn igniti | on switch ON | ۱. | | | | | |
| Check the | e voltage betv | ween VVEL co | ntrol shaft po | sition sensor l | narness conn | ector and ground. | C |
| | | | | | | _ | |
| DTC No. | | control shaft position | | Ground | Voltage (V |) | |
| | Bank | Connector | Terminal | | | · | Ε |
| P1089 | 1 | F46 | 3 | | | | |
| | | | 6 | Ground | Approx. 5 | | |
| P1092 | 2 | F47 | 3 | | | | E |
| | | | 6 | | | _ | |
| s the inspecti | | mal? | | | | | F |
| | O TO 4. | | | | | | |
| | О ТО 3. | | | | | | |
| 3. DETECT N | IALFUNCTIC | NING PART | | | | | (|
| Check the follo | | | | | | | |
| Harness cor | | | <u>.</u> | <i></i> | 1.0.0 | - , , , , , | |
| Harness for | open or snor | t between VVE | L CONTROL SN | art position ser | nsor and VVE | L control module | ŀ |
| 1. CHECK V\ | • • | rcuit, short to g | ground or sho | ort to power in | hornooc or o | onnectors | |
| | | | SITION SEN | • | | OR OPEN AND SHORT | |
| 3. Check the | | F. rol module har between VVEL | ness connec | SOR GROUN | D CIRCUIT F | | |
| 3. Check the | ct VVEL cont e continuity b arness conne | FF. rol module har between VVEL ector. | ness connec control shaf | SOR GROUN tor. t position sen | D CIRCUIT F | OR OPEN AND SHORT | |
| 3. Check the | ct VVEL cont e continuity b arness conne VVEL co | F. rol module har between VVEL ector. | ness connec control shaf | SOR GROUN tor. t position sens | D CIRCUIT F sor harness | OR OPEN AND SHORT | ntrol |
| Check the module has | ct VVEL cont e continuity b arness conne | FF. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal | SOR GROUN tor. t position sen | D CIRCUIT F sor harness rol module Terminal | OR OPEN AND SHORT | ntrol |
| Check the module has | ct VVEL cont e continuity b arness conne VVEL co | F. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 | SOR GROUN tor. t position sens | D CIRCUIT F sor harness rol module Terminal 4 | OR OPEN AND SHORT | ntrol |
| Check the module has been been been been been been been bee | ct VVEL cont e continuity b arness conne VVEL co Bank | F. rol module har between VVEL ector. ontrol shaft position Connector | ness connec control shaf n sensor Terminal 2 5 | SOR GROUN tor. t position sens | D CIRCUIT F sor harness rol module Terminal 4 17 | OR OPEN AND SHORT | ntrol |
| Check the module has been been been been been been been bee | ct VVEL cont e continuity b arness conne VVEL co Bank | F. rol module har between VVEL ector. ontrol shaft position Connector | ness connec control shaf n sensor Terminal 2 5 2 | SOR GROUN tor. t position sens VVEL cont Connector | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has DTC No. P1089 P1092 | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 | F. rol module har between VVEL ector. ontrol shaft position Connector F46 F47 | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 | COR OPEN AND SHORT | ntrol |
| Check the module has DTC No. P1089 P1092 | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 | F. rol module har between VVEL ector. ontrol shaft position Connector F46 | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has DTC No. P1089 P1092 Also check s the inspection | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result nor | F. rol module har between VVEL ector. ontrol shaft position Connector F46 F47 F47 | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has no series of the inspection of the series of the inspection of the series of the inspection of the series of | ct VVEL cont e continuity b arness conne VVEL cc Bank 1 2 k harness for on result norr O TO 6. | F. rol module har between VVEL ector. ontrol shaft position Connector F46 F47 F47 | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has DTC No. P1089 P1092 Also check is the inspection of the second second | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. | F. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has DTC No. P1089 P1092 Also check is the inspection of the second second | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. | F. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has module has DTC No. P1089 P1092 Also check sthe inspection YES >> G NO >> G DETECT M Check the following the follo | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. MALFUNCTIC owing. | F. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 5 2 5 5 | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F sor harness rol module Terminal 4 17 6 | COR OPEN AND SHORT | ntrol |
| Check the module has module has DTC No. P1089 P1092 Also check the inspection of the i | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. MALFUNCTIC owing. nnectors F1, 1 | F. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 5 2 5 nd and power | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F | Continuity | ntrol |
| Check the module has module has DTC No. P1089 P1092 Also check sthe inspection of the inspection of the second second | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. MALFUNCTIC owing. nnectors F1, 1 | F. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 5 2 5 nd and power | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F | COR OPEN AND SHORT | ntrol |
| Check the module has module has DTC No. P1089 P1092 Also check sthe inspection of the second seco | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. MALFUNCTIC owing. nectors F1, 1 open or shor | F. rol module har between VVEL ector. Connector F46 F47 F47 r short to grour mal? DNING PART E3 t between VVE | ness connec control shaf | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F | Continuity Existed EL control module | ntrol |
| Check the module has module has DTC No. P1089 P1092 Also check the inspection YES >> G D.DETECT M Check the follow Harness for Harness for >> R | ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 k harness for on result norr O TO 6. O TO 5. IALFUNCTIC owing. nectors F1, I open or shor epair open ci | FF. rol module har between VVEL ector. | ness connec control shaf n sensor Terminal 2 5 2 5 nd and power EL control sha | SOR GROUN tor. t position sense VVEL cont Connector E15 | D CIRCUIT F | Continuity Existed EL control module | ntrol |

1. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| DTC No. | VVEL control shaft position sensor | | | VVEL control module | | Continuity |
|---------|------------------------------------|-----------|----------|---------------------|----------|------------|
| DIC NO. | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1089 | 1 | F46 | 1 | E15 | 3 | Existed |
| P1069 | | | 4 | | 16 | |
| P1092 | 2 | F47 | 1 | | 5 | |
| F 1092 | | | 4 | | 18 | |

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

Is the inspection result normal?

YES >> GO TO 8. NO

>> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

Harness for open or short between VVEL control shaft position sensor and VVEL control module

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

8.CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.

>> Repair or replace. NO

9.REPLACE VVEL CONTROL MODULE

- Replace VVEL control module. Refer to EC-38, "Component Parts Location". 1.
- 2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC. 2
- 3. Perform DTC Confirmation Procedure. See EC-392, "DTC Logic".

Is the DTC P1089 or P1092 displayed again?

- YES >> GO TO 11.
- NO >> INSPECTION END

11.REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly.
- Go to EC-394, "Special Repair Requirement". 2.

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156455

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-22, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement".

>> GO TO 2.

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|-----------|
| 2. PERFORM IDLE AIR VOLUME LEARNING | A |
| Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement". | |
| >> END | EC |
| | |
| | С |
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P1090, P1093 VVEL ACTUATOR MOTOR

Description

The VVEL actuator motor rotates the control shaft according to the control signal from the VVEL control module. The VVEL control module judges whether the VVEL actuator motor controls the angle properly by the VVEL control shaft position sensor signal.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1090 or P1093 is displayed with DTC P1091, first perform the trouble diagnosis for DTC P1091. Refer to <u>EC-400</u>, "<u>DTC Logic</u>".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|----------------------------------|---|---|
| P1090 | VVEL system performance (bank 1) | | Harness or connectors |
| P1093 | VVEL system performance (bank 2) | Event angle difference between the actual and the target is detected. Abnormal current is sent to VVEL actuator motor. | (VVEL actuator motor circuit is open or shorted.) VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 10 second.
- 2. Keep the engine speed at about 3,500 rpm for at least 10 seconds under no load.
- Check DTC.
- Is DTC detected?
- YES >> Go to EC-396, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connections M95, E46. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.vvel actuator motor output signal circuit for open and short

- 1. Disconnect VVEL control module harness connector.
- 2. Disconnect VVEL actuator motor harness connector.
- Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

EC-396

INFOID:000000008156458

INFOID:000000008156456

INEOID:000000008156457

P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Bank 1 | Connector | Terminal 12 | Connector | Terminal | - Continuity | |
|---|---|--|--|--|--|--|
| 1 | - | 12 | | | | |
| 1 | | 12 | | 1 | Existed | EC |
| - | - | | F48 | 2 | Not existed | LO |
| | | 25 | F48 | 1 | Not existed | |
| | E15 | 20 | | 2 | Existed | С |
| | EIS | 2 | | 1 | Existed | |
| 2 | | 2 | F49 | 2 | Not existed | D |
| 2 | | 15 | 145 | 1 | Not existed | D |
| | | 15 | | 2 | Existed | |
| on result nor O TO 4. O TO 3. MALFUNCTIC owing. nnectors F1, open or sho epair open c /EL ACTUAT 98, "Compor on result nor O TO 6. O TO 5. VVEL ACTU | mal? DNING PART E3 t between VVE ircuit, short to g OR MOTOR <u>nent Inspection</u> mal? NATOR SUB AS | EL actuator m ground or sho (VVEL ACTI SSEMBLY y. | notor and VVE ort to power in | harness or o | | F G H J |
| TERMITTEN 2, "Intermitter on result nor O TO 7. epair or repla VVEL CONT VVEL control -18, "ADDIT pecial Repair | IT INCIDENT <u>nt Incident"</u> . <u>mal?</u> ace. ROL MODULE module. Refer | to <u>EC-38, "C</u> | Component Pa EPLACING C | urts Location' ONTROL UI | NIT (VVEL CONTROL MOD | L M N D- O |
| ion switch Ol C. DTC Confirm: 96, "DTC Lo | N. ation Procedur <u>gic"</u> . | e. | | | | Ρ |
| | on result nor O TO 4. O TO 3. IALFUNCTIO Dwing. Inectors F1, open or shore repair open c /EL ACTUAT 98, "Compore on result nor O TO 6. O TO 5. VVEL ACTU /VEL actuato 399, "Special ISPECTION TERMITTEN C, "Intermitter on result nor O TO 7. epair or replat VVEL CONT VEL CONT VEL control -18, "ADDIT ecial Repair O TO 8. I DTC CONF on switch Of C. O TO 7. | on result normal? O TO 4. O TO 3. IALFUNCTIONING PART owing. Inectors F1, E3 open or short between VVE epair open circuit, short to g /EL ACTUATOR MOTOR 98, "Component Inspection on result normal? O TO 6. O TO 5. VVEL ACTUATOR SUB AS /VEL actuator sub assembl 399, "Special Repair Requi ISPECTION END TERMITTENT INCIDENT C. "Intermittent Incident". on result normal? O TO 7. epair or replace. VVEL CONTROL MODULE /VEL control module. Refer -18, "ADDITIONAL SERVIC ecial Repair Requirement". O TO 8. I DTC CONFIRMATION PR on switch ON. C. DTC Confirmation Procedure 96, "DTC Logic". | on result normal? O TO 4. O TO 3. IALFUNCTIONING PART Dwing. Intectors F1, E3 open or short between VVEL actuator m repair open circuit, short to ground or short (EL ACTUATOR MOTOR 98, "Component Inspection (VVEL ACTION 10 TO 6. O TO 6. O TO 6. O TO 6. VVEL ACTUATOR SUB ASSEMBLY (VEL actuator sub assembly. 399, "Special Repair Requirement". ISPECTION END TERMITTENT INCIDENT 2. "Intermittent Incident". O TO 7. repair or replace. VVEL CONTROL MODULE (VEL control module. Refer to EC-38, "C -18, "ADDITIONAL SERVICE WHEN R ecial Repair Requirement". O TO 8. I DTC CONFIRMATION PROCEDURE on switch ON. C. DTC Confirmation Procedure. | O TO 4. O TO 3. IALFUNCTIONING PART owing. unectors F1, E3 open or short between VVEL actuator motor and VVE epair open circuit, short to ground or short to power in //EL ACTUATOR MOTOR 98, "Component Inspection (VVEL ACTUATOR MOTO on result normal? O TO 6. O TO 5. VVEL ACTUATOR SUB ASSEMBLY //VEL actuator sub assembly. 399, "Special Repair Requirement". ISPECTION END TERMITTENT INCIDENT ., "Intermittent Incident". on result normal? O TO 7. epair or replace. VVEL CONTROL MODULE //VEL control module. Refer to EC-38, "Component Pa -18, "ADDITIONAL SERVICE WHEN REPLACING C ecial Repair Requirement". O TO 8. I DTC CONFIRMATION PROCEDURE on switch ON. C. DTC Confirmation Procedure. 96, "DTC Logic". | k harness for short to ground and power. on result normal? O TO 4. O TO 3. IALFUNCTIONING PART Dwing. inectors F1, E3 open or short between VVEL actuator motor and VVEL control mo epair open circuit, short to ground or short to power in harness or of //EL ACTUATOR MOTOR 98, "Component Inspection (VVEL ACTUATOR MOTOR)". on result normal? O TO 6. O TO 6. O TO 5. VVEL ACTUATOR SUB ASSEMBLY //VEL actuator sub assembly. 399, "Special Repair Requirement". ISPECTION END TERMITTENT INCIDENT 1, "Intermittent Incident". on result normal? O TO 7. epair or replace. VVEL CONTROL MODULE //VEL control module. Refer to EC-38. "Component Parts Location" -18. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UI ecial Repair Requirement". O TO 8. I DTC CONFIRMATION PROCEDURE on switch ON. C. JTC Confirmation Procedure. 96. "DTC Logic". | k harness for short to ground and power. an result normal? O TO 4. O TO 3. IALFUNCTIONING PART owing. inectors F1, E3 open or short between VVEL actuator motor and VVEL control module espair open circuit, short to ground or short to power in harness or connectors. (EL ACTUATOR MOTOR 88, "Component Inspection (VVEL ACTUATOR MOTOR)". on result normal? O TO 6. O TO 6. O TO 6. VVEL ACTUATOR SUB ASSEMBLY VVEL CONTROL MOD TERMITTENT INCIDENT ., "Intermittent Incident". on result normal? O TO 7. epair or replace. VVEL CONTROL MODULE VVEL CONTROL M |

P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

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

9.CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-398. "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. Replace vvel actuator sub assembly

1. Replace VVEL actuator sub assembly.

2. Go to EC-399, "Special Repair Requirement".

>> INSPECTION END

11.CHECK VVEL LADDER ASSEMBLY

Refer to EM-94, "Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. Replace cylinder head, vvel ladder assembly and vvel actuator sub assembly

- Replace cylinder head (refer to <u>EM-102</u>, "<u>Disassembly and Assembly</u>"), VVEL ladder assembly and VVEL actuator sub assembly.
- 2. Go to EC-399, "Special Repair Requirement".

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:000000008156459

1.CHECK VVEL ACTUATOR MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor harness connector.
- 3. Check resistance between VVEL actuator motor terminals as follows.

| VVEL actuator motor | Resistance | |
|---------------------|---------------------|--|
| Terminal | Resistance | |
| 1 and 2 | 16 Ω or less | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly.

2. Go to EC-399, "Special Repair Requirement".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:000000008156460

1.CHECK VVEL ACTUATOR SUB ASSEMBLY

P1090, P1093 VVEL ACTUATOR MOTOR

| F1090, F1093 VVEL ACTUATOR MOTOR | | |
|--|------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| Turn ignition switch OFF. Remove VVEL actuator sub assembly. Refer to <u>EM-85, "Disassembly and Assembly"</u>. Turn the ball screw shaft to check that it works smoothly. | | А |
| Is the inspection result normal? | | |
| YES >> INSPECTION END NO >> GO TO 2. | | EC |
| 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY | _ | |
| 1. Replace VVEL actuator sub assembly. | | С |
| 2. Go to EC-399, "Special Repair Requirement". | | |
| >> INSPECTION END | | D |
| Special Repair Requirement | | |
| | INFOID:000000008156461 | Е |
| 1. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT | | |
| Refer to <u>EC-22</u> , "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special R ment". | <u>epair Require-</u> | F |
| | | |
| >> GO TO 2. | | C |
| 2.PERFORM IDLE AIR VOLUME LEARNING | | G |
| Refer to EC-20. "IDLE AIR VOLUME LEARNING : Special Repair Requirement". | | |
| >> END | | Η |
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< DTC/CIRCUIT DIAGNOSIS >

P1091 VVEL ACTUATOR MOTOR RELAY

Description

Power supply for the VVEL actuator motor is provided to the VVEL control module via VVEL actuator motor relay. VVEL actuator motor relay is ON/OFF controlled by the VVEL control module. In addition, when the VVEL actuator motor relay cannot be controlled by the VVEL control module for some reason, it ON/OFF controlled by ECM.

DTC Logic

INFOID:000000008156463

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------------|---|--|
| P1091 | VVEL actuator motor relay circuit | VVEL control module detects the VVEL actuator motor relay is stuck OFF. VVEL control module detects the VVEL actuator motor relay is stuck ON. | Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.) VVEL actuator motor relay VVEL control module ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to <u>EC-400, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156464

1.VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor relay.
- 3. Check the voltage between VVEL actuator motor relay harness connector and ground.

| VVEL actuat | or motor relay | Ground | Voltage |
|-------------|----------------|--------|-----------------|
| Connector | Terminal | Glound | vollage |
| E16 | 1 | Ground | Battery voltage |
| LIU | 5 | Glound | Dattery voltage |

Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 2. [VQ37VHR]

P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | e link (letter N r open or shoi | | VEL actuato | r motor relay | and battery | | |
|--|--|---|--|---|-------------------------|-------------------------------------|------|
| | | | | | | | |
| ` | Repair open c | | - | • | | r connectors. | |
| | TUATOR MO | | | | JIT-II | | |
| 2. Check th | ect VVEL cont ne continuity b connector. | | | | arness conne | ector and VVEL control mo | dule |
| VVEL | control module | VVE | EL actuator mot | tor relay | Continuity | | |
| Connector | Termina | l Conn | ector | Terminal | Continuity | | |
| E15 | 23 | E | 16 | 2 | Existed | | |
| 3. Also che | ck harness fo | r short to gro | und and pov | ver. | | | |
| <u>s the inspec</u> | tion result nor | mal? | | | | | |
| | GO TO 4. | rouit charts | | bort to pours | r in hornooc - | rooppostoro | |
| | Repair open c | | - | • | | | |
| | TUATOR MO | IOR RELAY | INPUT SIGN | NAL CIRCUIT | FOR OPEN | | |
| | ha continuity | hotwoon \/\/ | | motor rolay h | arnoss conn | actor and V/VEL control may | |
| 1. Check t | he continuity connector. | between VV | EL actuator | motor relay h | narness conn | ector and VVEL control mo | dule |
| Check t harness | • | | | motor relay h | | ector and VVEL control mod | dule |
| 1. Check t harness | connector. | ule Terminal | | | Continuity | ector and VVEL control mod | dule |
| I. Check t harness V Bank 1 | CONNECTOR. | ule Terminal 13 | VVEL actua | tor motor relay | | ector and VVEL control mod | dule |
| L. Check t harness | Connector. /EL control modu Connector E15 | ule Terminal 13 1 | VVEL actua Connector E16 | tor motor relay Terminal 3 | - Continuity | ector and VVEL control mo - - | dule |
| 1. Check t harness Bank 1 2 2. Also che | Connector. /EL control modu Connector E15 ck harness fo | ule Terminal 13 1 r short to gro | VVEL actua Connector E16 | tor motor relay Terminal 3 | - Continuity | ector and VVEL control mo - - | dule |
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| Check t harness V Bank 1 2 Also che s the inspec YES >> 0 O.CHECK V Refer to EC-4 s the inspec YES >> 0 YES >> 0 | connector. /EL control modu Connector E15 ck harness fo tion result nor GO TO 5. Repair open c VEL ACTUAT 402, "Compor tion result nor | ule Terminal 13 1 r short to gro mal? ircuit, short to "OR MOTOR nent Inspection mal? | VVEL actua Connector E16 und and pov o ground or s RELAY | tor motor relay Terminal 3 ver. | - Continuity Existed | - - - | dule |
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| | Connector. VEL control modu Connector E15 ck harness fo tion result nor GO TO 5. Repair open c VEL ACTUAT 402, "Compor tion result nor GO TO 6. Replace VVEL | ule Terminal 13 1 r short to gro mal? ircuit, short to OR MOTOR ircuit, short to OR MOTOR int Inspection mal? . actuator mod | VVEL actua Connector E16 ound and pov o ground or s RELAY on". | tor motor relay Terminal 3 ver. | - Continuity Existed | - - - | dule |
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| 1. Check t harness Bank 1 2 2. Also che s the inspec YES >> 0 NO >> F 5.CHECK V Refer to EC-4 S the inspec YES >> 0 NO >> F 6.CHECK A 1. Disconne 2. Check th | Connector. VEL control modu Connector E15 ck harness fo tion result nor GO TO 5. Repair open c VEL ACTUAT 402, "Compor tion result nor GO TO 6. Replace VVEL BORT CIRCL ect ECM harm- tion continuity b | ule Terminal 13 1 r short to gro mal? ircuit, short to OR MOTOR ircuit, short to OR MOTOR incuit, short to DIT FOR OPE ess connecto etween VVE | VVEL actua Connector E16 und and pov o ground or s RELAY on". | tor motor relay Terminal 3 ver. short to powe | - Continuity Existed | - - or connectors. | |

NO >> GO TO 7.

7.DTECT MALFUNCTIONING PART

Check the following.

P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

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

8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

9.REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module. Refer to <u>EC-38, "Component Parts Location"</u>.
- 2. Go to EC-18. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-400, "DTC Logic"</u>.

Is the DTC P1091 displayed again?

- YES >> GO TO 11.
- NO >> INSPECTION END

11.REPLACE ECM

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

>> INSPECTION END

Component Inspection

INFOID:000000008156465

[VQ37VHR]

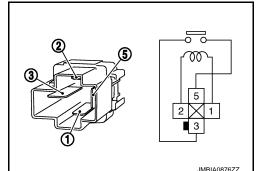
1.CHECK VVEL ACTUATOR MOTOR RELAY

- 1. Turn ignition switch OFF.
- 2. Remove VVEL actuator motor relay.
- 3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.

| Terminal | Condition | Continuity |
|----------|--|-------------|
| 3 and 5 | 12 V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace VVEL actuator motor relay.



P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

DTC DETECTION LOGIC **NOTE**:

DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.

When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---------------------------------------|--|--|--|
| P1148 | Closed loop control function (bank 1) | The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition. | Harness or connectors (The A/F sensor 1 circuit is open or shorted.) | |
| P1168 | Closed loop control function (bank 2) | The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition. | A/F sensor 1 A/F sensor 1 heater | |

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P1211 TCS CONTROL UNIT

< DTC/CIRCUIT DIAGNOSIS >

P1211 TCS CONTROL UNIT

Description

The malfunction information related to TCS is transferred via the CAN communication line from "ABS actuator and electric unit (control unit)" to ECM.

Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|--|
| P1211 | TCS control unit | ECM receives malfunction information from "ABS actuator and electric unit (control unit)". | ABS actuator and electric unit (control unit) TCS related parts |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-404, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

Go to BRC-5, "Work Flow".

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[VQ37VHR]

INFOID:000000008156468

P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

P1212 TCS COMMUNICATION LINE

Description

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)". Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1212 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1212 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | F |
|---------|------------------------|---|--|---|
| P1212 | TCS communication line | ECM cannot receive the information from "ABS actuator and electric unit (control unit)" continuously. | Harness or connectors (The CAN communication line is open or short- ed.) ABS actuator and electric unit (control unit) Dead (Weak) battery | G |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

| > | > GO | TO 2. | |
|---|------|-------|--|
| | | | |

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to <u>EC-405, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

Go to BRC-5, "Work Flow".

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< DTC/CIRCUIT DIAGNOSIS >

P1217 ENGINE OVER TEMPERATURE

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------------|---|---|
| P1217 | Engine over temperature (Overheat) | Cooling fan does not operate properly (Overheat). Cooling fan system does not operate properly (Overheat). Engine coolant was not added to the system using the proper filling method. Engine coolant is not within the specified range. | Harness or connectors (The cooling fan circuit is open or shorted.) IPDM E/R Cooling fan control module Cooling fan motor Radiator hose Radiator Radiator cap Water pump Thermostat |

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to <u>CO-7, "Draining"</u> and <u>CO-8,</u> "<u>Refilling"</u>. Also, replace the engine oil. Refer to <u>LU-8, "Draining"</u> and <u>LU-9, "Refilling"</u>.

- 1. <u>MA-11, "Anti-Freeze Coolant Mixture Ratio"</u>Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to .
- 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-406, "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-407, "Diagnosis Procedure".

Component Function Check

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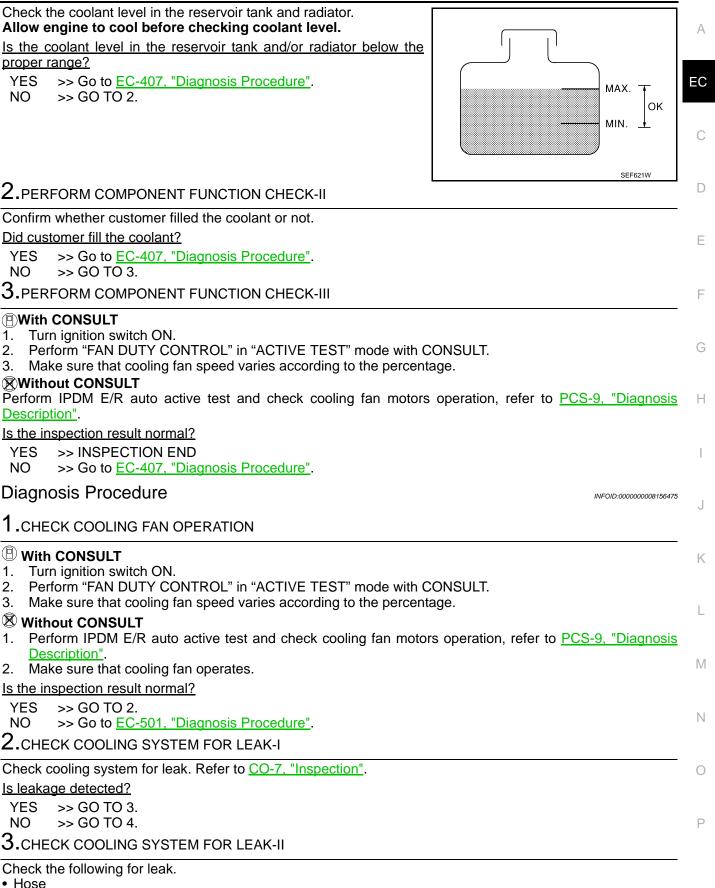
1.PERFORM COMPONENT FUNCTION CHECK-I

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

[VQ37VHR]



- Radiator
- Water pump

< DTC/CIRCUIT DIAGNOSIS >

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

>> Repair or replace malfunctioning part.

4.CHECK RADIATOR CAP

Check radiator cap. Refer to CO-11, "RADIATOR CAP : Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap. Refer to <u>CO-13</u>, "Exploded View".

5. CHECK THERMOSTAT

Check thermostat. Refer to CO-22. "Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat. Refer to CO-22, "Exploded View".

6.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-207, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.

7.CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|-------------------|------|--|--|--|---------------------------------------|
| OFF | 1 | Blocked radiator Blocked condenser Blocked radiator grille Blocked bumper | • Visual | No blocking | _ |
| | 2 | Coolant mixture | Coolant tester | MA-11, "Anti-Freeze Coola | int Mixture Ratio" |
| | 3 | Coolant level | Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | CO-7, "Inspection" |
| - | 4 | Radiator cap | Pressure tester | CO-11, "RADIATOR CAP : | Inspection" |
| ON* ² | 5 | Coolant leaks | Visual | No leaks | CO-7, "Inspection" |
| ON* ² | 6 | Thermostat | Touch the upper and lower radiator hoses | Both hoses should be hot | CO-22, "Inspection" |
| ON* ¹ | 7 | Cooling fan | CONSULT | Operating | EC-501, "Component Function Check" |
| OFF | 8 | Combustion gas leak | Color checker chemical tester 4 Gas analyzer | Negative | — |
| ON* ³ | 9 | Coolant temperature gauge | • Visual | Gauge less than 3/4 when driving | _ |
| | | Coolant overflow to res- ervoir tank | • Visual | No overflow during driving and idling | CO-7, "Inspection" |
| OFF* ⁴ | 10 | Coolant return from res- ervoir tank to radiator | Visual | Should be initial level in reservoir tank | CO-7, "Inspection" |
| OFF | 11 | Cylinder head | Straight gauge feeler gauge | 0.1 mm (0.004 in) Maxi- mum distortion (warping) | EM-107, "Inspection" |
| | 12 | Cylinder block and pis- tons | • Visual | No scuffing on cylinder walls or piston | EM-121, "Inspection" |

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to CO-3, "Troubleshooting Chart".

< DTC/CIRCUIT DIAGNOSIS >
>> INSPECTION END

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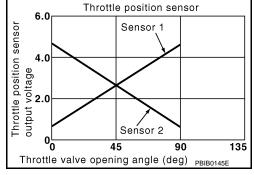
< DTC/CIRCUIT DIAGNOSIS >

P1225, P1234 TP SENSOR

Description

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

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



DTC Logic

DTC DETECTION LOGIC

INFOID:000000008156477

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|------------------------------------|
| P1225 | Closed throttle position learning per- formance (bank 1) | Closed throttle position learning value | Electric throttle control actuator |
| P1234 | Closed throttle position learning per- formance (bank 2) | is excessively low. | (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-410, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156478

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.

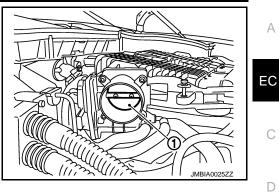
P1225, P1234 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <u>EC-19</u>, <u>"THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"</u>.



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2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Exploded View".

 2. Go to EC-411, "Special Repair Requirement".

 >> INSPECTION END

 Special Repair Requirement

 I.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

 >> GO TO 2.

 2.PERFORM IDLE AIR VOLUME LEARNING

 Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

 >> END

Revision: 2012 July

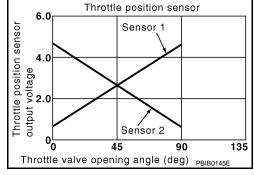
< DTC/CIRCUIT DIAGNOSIS >

P1226, P1235 TP SENSOR

Description

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

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



DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|------------------------------------|
| P1226 | Closed throttle position learn- ing performance (bank 1) | Closed throttle position learning is not performed | Electric throttle control actuator |
| P1235 | Closed throttle position learn- ing performance (bank 2) | successfully, repeatedly. | (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

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.
- Turn ignition switch ON. 3.
- Repeat steps 2 and 3 for 32 times. 4.
- Check 1st trip DTC. 5.

Is 1st trip DTC detected?

- YES >> Go to EC-412, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156482

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF. 1.
- Remove the intake air duct. 2

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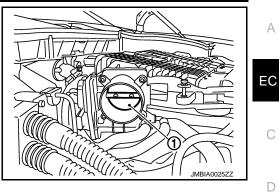
P1226, P1235 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <u>EC-19</u>, <u>"THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"</u>.



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P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:000000008156484

[VQ37VHR]

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000008156485

DTC DETECTION LOGIC

NOTE: If DTC P1233 or P2101 is displayed with DTC P1238, P1290, P2100 or 2119, first perform the trouble diagnosis for DTC P1238, P2119 or P1290, P2100. Refer to <u>EC-421, "DTC Logic"</u> or <u>EC-426, "DTC</u> <u>Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P1233 | Electric throttle control performance (bank 2) | Electric throttle control function does not oper- | Harness or connectors (Throttle control motor circuit is open or |
| P2101 | Electric throttle control performance (bank 1) | ate properly. | shorted)Electric throttle control actuator |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

1. Turn ignition switch OFF and wait at least 10 seconds.

- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

Is DTC detected?

- YES >> Go to EC-414, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector terminals as per the following.

EC-414

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | | ECM | | | | | 1 | |
|---------------|------------------------|----------------------------|-----------------|------------|------------|-----------------|--------------|------------------|--|
| DTC | | + | | _ | | Con | dition | Voltage (V) | |
| Conn | | | al Conn | ector Te | rminal | | | | |
| | | | | | | | OFF | Approx. 0 | |
| P1233 | F102 | 52 | | | | | ON | Battery voltage | |
| | = | | M1 | 07 | 128 | Ignition switch | OFF | Approx. 0 | |
| P2101 | F101 | 3 | | | | | ON | Battery voltage | |
| Is the ir | nspectior | n result no | rmal? | | | | | | |
| YES | >> GO | | | | | | | | |
| NO | >> GO | | | | | | | | |
| 3. CHE | CK THR | OTTLE C | ONTRO | | R REL/ | AY POWER S | UPPLY CIRC | UIT | |
| | | n switch C | | | | | | | |
| | | ECM harr IPDM E/F | | | or E7. | | | | |
| | | | | | | ess connector | and ECM ha | rness connector. | |
| | | | | | | | | | |
| IF | PDM E/R | | ECM | c | continuity | / | | | |
| Connec | | | | rminal | | | | | |
| E7 | | | 101 | | Existed | _ | | | |
| | | | | o ground | and sh | nort to power. | | | |
| | • | n result no | <u>rmal?</u> | | | | | | |
| YES NO | >> GO >> GO | | | | | | | | |
| A - | | LFUNCTI | | | | | | | |
| | | | | | | | | | |
| | the follov ess conn | ectors E3 | . F1 | | | | | | |
| • Harne | ess conn | ectors F10 | 04, F105 | | | | | | |
| • Harne | ess for op | pen or sho | ort betwee | en ECM a | and IP | DM E/R | | | |
| | | oir on on a | oirouit oh | ort to are | | r abort to pow | r in hornood | or connectore | |
| 5 | | • | | - | | AY INPUT SIG | | or connectors. | |
| | | | | | | | | | |
| 1. Ch | eck the c | continuity I | between | IPDM E/ | R harn | ess connector | and ECM ha | rness connector. | |
| | | IPDM | E/D | | ECM | | _ | | |
| DT | гс _ | | | Connecto | - | Continuit | у | | |
| D4/ | 233 | Connector | Terminal | F102 | | ninal | | | |
| P12 | | E7 | 54 | F102 | | 52 Existed | | | |
| | | horness fr | or obout t | | | | _ | | |
| | | | | s ground | and sr | nort to power. | | | |
| YES | spection >> GO | <u>n result no</u> TO 7 | <u>iiiiai (</u> | | | | | | |
| NO | >> GO | | | | | | | | |
| ~ | | LFUNCTI | ONING F | PART | | | | | |
| | | | | - | | | | | |
| | the follov ess conn | ving. ectors E3 | . F1 | | | | | | |

• Harness connectors E3, F1

• Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

EC-415

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

7.CHECK FUSE

1. Disconnect 15 A fuse (No. 51) from IPDM E/R.

2. Check 15 A fuse for blown.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Replace 15 A fuse.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace harness or connectors.

$9. {\sf check throttle control motor output signal circuit for open or short}$

- 1. Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electri | c throttle cont | rol actuator | EC | Continuity | |
|--------|---------|-----------------|--------------|-----------|------------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| | | | 5 | | 49 | Existed |
| P1233 | 2 | F27 | 5 | F102 | 50 | Not existed |
| F 1233 | 2 | Γ21 | 6 | | 49 | Not existed |
| | | | 0 | | 50 | Existed |
| | | | 1 | | 2 | Existed |
| P2101 | 1 | F6 | I | F101 | 4 | Not existed |
| FZIUI | I | 60 | 2 | FIUI | 2 | Not existed |
| | | | 2 | | 4 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace.

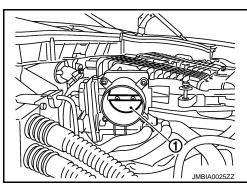
10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Remove the intake air duct.
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".



11. CHECK THROTTLE CONTROL MOTOR

Refer to EC-417, "Component Inspection".

Is the inspection result normal?

| YES | >> GO TO 12. |
|-----|--------------|
| NO | >> GO TO 13. |

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| < DTC/CIRCUIT DIAGNOS | 5> | |
|---|---|----------------------------------|
| 12. CHECK INTERMITTEN | T INCIDENT | |
| Refer to GI-42, "Intermittent I | ncident". | |
| Is the inspection result norma | <u>al?</u> | |
| YES >> GO TO 13. NO >> Repair or replace | e harness or connectors. | |
| | THROTTLE CONTROL ACTUATOR | |
| | ctric throttle control actuator. Refer to \underline{E} | M-29, "Exploded View". |
| 2. Go to EC-417, "Special F | | |
| >> INSPECTION EN | ND | |
| Component Inspection | | INFOID:000000008156487 |
| | | 14 CI2.00000000130407 |
| 1. CHECK THROTTLE CON | | |
| Turn ignition switch OFF. Disconnect electric thrott | le control actuator harness connector. | |
| | en electric throttle control actuator term | inals as per the following. |
| Electric throttle control activation | | |
| Electric throttle control actuator Bank Terminals | Resistance (Ω) | |
| 1 1 and 2 | | |
| 2 5 and 6 | Approx. 1 - 15 [at 25°C (77°F)] | |
| Is the inspection result norma | <u>al?</u> | |
| YES >> INSPECTION EN NO >> GO TO 2. | ND | |
| • | ROTTLE CONTROL ACTUATOR | |
| | electric throttle control actuator. Refer to | p EM-29. "Exploded View". |
| 2. Go to <u>EC-417, "Special F</u> | | |
| | | |
| >> INSPECTION EN | | |
| Special Repair Require | ement | INFOID:00000008156488 |
| 1. PERFORM THROTTLE V | ALVE CLOSED POSITION LEARNING | ì |
| Refer to EC-19, "THROTTLE | VALVE CLOSED POSITION LEARNIN | IG : Special Repair Requirement" |
| | | |
| >> GO TO 2. 2.PERFORM IDLE AIR VOL | | |
| | | |
| Refer to <u>EG-20, "IDLE AIR V</u> | OLUME LEARNING : Special Repair R | equirement" |
| >> END | | |
| | | |
| | | |

Ρ

P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

P1236, P2118 THROTTLE CONTROL MOTOR

Description

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000008156490

[VQ37VHR]

INFOID:00000008156489

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1236 | Throttle control motor (bank 2) circuit short | ECM detects short in both circuits between | Harness or connectors (Throttle control motor circuit is shorted.) |
| P2118 | Throttle control motor (bank 1) circuit short | ECM and throttle control motor. | Electric throttle control actuator (Throttle control motor) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.
- Is DTC detected?
- YES >> Go to EC-418, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.check throttle control motor output signal circuit for open and short

- 1. Disconnect electric throttle control actuator harness connector.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

INEOID-000000008156491

P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| DTC | Electric | Electric throttle control actuator | | | ECM Continuity | | | | | |
|---|---|--|---|--|--|-----------------------|--------------------|--------------------|--------------------------|-------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | | |
| | | | 5 | | 49 | Existed | | | | |
| P1236 | 2 | F27 | | F102 | 50 | Not existed | | | | |
| 1 1200 | - | 121 | 6 | 1102 | 49 | Not existed | | | | |
| | | | 0 | | 50 | Existed | | | | |
| | | | 1 | | 2 | Existed | | | | |
| D0440 | | 50 | I | E 404 | 4 | Not existed | | | | |
| P2118 | 1 | F6 | 0 | F101 | 2 | Not existed | | | | |
| | | | 2 | | 4 | Existed | | | | |
| 1. Also c | heck h | arness for | short to g | round and | short to p | ower. | | | | |
| | | result norm | • | | · | | | | | |
| YES > | > GO 1 | FO 3. | | | | | | | | |
| - | | air or replac | | | | | | | | |
| 3. CHECł | | OTTLE COI | | IOTOR | | | | | | |
| Refer to E | <u>C-</u> 419. | "Compone | nt Inspec | tion". | | | | | | |
| | | result norm | | | | | | | | |
| | > GO 1 | | | | | | | | | |
| NO > | > GO 1 | FO 5. | | | | | | | | |
| 1. CHECH | | RMITTENT | | IT | | | | | | |
| Refer to G | il-42. "I | ntermittent | Incident" | | | | | | | |
| | | result norm | | | | | | | | |
| | | | | | | | | | | |
| YES > | > GO | FO 5. | | | | | | | | |
| | > GO 1 > Repa | FO 5. air or replac | e harnes | s or conne | ctors. | | | | | |
| NO > | > Repa | | | | | TOR | | | | |
| NO > 5.REPLA | > Repa | air or replac | HROTTLE | CONTRO | L ACTUA | | | ploded Vie | w". | |
| NO > 5. REPLA 1. Repla | > Repa CE EL ce mal | air or replac | HROTTLE | CONTRC | DL ACTUA | TOR or. Refer to j | M-29, "E | cploded Vie | <u>w"</u> . | |
| NO > 5. REPLA 1. Repla | > Repa CE EL ce mal | air or replace ECTRIC TH functioning | HROTTLE | CONTRC | DL ACTUA | | <u>:M-29, "E</u>) | <u>ploded Vie</u> | <u>w"</u> . | |
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P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156493

 $1. {\tt perform\ throttle\ valve\ closed\ position\ learning}$

Refer to EC-19. "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-20. "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.

DTC Logic

INFOID:000000008156495

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause | |
|---------|---------------------------|--|---|------------------------------------|---|
| | Electric throttle control | A) Electric throttle control actuator does not func- tion properly due to the return spring malfunc- tion. | | | |
| P1238 | actuator (bank 2) | B) | Throttle valve opening angle in fail-safe mode is not in specified range. | | |
| | | C) ECM detect the throttle valve is stuck open. | | Electric throttle control actuator | (|
| P2119 | Electric throttle control | A) | Electric throttle control actuator does not func- tion properly due to the return spring malfunc- tion. | | ŀ |
| | actuator (bank 1) | B) | Throttle valve opening angle in fail-safe mode is not in specified range. | - | |
| | | C) | ECM detect the throttle valve is stuck open. | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

| If DTC Confirmation Procedure has been previously conducted, always perform the following procedure | |
|---|--|
| before conducting the next test. | |

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Shift selector lever to D position (A/T) or 1st position (M/T) and wait at least 3 seconds.
- 3. Shift selector lever to P position (A/T) or Neutral position (M/T).
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON and wait at least 1 second.
- 6. Shift selector lever to D position (A/T) or 1st position (M/T) and wait at least 3 seconds.
- 7. Shift selector lever to P position (A/T) or Neutral position (M/T).
- 8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 9. Check DTC.

Is DTC detected?

- YES >> Go to EC-422, "Diagnosis Procedure".
- NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Shift selector lever to D position (A/T) or 1st position (M/T) and wait at least 3 seconds.
- 3. Shift selector lever to P position (A/T) or Neutral position (M/T).
- 4. Start engine and let it idle for 3 seconds.

EC-421

[VQ37VHR]

INFOID:00000008156494

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P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:000000008156496

5. Check DTC.

Is DTC detected?

YES >> Go to <u>EC-422, "Diagnosis Procedure"</u>. NO >> INSPECTION END

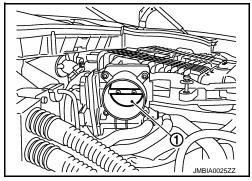
Diagnosis Procedure

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".



2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29. "Exploded View".
- 2. Go to EC-422, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156497

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-20. "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

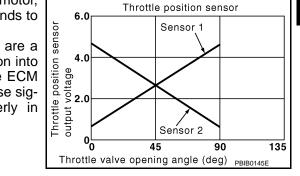
< DTC/CIRCUIT DIAGNOSIS >

P1239, P2135 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1239 or P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-380, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|--|--|---|---|
| P1239 | Throttle position sensor (bank 2) circuit range/ performance | Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 | Harness or connector (TP sensor 1 or 2 circuit is open or short- ed.) | ŀ |
| P2135 | Throttle position sensor (bank 1) circuit range/ performance | and TP sensor 2. | Electric throttle control actuator (TP sensor 1 or 2) | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure k before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-423, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

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EC

P1239, P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.

- 2. Turn ignition switch ON.
- 3. Check the voltage between electric throttle control actuator harness connector and ground.

| DTC | Electr | ic throttle cont | trol actuator | Ground | Voltage (V) |
|-------|--------|------------------|---------------|--------|-------------|
| DIC | Bank | Connector | Terminal | Ground | voltage (v) |
| P1239 | 2 | F27 | 1 | Ground | Approx. 5 |
| P2135 | 1 | F6 | 6 | Ground | Αρριολ. 3 |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electri | c throttle cont | rol actuator | EC | Continuity | |
|-------|---------|-----------------|--------------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | F27 | 4 | E101 | 48 | Existed |
| P2135 | 1 | F6 | 3 | F101 40 | Existed | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

 Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | EC | Continuity | | |
|--------|------------------------------------|-----------|----------|-----------|------------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P1239 | 2 | F27 | 2 | F101 | 31 | | |
| F 1239 | 2 | Γ21 | 3 | | 35 | Existed | |
| P2135 | 1 | F6 | 4 | | 30 | EXISTED | |
| F2133 | I | 1.0 | 5 | | 34 | | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-425, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Exploded View".

P1239, P2135 TP SENSOR

| | RCUIT DIAGNOSIS > | | | | | [VQ37VHR] |
|-----------------|---|---------------|---------------------------------------|-------------------|-----------------|------------------------|
| 2. <u>EC-42</u> | 25, "Special Repair Requ | irement". | | | | |
| > | > INSPECTION END | | | | | |
| - | | ENT | | | | |
| | I-42, "Intermittent Incide | | | | | |
| | | <u></u> . | | | | |
| > | > INSPECTION END | | | | | |
| Compon | ent Inspection | | | | | INFOID:000000008156501 |
| - | - | | | | | |
| | THROTTLE POSITION | ISENSOR | | | | |
| | gnition switch OFF. Inect all harness connec | tors disconn | ected | | | |
| B. Perfor | m <u>EC-19, "THROTTLE \</u> | | | EARNING : Spe | ecial Repair Re | <u>quirement"</u> . |
| | gnition switch ON. elector lever to D (A/T) or | · 1st (M/T) n | osition | | | |
| | the voltage between EC | | | als as per the fo | llowing. | |
| | | | | | | _ |
| | ECM | | _ | | | |
| Connector - | + Terminal | - Terminal | Cond | lition | Voltage (V) | |
| | Terminal | Terminal | | Fully released | More than 0.36 | - |
| | 30 [TP sensor 1 (bank 1)] | 40 | | Fully depressed | Less than 4.75 | _ |
| | | | _ | Fully released | More than 0.36 | _ |
| _ | 31 [TP sensor 1 (bank 2)] | 48 | | Fully depressed | Less than 4.75 | _ |
| F101 | | 40 | Accelerator pedal | Fully released | Less than 4.75 | _ |
| | 34 [TP sensor 2 (bank 1)] | 40 | | Fully depressed | More than 0.36 | _ |
| | 35 [TP sensor 2 (bank 2)] | 48 | | Fully released | Less than 4.75 | _ |
| | | 10 | | Fully depressed | More than 0.36 | _ |
| | ection result normal? | | | | | |
| | > INSPECTION END > GO TO 2. | | | | | |
| | | LE CONTR | OL ACTUATOR | | | |
| | ce malfunctioning electri | | | er to FM-29 "E | xploded View" | |
| | EC-425, "Special Repair | | | | picaca ricir. | |
| | | | | | | |
| | > INSPECTION END | | | | | |
| Special | Repair Requiremer | nt | | | | INFOID:000000008156502 |
| PERFC | ORM THROTTLE VALVE | CLOSED P | OSITION LEARN | ING | | |
| | C-19, "THROTTLE VAL\ | | | | Repair Require | ement" |
| | | | | | | |
| > | > GO TO 2. | | | | | |
| 2.PERFC | ORM IDLE AIR VOLUME | LEARNING | i | | | |
| | C-20, "IDLE AIR VOLUN | | | | | |

>> END

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:000000008156503

[VQ37VHR]

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

DTC Logic

INFOID:000000008156504

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1290 | Throttle control motor relay circuit open (bank 2) | ECM detects a voltage of power source for | Harness or connectors (Throttle control motor relay circuit is |
| P2100 | Throttle control motor relay circuit open (bank 1) | throttle control motor is excessively low. | open) Throttle control motor relay |
| P2103 | Throttle control motor relay circuit short | ECM detect the throttle control motor relay is stuck ON. | Harness or connectors (Throttle control motor relay circuit is shorted) Throttle control motor relay |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V.

Which DTC is detected?

P1290, P2100>>GO TO 2.

P2103 >> GO TO 3.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1290 AND P2100

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

Is DTC detected?

YES >> Go to EC-426. "Diagnosis Procedure".

NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to EC-426, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.

EC-426

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

- 3. Disconnect IPDM E/R harness connector E7.
- 4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

| | /I E/R | EC | CM | Continuit | | |
|---|---|---|--|------------|--|--|
| Connector | Terminal | Connector | Terminal | Continuity | | |
| E7 | 70 | F101 | 25 | Existed | | |
| Also c | heck harn | ess for sho | ort to grou | nd and sho | ort to power. | |
| | ection resu | | 2 | | | |
| | > GO TO (> GO TO (| | | | | |
| - | T MALFU | | | | | |
| | | | IG FART | | | |
| | following. connector | s E3, F1 | | | | |
| Harness | connector | s F104, F | | | | |
| Harness | for open o | or short be | tween EC | M and IPD | M E/R | |
| | > Popoir o | non circuit | e chort to | around or | short to now in harness or connectors | |
| | • | - | | - | short to power in harness or connectors. Y INPUT SIGNAL CIRCUIT | |
| | | | | | | |
| Check | the contin | nuity betwe | en IPDM | E/R senso | r harness connector and ECM harness connector. | |
| | IPDN | I F/R | F | СМ | | |
| DTC | Connector | Terminal | Connector | Continuity | | |
| P1290 | | | F102 | 52 | | |
| P2100 | | | F101 | 3 | | |
| Dataa | E7 | 54 | F101 | 3 | Existed | |
| P2103 | | | F102 | 52 | | |
| Also c | heck harn | ess for sho | ort to grou | nd and sho | ort to power. | |
| | ection resu | | > | | | |
| | > GO TO S | | | | | |
| | | | | | | |
| NO > | > GO TO 4 | | | | | |
| NO > | T MALFU | | IG PART | | | |
| NO > | T MALFU | NCTIONIN | IG PART | | | |
| NO > .DETEC heck the Harness | T MALFU | NCTIONIN | | M and IPD | M E/R | |
| NO > DETEC heck the Harness | T MALFU following. connector | NCTIONIN | | M and IPD | M E/R | |
| NO > .DETEC Check the Harness Harness | T MALFU following. connector for open c > Repair o | NCTIONIN s E3, F1 or short be | tween EC | | M E/R short to power in harness or connectors. | |
| NO > .DETEC Check the Harness Harness | T MALFU following. connector for open c > Repair o | NCTIONIN s E3, F1 or short be | tween EC | | | |
| NO > .DETEC Check the Harness Harness > .CHECH . Disco | T MALFU following. connector for open of Repair o FUSE nnect 15 A | NCTIONIN s E3, F1 or short be pen circuit fuse (No. | tween EC | ground or | short to power in harness or connectors. | |
| NO > .DETEC heck the Harness Harness > .CHECH . Discort . Check | T MALFU following. connector for open o > Repair o & FUSE | NCTIONIN rs E3, F1 or short be pen circuit fuse (No. for blown | tween ECI t, short to 51) from I | ground or | short to power in harness or connectors. | |

YES >> GO TO 6.

NO >> Replace 15A fuse.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace harness or connectors.

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[VQ37VHR]

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P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P1550 BATTERY CURRENT SENSOR

Description

INFOID:000000008156509

[VQ37VHR]

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to <u>CHG-10. "System Description"</u>.

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:000000008156510

DTC DETECTION LOGIC

NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to <u>EC-380,</u> "<u>DTC Logic</u>".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P1550 | Battery current sensor circuit range/performance | The output voltage of the battery current sensor remains within the specified range while engine is running. | Harness or connectors (Battery current sensor circuit is open or shorted.) Battery current sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON.

3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-428, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

EC-428

| 2.снески | BATTER | | IT SENS | OR POWER SUPPLY CIRCUIT-I |
|---|--|--|---|---|
| 1. Disconr | nect batte | ry current | | arness connector. |
| | nition swit | | battony | current sensor harness connector and ground. |
| J. CHECKI | ne voltag | e between | ballery | current sensor namess connector and ground. |
| Battery curr | ent sensor | | | |
| Connector | Terminal | Ground | Voltage | (V) |
| E21 | 1 | Ground | Approx | < <u>.</u> 5 |
| Is the inspec | ction resu | It normal? | | |
| | GO TO 4 | | | |
| • | GO TO 3 | | | |
| 3.DETECT | MALFUN | NCTIONIN | G PART | |
| Check the fo | | E 4 E 2 | | |
| Harness c Harness for | | | ween hat | tery current sensor and ECM |
| Tiamess it | or open o | | ween bat | |
| >> | Repair or | pen circuit | short to | ground or short to power in harness connectors. |
| 4 | | | | OR GROUND CIRCUIT FOR OPEN AND SHORT |
| | | | | |
| | nition swit | | opportor | |
| | | | | |
| | nect ECM | | | |
| | | | | y current sensor harness connector and ECM harness connector. |
| Check t | he contin | | en batter | y current sensor harness connector and ECM harness connector. |
| | he contin | uity betwe | en batter | |
| 3. Check t Battery curre Connector | he contin nt sensor Terminal | uity betwe EC Connector | en batter M Terminal | y current sensor harness connector and ECM harness connector. |
| 3. Check t Battery curre Connector E21 | he contin Int sensor Terminal 2 | EC Connector F102 | en batter M Terminal 95 | y current sensor harness connector and ECM harness connector. Continuity Existed |
| Check t Battery curre Connector E21 Also chemical | he contin Int sensor Terminal 2 eck harne | Uity betwe EC Connector F102 ess for sho | en batter M Terminal 95 rt to grou | y current sensor harness connector and ECM harness connector. |
| Check t Battery curre Connector E21 Also che Is the inspector | he contin nt sensor Terminal 2 eck harne ction resu | EC Connector F102 Ess for sho Ilt normal? | en batter M Terminal 95 rt to grou | y current sensor harness connector and ECM harness connector. Continuity Existed |
| Check t Battery curre Connector E21 Also che Is the inspective YES >> | he contin Int sensor Terminal 2 eck harne | EC Connector F102 ess for sho ilt normal? | en batter M Terminal 95 rt to grou | y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspect YES >> NO >> | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 5 | uity betwe EC Connector F102 ess for sho lt normal? | en batter M Terminal 95 rt to grou | y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 5 MALFUN | uity betwe EC Connector F102 ess for sho lt normal? | en batter M Terminal 95 rt to grou | y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT Check the fo | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 5 MALFUN pollowing. | uity betwe EC Connector F102 ess for sho lt normal? | en batter M Terminal 95 rt to grou | y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT Check the fo • Harness c | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 6 GO TO 5 MALFUN pollowing. | uity betwe EC Connector F102 ess for sho lt normal? 5. NCTIONIN s F1, E3 | en batter M Terminal 95 rt to grou G PART | y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT Check the fo • Harness c | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 6 GO TO 5 MALFUN pollowing. | uity betwe EC Connector F102 ess for sho lt normal? 5. NCTIONIN s F1, E3 | en batter M Terminal 95 rt to grou G PART | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT Check the fo • Harness fo | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 6 GO TO 5 MALFUN collowing. connectors or open o | uity betwe EC Connector F102 ess for sho lt normal? 5. NCTIONIN s F1, E3 r short bet | en batter M Terminal 95 rt to grou G PART ween bat | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT Check the fo • Harness fo >> | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 6 GO TO 5 MALFUN connectors or open o Repair op | uity betwe EC Connector F102 ess for sho ilt normal? S. NCTIONIN s F1, E3 r short bet | en batter M Terminal 95 rt to grou G PART ween bat | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspee YES >> NO >> 5.DETECT Check the for • Harness for >> 6.CHECK F | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 6 GO TO 5 MALFUN connectors connectors connectors connectors connectors connectors | uity betwe EC Connector F102 ess for sho it normal? 5. NCTIONIN s F1, E3 r short bet pen circuit (CURREN | en batter M Terminal 95 rt to grou G PART ween bat , short to NT SENS | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspee YES >> NO >> 5.DETECT Check the for • Harness for >> 6.CHECK F | he contin Terminal 2 eck harne ction resu GO TO 6 GO TO 6 GO TO 5 MALFUN connectors connectors connectors connectors connectors connectors | uity betwe EC Connector F102 ess for sho it normal? 5. NCTIONIN s F1, E3 r short bet pen circuit (CURREN | en batter M Terminal 95 rt to grou G PART ween bat , short to NT SENS | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspee YES >> NO >> 5.DETECT Check the for • Harness for >> 6.CHECK F | he contin | uity betwe EC Connector F102 ess for sho it normal? 5. NCTIONIN s F1, E3 r short bet pen circuit (CURREN | en batter M Terminal 95 rt to grou G PART ween bat , short to JT SENS en batter | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT y current sensor harness connector and ECM harness connector. |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspece YES >> NO >> 5.DETECT Check the for • Harness for >> 6.CHECK F 1. Check the | he contin | uity betwe EC Connector F102 ess for sho it normal? S. NCTIONIN s F1, E3 r short bet pen circuit. (CURREN uity betwe | en batter M Terminal 95 rt to grou G PART ween bat , short to JT SENS en batter | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspec YES >> NO >> 5.DETECT Check the for • Harness for • Harness for • Harness for 1. Check t Battery curre Connector | he contin | uity betwe EC Connector F102 ess for sho ilt normal? 5. S NCTIONIN s F1, E3 r short bet pen circuit (CURREN uity betwe EC Connector | en batter M Terminal 95 rt to grou G PART ween bat , short to JT SENS en batter M Terminal | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT y current sensor harness connector and ECM harness connector. Continuity Continuity |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspee YES >> NO >> 5.DETECT Check the fo • Harness c • Harness fo >> 6.CHECK I 1. Check t Battery curre Connector E21 | he contin | uity betwe EC Connector F102 ess for sho ilt normal? S. S. NCTIONIN s F1, E3 r short bet pen circuit. (CURREN uity betwe EC Connector F102 | en batter M Terminal 95 rt to grou G PART ween bat , short to IT SENS en batter M Terminal 91 | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspece YES >> NO >> 5.DETECT Check the for • Harness for • Harness for • Harness for 1. Check t Battery curre Connector E21 2. Also che | he contin | uity betwe EC Connector F102 ess for sho alt normal? S. NCTIONIN s F1, E3 r short bet pen circuit. (CURREN uity betwe EC Connector F102 ess for sho | en batter M Terminal 95 rt to grou G PART ween bat , short to IT SENS en batter M Terminal 91 | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT y current sensor harness connector and ECM harness connector. Continuity Continuity |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspee YES >> NO >> 5.DETECT Check the for • Harness for • Harness for • Harness for • Harness for • Harness for | he contin | uity betwe EC Connector F102 Pass for sho It normal? S. NCTIONIN s F1, E3 r short bet pen circuit (CURREN uity betwe EC Connector F102 Pass for sho It normal? | en batter M Terminal 95 rt to grou G PART ween bat , short to IT SENS en batter M Terminal 91 | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT y current sensor harness connector and ECM harness connector. Continuity Existed |
| 3. Check t Battery curre Connector E21 4. Also che Is the inspee YES >> NO >> 5.DETECT Check the for • Harness c • Harness for >> 6.CHECK H 1. Check the Battery curre Connector E21 2. Also che Is the inspee YES >> | he contin | uity betwe EC Connector F102 Pass for sho It normal? S. NCTIONIN s F1, E3 r short bet pen circuit (CURREN uity betwe EC Connector F102 Pass for sho It normal? S. | en batter M Terminal 95 rt to grou G PART ween bat , short to IT SENS en batter M Terminal 91 | y current sensor harness connector and ECM harness connector. Continuity Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. OR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT y current sensor harness connector and ECM harness connector. Continuity Existed |

Check the following. • Harness connectors F1, E3

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

• Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY CURRENT SENSOR

Refer to EC-430, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

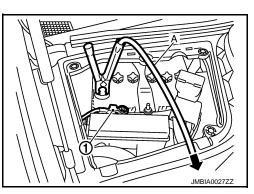
Component Inspection

1.CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).

E: To body ground

- 4. Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.



| | ECM | | |
|-----------|---------------------------------------|----------|-------------|
| Connector | + | - | Voltage (V) |
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P1551, P1552 BATTERY CURRENT SENSOR

Description

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-10. "System Description".

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:000000008156514

DTC DETECTION LOGIC

NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-380, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|--|---|---|---|
| P1551 | Battery current sensor circuit low input | An excessively low voltage from the sen- sor is sent to ECM. | Harness or connectors (Battery current sensor circuit is open | П |
| P1552 | Battery current sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | or shorted.) Battery current sensor | I |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

Turn ignition switch ON. 2.

Turn ignition switch OFF and wait at least 10 seconds. 3.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V with ignition switch ON

>> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE Ν 1. Turn ignition switch ON and wait at least 10 seconds. 2. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-431, "Diagnosis Procedure". >> INSPECTION END NO Diagnosis Procedure INFOID:000000008156515 P 1. CHECK GROUND CONNECTION

Turn ignition switch OFF. 1.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

INFOID:000000008156513

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P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Repair or replace ground connection.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.

- 2. Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

| Battery current sensor | | Ground | Voltage (V) | |
|------------------------|----------|---------|-------------|--|
| Connector | Terminal | Giodila | voltage (v) | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

 ${f 4.}$ CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E21 | 2 | F102 | 95 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

• Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity | |
|------------------------|----------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| E21 | 3 | F102 | 91 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

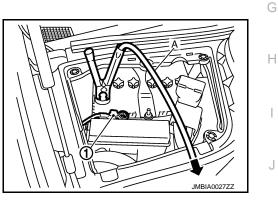
Check the following.

| P1551, P1552 BATTERY CURRENT SENSOR | |
|---|------------------------|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. 8. CHECK BATTERY CURRENT SENSOR | |
| Refer to EC-439, "Component Inspection". | |
| Is the inspection result normal? | |
| YES >> GO TO 9. NO >> Replace battery negative cable assembly. | |
| 9. CHECK INTERMITTENT INCIDENT | |
| Refer to GI-42, "Intermittent Incident". | |
| >> INSPECTION END | |
| Component Inspection | INFOID:000000008156516 |
| 1.CHECK BATTERY CURRENT SENSOR | |
| 1. Turn ignition switch OFF. | |

- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).

To body ground

- Install jumper cable (A) between battery negative terminal and 4. body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.



| | ECM | | |
|-----------|---------------------------------------|----------|-------------|
| Connector | + | _ | Voltage (V) |
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P1553 BATTERY CURRENT SENSOR

Description

INFOID:000000008156517

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to <u>CHG-10. "System Description"</u>.

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:000000008156518

DTC DETECTION LOGIC

NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to <u>EC-380,</u> "<u>DTC Logic</u>".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P1553 | Battery current sensor perfor- mance | The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation. | Harness or connectors (Battery current sensor circuit is open or shorted.) Battery current sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON.

3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-434, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

Revision: 2012 July

EC-434

2013 G Convertible

INFOID:000000008156519

[VQ37VHR]

| Battery current sensor Ground Voltage (V) E21 1 Ground Approx. 5 st the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. S. DETECT MALFUNCTIONING PART Check the following. Check the following. Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT I. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Eattery current sensor ECM Connector Terminal VES > GO TO 6. NO >> GO TO 5 | |
|---|------------|
| 3. Check the voltage between battery current sensor harness connector and ground. Battery current sensor Ground Voltage (V) E21 1 Ground Approx.5 Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. 3. DETECT MALFUNCTIONING PART Check the following. Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM intervent continuity E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. DETECT MALFUNCTIONING PART Check the following. Harness connectors F1, E3 | connector. |
| Battery current sensor Ground Voltage (V) Connector Terminal Ground Approx. 5 Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 • • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Connector Terminal Connector <t< th=""><th>connector.</th></t<> | connector. |
| Connector Terminal Ground Voltage (V) E21 1 Ground Approx. 5 Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4 . CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal? YES > GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| Connector Terminal Approx. 5 E21 1 Ground Approx. 5 Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Check the following. • Harness connectors F1, E3 • Harness connectors F1, E3 • • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Connector Terminal E21 2 F102 95 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES > GO TO 5. 5. 5. 5. DETECT MALFUNCTIONING PART Check the following. • • Harness connectors F1, E3 • • | connector. |
| Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Connector Terminal Connector Terminal Connector result normal? YES > GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| NO >> GO TO 3. 3. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness $\frac{Battery current sensor ECM}{Continuity} Connector Terminal Continuity}$ 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| Check the following. Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. Harness connectors F1, E3 | |
| Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | connector. |
| Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Eattery current sensor ECM Continuity Connector Terminal Connector Terminal Eattery current sensor of the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Continuity Connector Terminal Connector Terminal Continuity E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Continuity Connector Terminal Connector Terminal Continuity E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | connector. |
| Turn ignition switch OFF. Disconnect ECM harness connector. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Continuity Connector Terminal Connector Terminal Connector Terminal E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 Continuity Context and short to ground and short to ground and short to ground and short to power. Easter and the provide the | connector. |
| Disconnect ECM harness connector. Check the continuity between battery current sensor harness connector and ECM harness Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 2 F102 95 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. DETECT MALFUNCTIONING PART Check the following. Harness connectors F1, E3 | connector. |
| E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| 4. Also check harness for short to ground and short to power. <u>Is the inspection result normal?</u> YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. Harness connectors F1, E3 | |
| Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F1, E3 | |
| Check the following. • Harness connectors F1, E3 | |
| Check the following. • Harness connectors F1, E3 | |
| Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM | |
| Harness for open or short between battery current sensor and ECM | |
| | |
| . Denoir open eirouit, chartes ground ar chartes never in homeses an error start | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. | Ŧ |
| 6 . CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHOP | |
| 1. Check the continuity between battery current sensor harness connector and ECM harness | connector. |
| | |
| Battery current sensor ECM Continuity | |
| Connector Terminal Connector Terminal | |
| E21 3 F102 91 Existed | |
| 2. Also check harness for short to ground and short to power. | |
| Is the inspection result normal? | |
| YES >> GO TO 8. NO >> GO TO 7. | |
| 7. DETECT MALFUNCTIONING PART | |

Check the following. • Harness connectors F1, E3

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

• Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY CURRENT SENSOR

Refer to EC-439, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

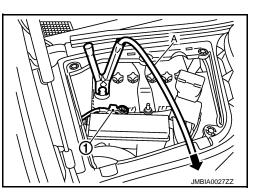
Component Inspection

1.CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).

E: To body ground

- 4. Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.



| ECM | | | |
|-----------|---------------------------------------|----------|-------------|
| Connector | + | - | Voltage (V) |
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

INFOID:000000008156520

P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P1554 BATTERY CURRENT SENSOR

Description

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to <u>CHG-10</u>, "System Description".

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:000000008156522

DTC DETECTION LOGIC

NOTE:

If DTC P1554 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-</u> <u>380, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | Ц |
|---------|---|--|---|---|
| P1554 | Battery current sensor perfor- mance | The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough. | (Battery current sensor circuit is open or shorted) | |

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-437, "Component Function Check".

NOTE:

Use component function check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-438, "Diagnosis Procedure".

Component Function Check

1.PRECONDITIONING

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 12.8 V at idle.
- Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.

>> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

With CONSULT

1. Start engine and let it idle.

- 2. Select "BAT CUR SEN" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BAT CUR SEN" indication for 10 seconds.
- "BAT CUR SEN" should be above 2,300 mV at least once.

Without CONSULT

1. Start engine and let it idle.

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P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

2. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | |
|-----------|---------------------------------------|----------|-------------------------|--|
| Connector | + | _ | Voltage (V) | |
| Connector | Terminal | Terminal | * | |
| F102 | 91 (Battery current sensor signal) | 95 | Above 2.3 at least once | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>EC-438</u>, "Diagnosis Procedure"

Diagnosis Procedure

INFOID:000000008156524

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

| Battery current sensor | | Ground | Voltage (V) |
|------------------------|----------|--------|-------------|
| Connector | Terminal | Giouna | voltage (v) |
| E21 | 1 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F1, E3

• Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 2 | F102 | 95 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

NO >> GO 10 5.

5.DETECT MALFUNCTIONING PART

Check the following.

| P1554 BATTERY CURRENT SENSOR | | |
|--|-----------|--|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM | A | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHOR 1. Check the continuity between battery current sensor harness connector and ECM harness | | |
| | С | |
| Battery current sensor ECM Continuity | | |
| Connector Terminal Connector Terminal | D | |
| E21 3 F102 91 Existed | D | |
| Also check harness for short to ground and short to power. Is the inspection result normal? | E | |
| YES >> GO TO 8. NO >> GO TO 7. | | |
| 7.DETECT MALFUNCTIONING PART | | |
| Check the following. | | |
| Harness connectors F1, E3 Harness for open or short between battery current sensor and ECM | G | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. 8. CHECK BATTERY CURRENT SENSOR | Н | |
| Refer to EC-439, "Component Inspection". | | |
| Is the inspection result normal? | I | |
| YES >> GO TO 9. NO >> Replace battery negative cable assembly. | | |
| 9. CHECK INTERMITTENT INCIDENT | | |
| Refer to GI-42, "Intermittent Incident". | | |
| >> INSPECTION END | К | |
| Component Increation | | |
| | | |
| 1.CHECK BATTERY CURRENT SENSOR | | |
| 1. Turn ignition switch OFF. | | |

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).

To body ground

- 4. Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

|--|

| ECM | | | |
|-----------|---------------------------------------|----------|-------------|
| Connector | + | _ | Voltage (V) |
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".



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< DTC/CIRCUIT DIAGNOSIS >

<u>Is the inspection result normal?</u> YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

P1564 ASCD STEERING SWITCH

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. Refer to <u>EC-74, "System Description"</u> for the ASCD function.

DTC Logic

DTC DETECTION LOGIC **NOTE**:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | | | | |
|---|---------------------------|--|---|---|--|--|--|
| P1564 | ASCD steering switch | An excessively high voltage signal from the ASCD steering switch is sent to ECM. ECM detects that input signal from the ASCD steering switch is out of the specified range. ECM detects that the ASCD steering switch is stuck ON. | Harness or connectors (The switch circuit is open or shorted.) ASCD steering switch ECM | F | | | |
| DTC CON | NFIRMATION PRO | DCEDURE | | Н | | | |
| 1.PRECO | ONDITIONING | | | | | | |
| If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test. 1. Turn ignition switch OFF and wait at least 10 seconds. | | | | | | | |
| Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. | | | | | | | |
| >> GO TO 2. | | | | | | | |
| 2. PERFORM DTC CONFIRMATION PROCEDURE | | | | | | | |
| Turn ignition switch ON and wait at least 10 seconds. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at lease it and wait at least 10 seconds. | | | | | | | |

- Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Check DTC.
- Is DTC detected?
- YES >> Go to EC-441, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

- **1.**CHECK GROUND CONNECTION
- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in <u>GI-45. "Circuit Inspection"</u>.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.
- 2.CHECK ASCD STEERING SWITCH CIRCUIT

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P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

- 1. Turn ignition switch ON.
- 2. Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT.
- 3. Check each item indication under the following conditions.

| Monitor item | Condition | | Indication |
|---------------|------------------|----------|------------|
| MAIN SW | MAIN switch | Pressed | ON |
| MAIN SW | WAIN SWICH | Released | OFF |
| CANCEL SW | CANCEL switch | Pressed | ON |
| CANCEL SW | CANCEL SWICH | Released | OFF |
| RESUME/ACC SW | RESUME/ACCEL- | Pressed | ON |
| RESUME/ACC SW | ERATE switch | Released | OFF |
| SET SW | SET/COAST switch | Pressed | ON |
| 5L1 5VV | SE 1/COAST SWICH | Released | OFF |

Without CONSULT

1. Turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | |
|-----------|--------------------------------------|----------|--------------------------------------|-------------|
| Connector | + | - | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | MAIN switch: Pressed | Approx. 0 |
| | 101 (ASCD steering switch signal) | 108 | CANCEL switch: Pressed | Approx. 1 |
| M107 | | | SET/COAST switch: Pressed | Approx. 2 |
| | | | RESUME/ACCELERATE switch: Pressed | Approx. 3 |
| | | | All ASCD steering switches: Released | Approx. 4 |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

$\mathbf{3}.$ CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Disconnect combination switch harness connector M303.

4. Check the continuity between combination switch and ECM harness connector.

| Combination switch | EC | Continuity | |
|--------------------|-----------|------------|------------|
| Terminal | Connector | Terminal | Continuity |
| 16 | M107 | 108 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

Combination switch (spiral cable)

• Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

EC-442

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

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5.check ascd steering switch input signal circuit for open and short

1. Check the continuity between combination switch and ECM harness connector.

| Combination switch | ECM | | Continuity |
|--------------------|--------------------|-----|------------|
| Terminal | Connector Terminal | | Continuity |
| 13 | M107 | 101 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

Combination switch (spiral cable)

Harness for open and short between ECM and combination switch

>> Repair open circuit short to around or short to power in harness or connectors

| >> Repair open circuit, short to ground or short to power in namess or connectors. | |
|--|------------------------|
| 7.CHECK ASCD STEERING SWITCH | |
| Refer to EC-443, "Component Inspection". | |
| Is the inspection result normal? | |
| YES >> GO TO 8. | |
| NO >> Replace ASCD steering switch. | |
| 8. CHECK INTERMITTENT INCIDENT | |
| Refer to GI-42, "Intermittent Incident". | |
| >> INSPECTION END | |
| Component Inspection | INFOID:000000008156529 |

Component Inspection

1.CHECK ASCD STEERING SWITCH

1. Turn ignition switch OFF.

2. Disconnect combination switch (spiral cable) harness connector M303.

Check resistance between combination switch harness connector terminals under the following condi-3. L tions.

| Combination switch Connector Terminals | | Condition | Desistance (O) |
|---|-------------|--------------------------------------|-----------------------|
| | | Condition | dition Resistance (Ω) |
| M303 13 and 1 | | MAIN switch: Pressed | Approx. 0 |
| | | CANCEL switch: Pressed | Approx. 250 |
| | 13 and 16 | SET/COAST switch: Pressed | Approx. 660 |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 1,480 |
| | | All ASCD steering switches: Released | Approx. 4,000 |
| ls the insp | ection resu | ult normal? | |
| | | | |

YES >> INSPECTION END

NO >> Replace ASCD steering switch

< DTC/CIRCUIT DIAGNOSIS >

P1564 ICC STEERING SWITCH

Description

ICC steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated. Refer to <u>CCS-16</u>, "System Description" for the ICC function.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------|---|--|
| P1564 | ICC steering switch | An excessively high voltage signal from the ICC steering switch is sent to ECM. ECM detects that input signal from the ICC steering switch is out of the specified range. ECM detects that the ICC steering switch is stuck ON. | Harness or connectors (The switch circuit is open or shorted.) ICC steering switch ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 7. Check DTC.

Is DTC detected?

YES >> Go to EC-444, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156532

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".
- Is the inspection result normal?
- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

2. CHECK ICC STEERING SWITCH CIRCUIT

With CONSULT

INFOID:000000008156530

INFOID:000000008156531

P1564 ICC STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

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- 1. Turn ignition switch ON.
- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW", "SET SW" and "DIST SW" in "DATA MONITOR" A mode with CONSULT.
- 3. Check each item indication under the following conditions.

| Monitor item Condition Indication | | | | | | | |
|-----------------------------------|-------------------|----------|------------|--|--|--|--|
| Monitor item | Condition | 1 | Indication | | | | |
| MAIN SW | MAIN switch | Pressed | ON | | | | |
| | MAIN SWICH | Released | OFF | | | | |
| CANCEL SW | CANCEL switch | Pressed | ON | | | | |
| CANCEL SW | OANOLE SWICH | Released | OFF | | | | |
| RESUME/ACC SW | RESUME/ACCEL- | Pressed | ON | | | | |
| NEGOMIE/AGG GW | ERATE switch | Released | OFF | | | | |
| SET SW | SET/COAST switch | Pressed | ON | | | | |
| 3L1 3W | SE 1/COAST SWITCH | Released | OFF | | | | |
| DIST SW | DISTANCE switch | Pressed | ON | | | | |
| | | Released | OFF | | | | |

Without CONSULT

1. Turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | |
|-----------|------------------------------|----------|-------------------------------------|-------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | MAIN switch: Pressed | Approx. 0 | |
| | 101 | 100 | CANCEL switch: Pressed | Approx. 1.3 | |
| | | | DISTANCE switch: Pressed | Approx. 2.2 | |
| M107 | (ICC steering switch signal) | 108 | SET/COAST switch: Pressed | Approx. 3.0 | |
| | | RE | RESUME/ACCELERATE switch: Pressed | Approx. 3.7 | |
| | | | All ICC steering switches: Released | Approx. 4.3 | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

 ${f 3.}$ CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Disconnect combination switch harness connector M303.

4. Check the continuity between combination switch and ECM harness connector.

| Combination switch | EC | Continuity | |
|--------------------|-----------|------------|------------|
| Terminal | Connector | Terminal | Continuity |
| 16 | M107 | 108 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

• Combination switch (spiral cable)

· Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. Check ICC steering switch input signal circuit for open and short

1. Check the continuity between combination switch and ECM harness connector.

| Combination switch | ECM | | Continuity | |
|--------------------|-----------|----------|------------|--|
| Terminal | Connector | Terminal | Continuity | |
| 13 | M107 | 101 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

• Combination switch (spiral cable)

Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

1.CHECK ICC STEERING SWITCH

Refer to EC-446, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ICC steering switch. Refer to CCS-120, "Exploded View".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000008156533

1. CHECK ICC STEERING SWITCH

- 1. Turn ignition switch OFF.
- 2. Disconnect combination switch (spiral cable) harness connector M303.
- 3. Check resistance between combination switch harness connector terminals under the following conditions.

| Combinat | ion switch | Condition | Resistance (Ω) |
|-----------|------------|-------------------------------------|-------------------|
| Connector | Terminals | Condition | 1(03)3(01)00 (32) |
| | | MAIN switch: Pressed | Approx. 0 |
| | | CANCEL switch: Pressed | Approx. 310 |
| M303 | 13 and 16 | DISTANCE switch: Pressed | Approx. 740 |
| 101303 | 15 and 10 | SET/COAST switch: Pressed | Approx. 1,400 |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 2,600 |
| | | All ICC steering switches: Released | Approx. 5,500 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC steering switch. Refer to CCS-120, "Exploded View".

P1568 ICC FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

P1568 ICC FUNCTION

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1568 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1568 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</u>.
- If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---|---|--|---|
| P1568 | ICC function | ECM detects a difference between signals from ICC sensor integrated unit is out of spec- ified range. | Harness or connectors (The CAN communication line is open or shorted.) ICC sensor integrated unit ECM |
| DTC CON | NFIRMATION PRO | DCEDURE | |
| 1.PRECO | ONDITIONING | | |
| before cor 1. Turn i 2. Turn i 3. Turn i TESTING Step 4 ma | nducting the next te gnition switch OFF gnition switch ON. gnition switch OFF CONDITION: ay be conducted w | st. and wait at least 10 seconds. and wait at least 10 seconds. | always perform the following procedure or by driving the vehicle. If a road test |
| • | > GO TO 2. | MATION PROCEDURE | |
| | gnition switch ON. | | |
| Press Drive CAUT Alway Press | MAIN switch on IC the vehicle at more TION: ys drive vehicle at SET/COAST switc | than 40 km/h (25 MPH). a safe speed. | |
| | CDTC. | | |
| | | <u>Diagnosis Procedure"</u> . ID | |
| Diagnos | sis Procedure | | INFOID:000000008156535 |
| | CE ICC SENSOR I | NTEGRATED UNIT | |
| 1. Repla 2. Perfor <u>Mode</u> | ce ICC sensor integ rm <u>CCS-11, "ACTION</u> ". | grated unit. Refer to <u>CCS-119, "Remova</u> | ent (Vehicle-To-Vehicle Distance Control |

>> INSPECTION END

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< DTC/CIRCUIT DIAGNOSIS >

P1572 ASCD BRAKE SWITCH

Description

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to <u>EC-74</u>, "System Description" for the ASCD function.

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</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 is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

| DTC No. | Trouble diagnosis name | | DTC detecting condition | Possible cause |
|---------|---------------------------|----|--|---|
| | | A) | When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time. | Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors (The ASCD brake switch circuit is shorted.) |
| P1572 | ASCD brake switch | B) | ASCD brake switch signal is not sent to ECM for extremely long time while the ve- hicle is being driven. | Stop lamp switch ASCD brake switch Incorrect stop lamp switch installation Incorrect ASCD brake switch installation ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

- 1. Start engine (VDC switch OFF).
- 2. Press MAIN switch and make sure that CRUISE lamp illuminates.
- 3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
 - CAUTION: Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

| Vehicle speed | More than 30 km/h (19 mph) |
|----------------|----------------------------|
| Selector lever | Suitable position |

4. Check 1st trip DTC.

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| | CUIT DIAGNOSIS > | | | | | [VQ37VHR] |
|---|--|--|---|---|----------------------------------|--------------------------|
| YES >> | TC detected? | | | | | |
| | Go to <u>EC-449, "Diagno</u> GO TO 3. | sis Proc | edure". | | | |
| B. PERFOF | M DTC CONFIRMATIC | N PRO | CEDURE | | | |
| | e vehicle for at least 5 o | consecu | tive seconds unde | er the following co | onditions. | |
| NOTÉ: This pr | ON: drive vehicle at a safe ocedure may be conde d test is expected to b | ucted w | ith the drive whe | | | ng the vehicle. |
| Vehicle spee | d | More thar | n 30 km/h (19 mph) | | | |
| Selector leve | | Suitable p | | | | |
| Driving locati | on | seconds s | he brake pedal for mores to as not to come off f entioned vehicle speed | rom the | | |
| <u>s 1st trip D</u> | Ist trip DTC. TC detected? | | <u> </u> | | | |
| YES >> NO >> | Go to <u>EC-449, "Diagno</u> INSPECTION END | <u>sis Proc</u> | edure". | | | |
| Diagnosis | s Procedure | | | | | INFOID:000000008156538 |
| - | OVERALL FUNCTION- | | | | | |
| | nition switch ON. BRAKE SW1" in "DATA | | | | | |
| | BRAKE SW1" indication | | | | | |
| | BRAKE SW1" indication | | | | | |
| Check ' Monitor item | BRAKE SW1" indication | n under | | litions. | | |
| B. Check " Monitor item BRAKE SW1 | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal (A/T) Brake pedal and clutch per | n under ondition II (M/T) | the following conc | litions. | | |
| Monitor item BRAKE SW1 | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal (A/T) Brake pedal and clutch per CONSULT nition switch ON. he voltage between EC ECM | n under ondition II (M/T) dal (M/T) | the following cond Slightly depressed Fully released | litions. Indication OFF ON ninals as per the | following. | |
| . Check " Monitor item BRAKE SW1 Without . Turn igr | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal and clutch per CONSULT nition switch ON. he voltage between EC ECM + | n under ondition II (M/T) dal (M/T) M harne | the following cond Slightly depressed Fully released ess connector term | litions. Indication OFF ON | following. | Voltage (V) |
| Monitor item BRAKE SW1 Without Unrn igr Check t | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal and clutch per CONSULT nition switch ON. he voltage between EC ECM + Terminal | n under ondition II (M/T) dal (M/T) | the following cond Slightly depressed Fully released ess connector term nal Brake pedal (A/ | litions. Indication OFF ON ninals as per the Condition | following. Slightly depressed | Voltage (V) Approx. 0 |
| Check " Monitor item BRAKE SW1 Without Turn igr Check t | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal and clutch per CONSULT nition switch ON. he voltage between EC ECM + | n under ondition II (M/T) dal (M/T) M harne | the following cond Slightly depressed Fully released ess connector term nal Brake pedal (A/ Brake pedal or Brake pedal (A/ | litions. Indication OFF ON hinals as per the Condition T) clutch pedal (M/T) T) | | |
| Check ' Monitor item BRAKE SW1 Without Turn igr Check t Connector M107 | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal and clutch per CONSULT nition switch ON. he voltage between EC ECM + Terminal 126 (ASCD brake switch signal) | n under ondition II (M/T) dal (M/T) M harne | the following cond Slightly depressed Fully released ess connector term nal Brake pedal (A/ Brake pedal or Brake pedal (A/ | litions. Indication OFF ON hinals as per the Condition | Slightly depressed | Approx. 0 |
| 3. Check ' Monitor item BRAKE SW1 Without I. Turn igr 2. Check t Connector M107 S the insper YES >> NO-1 >> NO-1 >> NO-2 >> | BRAKE SW1" indication Co Brake pedal (A/T) Brake pedal or clutch peda Brake pedal and clutch per CONSULT nition switch ON. he voltage between EC ECM + Terminal | n under ondition II (M/T) dal (M/T) M harne Termin 128 | the following cond Slightly depressed Fully released ess connector term nal Brake pedal (A/ Brake pedal or Brake pedal (A/ | litions. Indication OFF ON hinals as per the Condition T) clutch pedal (M/T) T) | Slightly depressed | Approx. 0 |

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EC-449

< DTC/CIRCUIT DIAGNOSIS >

| Monitor item | (| Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| DIVANE OWZ | Diake pedal | Fully released | OFF |

Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | Condition | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|
| Connector | + | - | | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M107 | 122 | 128 | Brake pedal | Slightly depressed | Battery voltage |
| 101 | (Stop lamp switch signal) | 120 | Diake peual | Fully released | Approx. 0 |

Is the inspection result normal?

YES >> GO TO 21.

NO >> GO TO 16.

$\mathbf{3}.$ check ascd brake switch power supply circuit

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD bra | ake switch | Ground | Voltage |
|-----------|------------|--------|-----------------|
| Connector | Terminal | Ciouna | voltage |
| E109 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- · Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

5. Check ascd brake switch input signal circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| ASCD bra | ke switch | EC | CM | Continuity |
|-----------|-----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E109 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

D.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

| 11 | | | | | 20 - I- | [VQ37VHR] |
|--|---|--|---|---|--|-----------|
| Harness f | for open or | r short be | etween ECM ar | nd ASCD brake sw | ritch | |
| >> | Repair or | oen circu | it. short to arou | und or short to pow | er in harness or connec | tors. |
| _ | ASCD BR | | - | | | |
| efer to EC | C-453, "Co | mponent | t Inspection (AS | SCD Brake Switch) | " | |
| | ection resu | | | · · · · · · · · · · · · · · · · · · · | - | |
| | GO TO 2 | | ale avital. Da | | | |
| | • | | WITCH CIRCU | fer to <u>BR-18, "Exp</u> IIT | IODED VIEW. | |
| | nition swite | | | /11 | | |
| . Disconi | nect ASCE | D brake s | switch harness | connector. | | |
| | nition swite | | an ASCD brake | switch harness co | nnector and ground. | |
| . Oneck | the voltage | e betwee | | Switch Hamess et | intector and ground. | |
| ASCD bra | ke switch | Ground | 0 | ondition | Voltage (V) | |
| Connector | Terminal | Giouna | | | voltage (v) | |
| E109 | 1 | Ground | Clutch pedal | Slightly depressed | Approx. 0 | |
| | | | - | Fully released | Battery voltage | |
| the inspe | ection resu | lt norma | <u> ?</u> | | | |
| | | | | | | |
| YES >> | GO TO 1 | 3. | | | | |
| YES >> NO >> | GO TO 1 GO TO 9 | 3. | WITCH POWE | R SUPPLY CIRCL | ЛТ | |
| YES >> NO >> CHECK | GO TO 1 GO TO 9 ASCD CL | 3. UTCH S | WITCH POWE | R SUPPLY CIRCL | ЛΤ | |
| YES >> NO >> CHECK . Turn ig . Discon | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE | 3. UTCH S ch OFF. D clutch : | WITCH POWE | | IJТ | |
| YES >> NO >> CHECK . Turn igi . Disconi . Turn igi | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite | 3. UTCH S ch OFF. D clutch s ch ON. | switch harness | connector. | | |
| YES >> NO >> CHECK . Turn igi . Disconi . Turn igi | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite | 3. UTCH S ch OFF. D clutch s ch ON. | switch harness | connector. | JIT onnector and ground. | |
| YES >> NO >> CHECK . Turn igi . Disconi . Turn igi | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage | 3. UTCH S ch OFF. D clutch s ch ON. e betwee | switch harness en ASCD clutch | connector. | | |
| YES >> NO >> CHECK . Turn ig . Disconi . Turn ig . Check ASCD clut Connector | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal | 3. UTCH S ch OFF. D clutch s ch ON. e betwee | switch harness en ASCD clutch ^{Voltage} | connector. | | |
| YES >> NO >> CHECK Turn ig Discon Turn ig Check ASCD clut Connector E108 | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground | switch harness en ASCD clutch Voltage Battery voltage | connector. | | |
| YES >> NO >> CHECK . Turn igi . Disconi . Turn igi . Check ASCD clut Connector E108 s the inspe | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground | switch harness en ASCD clutch Voltage Battery voltage | connector. | | |
| YES >> NO >> CHECK . Turn igi . Disconi . Turn igi . Check ASCD clut Connector E108 s the inspe YES >> | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal | switch harness en ASCD clutch Voltage Battery voltage | connector. | | |
| YES >> NO >> .CHECK . Turn ig . Discond . Turn ig . Check ASCD clut Connector E108 sthe inspe YES >> NO >> | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu GO TO 1 | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. | switch harness en ASCD clutch Voltage Battery voltage | connector. | | |
| YES >> NO >> .CHECK . Turn igi . Disconi . Turn igi . Check ASCD clut Connector E108 sthe inspe YES >> NO >> O.DETE | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu GO TO 1 GO TO 1 CT MALFU | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. | switch harness en ASCD clutch Voltage Battery voltage | connector. | | |
| YES >> NO >> I.CHECK . Turn igi . Disconi . Turn igi . Check : ASCD clut Connector E108 . the inspe YES >> NO >> O.DETEC . heck the f Fuse bloc | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 cction resu GO TO 1 GO TO 1 GO TO 1 GO TO 1 GO TO 1 CT MALFU | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. 0. JNCTIO | switch harness en ASCD clutch Voltage Battery voltage I? NING PART | connector. | | |
| YES >> NO >> I.CHECK . Turn igu . Disconu . Turn igu . Check : ASCD clut Connector E108 Sthe inspe YES >> NO >> O.DETEC Check the f Fuse bloc 10 A fuse | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu GO TO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 G | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. 0. JNCTIO | switch harness en ASCD clutch Voltage Battery voltage I? NING PART E103 | connector. | onnector and ground. | |
| YES >> NO >> CHECK . Turn igu . Disconu . Turn igu . Check : ASCD clut Connector E108 Sthe inspe YES >> NO >> NO >> O.DETEC Check the f Fuse bloc 10 A fuse | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu GO TO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 G | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. 0. JNCTIO | switch harness en ASCD clutch Voltage Battery voltage I? NING PART E103 | connector. | onnector and ground. | |
| YES >> NO >> CHECK . Turn ig: . Disconi . Turn ig: . Check : ASCD clut Connector E108 Sthe inspe YES >> NO >> NO >> O.DETEC Check the f Fuse bloc 10 A fuse Harness f | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 cction resu GO TO 1 GO 1 GO TO 1 GO TO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 G | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. 0. JNCTIO nnector I r short be | switch harness en ASCD clutch Voltage Battery voltage I? NING PART E103 etween ASCD o | connector. | onnector and ground. | |
| YES >> NO >> CHECK . Turn igu . Disconu . Turn igu . Check : ASCD clut Connector E108 S the inspe YES >> NO >> O.DETE Check the f Fuse bloc 10 A fuse Harness f | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu GO TO 1 GO 1 GO TO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 GO 1 G | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground Ground It normal 1. 0. UNCTIO nnector I r short be | switch harness en ASCD clutch Voltage Battery voltage I? NING PART E103 etween ASCD o | connector. a switch harness co clutch switch and fo ound in harness or | onnector and ground. | DRT-I |
| YES >> NO >> D.CHECK . Turn igu . Discond . Turn igu . Check 1 ASCD clut Connector E108 S the inspe YES >> NO >> IO.DETE Check the f Fuse bloc 10 A fuse Harness f >> IO.CHEC . Turn igu | GO TO 1 GO TO 9 ASCD CL nition swite nect ASCE nition swite the voltage tch switch Terminal 1 ection resu GO TO 1 GO 1 GO TO 1 | 3. UTCH S ch OFF. D clutch s ch ON. e betwee Ground It normal 1. 0. UNCTIO nnector I r short be Den circu BRAKE S ch OFF. | switch harness en ASCD clutch Voltage Battery voltage I? NING PART E103 etween ASCD of swit or short to gro | connector. a switch harness co clutch switch and fo ound in harness or SIGNAL CIRCUIT | use · connectors. Γ FOR OPEN AND SHO | DRT-I |

| ASCD clu | tch switch | ASCD bra | ke switch | Continuity |
|-----------|------------|-----------|--------------------|------------|
| Connector | Terminal | Connector | Connector Terminal | |
| E108 | 2 | E109 | 1 | Existed |

3. Also check harness for short to ground and short to power.

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

Refer to EC-454, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace ASCD clutch switch. Refer to <u>CL-9, "Exploded View"</u>.

13. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| ASCD bra | ke switch | EC | CM | Continuity |
|-----------|-----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E109 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 15. NO >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

15.CHECK ASCD BRAKE SWITCH

Refer to EC-453, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace ASCD brake switch. Refer to <u>BR-18, "Exploded View"</u>.

16. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect stop lamp switch harness connector.

3. Check the voltage between stop lamp switch harness connector and ground.

| Stop lam | p switch | Ground | Voltage | |
|--------------------|----------|--------|-----------------|--|
| Connector Terminal | | Ciouna | vollage | |
| E110 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 18.

NO >> GO TO 17.

17. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10A fuse (No. 7)

• Harness for open or short between stop lamp switch and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

EC-452

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| 18. сне | | | | |
|--|---|---|--|---|
| | CK STOP L | AMP SWITCH | INPUT SIGNA | L CIRCUIT FOR OPEN AND SHORT |
| | | harness conned | | |
| 2. Check | the continu | uity between sto | p lamp switch | harness connector and ECM harness connector. |
| | | | | E |
| Stop larr | p switch | ECM | Continuity | |
| Connector | Terminal | Connector Termi | nal | |
| E110 | 2 | M107 122 | 2 Existed | |
| 3. Also c | heck harne | ss for short to g | round and sho | rt to power. |
| | ection resu | | | |
| | > GO TO 2 > GO TO 1 | | | |
| | | | | |
| | | JNCTIONING F | ARI | |
| | following. | nnectors E103, | MO | |
| | | short between | | lamp switch |
| | 1 | | | |
| > | > Repair op | en circuit, short | to ground or s | hort to power in harness or connectors. |
| 20.CHE | CK STOP L | AMP SWITCH | - | |
| | | mponent Inspec | tion (Stop Lar | n Switch)" |
| | ection resu | | | · · · · |
| | > GO TO 2 | | | |
| | | | n. Refer to <u>BR-</u> | 18, "Exploded View". |
| 2 1. CHE | | IITTENT INCID | ENT | |
| | | | | |
| Refer to G | I-42, "Interr | nittent Incident" | | |
| Refer to <u>G</u> | <u>1-42, "Interr</u> | nittent Incident" | | |
| | I-42, "Interr > INSPECT | | | |
| > | > INSPECT | ION END | | vitch) |
| < Compon | > INSPECT | TION END ection (ASC | D Brake Sw | vitch) |
| > Compon | > INSPECT | ION END | D Brake Sw | , |
| < | > INSPECT ent Inspe (ASCD BR gnition swite | TION END ection (ASC AKE SWITCH-I ch OFF. | D Brake Sw | , |
| Compon .CHECk . Turn ig . Discored. | > INSPECT ent Inspect (ASCD BR gnition swite nnect ASCE | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h | D Brake Sw | , |
| Compon CHECk Turn ig Discor | > INSPECT ent Inspect (ASCD BR gnition swite nnect ASCE | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h | D Brake Sw | , |
| Compon CHECk Turn ig Discor | > INSPECT ent Inspect (ASCD BR gnition swite nect ASCE the continu | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h | D Brake Sw arness connec CD brake swit | ctor. ch terminals under the following conditions. |
| Compon CHECk Turn ig Discor Check Terminals | > INSPECT ent Inspect (ASCD BR gnition swite nect ASCE the continu | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h uity between AS | D Brake Sw | ctor. ch terminals under the following conditions. |
| > Compon .CHECk . Turn iq . Discor . Check | > INSPECT ent Inspect (ASCD BR gnition swite nect ASCE the continu | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released | D Brake Sw barness connection CD brake switt Continuity Existed | ctor. ch terminals under the following conditions. |
| > COMPON .CHECk . Turn ig . Discor . Check Terminals 1 and 2 | > INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depresse | D Brake Sw barness connection CD brake switt Continuity Existed | ctor. ch terminals under the following conditions. |
| > COMPON .CHECk . Turn ig . Discor . Discor . Check Terminals 1 and 2 . the insp | > INSPECT ent Inspect (ASCD BR gnition swite nect ASCE the continu | TION END ection (ASC AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed It normal? | D Brake Sw barness connection CD brake switt Continuity Existed | ctor. ch terminals under the following conditions. |
| > COMPON .CHECK . Turn ig . Discor . Check Terminals 1 and 2 . Sthe insp YES > NO > | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal Brake pedal INSPECT > GO TO 2 | TION END ection (ASCI AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed It normal? TION END | D Brake Sw arness connect CD brake switt Continuity Existed Not existed | ctor. ch terminals under the following conditions. |
| > COMPON .CHECK . Turn ig . Discor . Check Terminals 1 and 2 . Sthe insp YES > NO > | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal Brake pedal INSPECT > GO TO 2 | TION END ection (ASCI AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed It normal? TION END | D Brake Sw arness connect CD brake switt Continuity Existed Not existed | ctor. ch terminals under the following conditions. |
| > Compon .CHECk . Turn ig . Discor . Check Terminals 1 and 2 . the insp YES > NO > .CHECk | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal Brake pedal OTO 2 (ASCD BR | TION END ection (ASC) AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed Slightly depressed It normal? TION END AKE SWITCH-I | D Brake Sw parness connect CD brake switt Continuity Existed Not existed | ctor. ch terminals under the following conditions. |
| > COMPON .CHECk . Turn ig . Discor . Check Terminals 1 and 2 . Terminals 1 and 2 . Check . Sthe insp YES > NO > .CHECk . Adjust | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal ection results > INSPECT > GO TO 2 (ASCD BR ASCD bra | TION END ection (ASC) AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed Slightly depressed It normal? TION END AKE SWITCH-I ke switch install | D Brake Sw parness connect CD brake switt Continuity Existed Not existed | ctor. ch terminals under the following conditions. |
| > COMPON CHECK Turn ig Discor Check Terminals 1 and 2 Sthe insp YES > NO > CHECK CHECK Adjust | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal ection results > INSPECT > GO TO 2 (ASCD BR ASCD bra | TION END ection (ASC) AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed Slightly depressed It normal? TION END AKE SWITCH-I ke switch install | D Brake Sw parness connect CD brake switt Continuity Existed Not existed | btor. ch terminals under the following conditions. |
| > Compon .CHECk . Turn ig . Discor . Check Terminals 1 and 2 Sthe insp YES > NO > CHECk . Adjust | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal ection resu > INSPECT > GO TO 2 (ASCD BR (ASCD brack) | TION END ection (ASC) AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed Slightly depressed It normal? TION END AKE SWITCH-I ke switch install | D Brake Sw parness connect CD brake switt Continuity Existed Not existed | btor. ch terminals under the following conditions. |
| Component I.CHECk I. Turn ig Discore Check Terminals 1 and 2 Sthe inspendent YES > NO > CHECk I. Adjust Check | INSPECT ent Inspect (ASCD BR gnition switch nect ASCE the continue Brake pedal ection resu > INSPECT > GO TO 2 (ASCD BR (ASCD brack) | TION END ection (ASC) AKE SWITCH-I ch OFF. D brake switch h uity between AS Condition Fully released Slightly depressed Slightly depressed It normal? TION END AKE SWITCH-I ke switch install uity between AS | D Brake Sw barness connect CD brake switt Continuity Existed ad Not existed | btor. ch terminals under the following conditions. |

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

< DTC/CIRCUIT DIAGNOSIS >

- YES >> INSPECTION END
- NO >> Replace ASCD brake switch. Refer to <u>BR-18</u>, "Exploded View".

Component Inspection (ASCD Clutch Switch)

1.CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.

- 2. Disconnect ASCD clutch switch harness connector.
- 3. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | Clutch pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to <u>BR-7, "Inspection and Adjustment"</u>.

2. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | Ciuton pedar | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD clutch switch. Refer to <u>CL-9, "Exploded View"</u>.

Component Inspection (Stop Lamp Switch)

INFOID:000000008156541

1.CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| i anu z | Diake pedai | Slightly depressed | Existed |

Is the inspection result normal?

| YES | >> INSPECTION END |
|-----|-------------------|
| | <u> </u> |

2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to <u>BR-7, "Inspection and Adjustment"</u>.
- 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 |
| | Diake peual | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18, "Exploded View"</u>.

EC-454

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< DTC/CIRCUIT DIAGNOSIS >

P1572 ICC BRAKE SWITCH

Description

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to <u>CCS-16</u>, "System Description" for the ICC function.

DTC Logic

DTC DETECTION LOGIC **NOTE**:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</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 is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

| DTC No. | Trouble diagnosis name | | DTC detecting condition | Possible cause | • |
|---------|------------------------|----|---|---|---|
| | | A) | ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time. | Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors | G |
| P1572 | ICC brake switch | B) | ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven | (The ICC brake switch circuit is shorted.) Stop lamp switch ICC brake switch ICC brake hold relay Incorrect stop lamp switch installation Incorrect ICC brake switch installation ECM | H |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine (VDC switch OFF).
- 2. Press MAIN switch and make sure that CRUISE lamp illuminates.
- 3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:

Always drive vehicle at a safe speed. NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

| Vehicle speed | More than 30 km/h (19 mph) |
|----------------|----------------------------|
| Selector lever | Suitable position |

^{4.} Check 1st trip DTC.

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< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

YES >> Go to EC-456, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION: Always drive vehicle at a safe speed. NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

| Vehicle speed | More than 30 km/h (19 mph) |
|------------------|---|
| Selector lever | Suitable position |
| Driving location | Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed. |

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to <u>EC-456, "Diagnosis Procedure"</u>. NO >> INSPECTION END
- Diagnosis Procedure

1.CHECK OVERALL FUNCTION-I

With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|---|--------------------|------------|
| BRAKE SW1 | Brake pedal (A/T) Brake pedal or clutch pedal (M/T) | Slightly depressed | OFF |
| DIVARE SWI | Brake pedal (A/T) Brake pedal and clutch pedal (M/T) | Fully released | ON |

Without CONSULT

1. Turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|----------------------------------|-----|---|--------------------|-----------------|
| Connector | + | _ | Condition | | Voltage (V) |
| Connector | Terminal Terminal | | | | |
| M107 | 126 (ICC brake switch signal) | 128 | Brake pedal (A/T) Brake pedal or clutch pedal (M/T) | Slightly depressed | Approx. 0 |
| | | | Brake pedal (A/T) Brake pedal and clutch pedal (M/T) | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO-1 >> A/T models: GO TO 3.

NO-2 >> M/T models: GO TO 8.

2.CHECK OVERALL FUNCTION-II

(I) With CONSULT

Select "BRAKE SW2" and check indication under the following conditions.

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< DTC/CIRCUIT DIAGNOSIS >

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| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW2 | Brako podal | Slightly depressed | ON |
| | Diake peuai | Fully released | OFF |

Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|---------------------------|-------------|----------------|--------------------|-----------------|
| Connector | + | _ | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M107 | 122 | 128 | Brake pedal | Slightly depressed | Battery voltage |
| M107 | (Stop lamp switch signal) | Blake peual | Fully released | Approx. 0 | |

Is the inspection result normal?

YES >> GO TO 22.

NO >> GO TO 16.

$\mathbf{3.}$ CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

| 1. | Turn | ignition | switch | OFF. |
|----|------|----------|--------|------|
|----|------|----------|--------|------|

2. Disconnect ICC brake switch harness connector.

- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake switch harness connector and ground.

| ICC brake switch | | Ground | Voltage |
|------------------|----------|--------|-----------------|
| Connector | Terminal | Ciouna | voltage |
| E114 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)

Harness for open or short between ICC brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

5.check ICC brake switch input signal circuit for open and short

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brake switch | | ECM | | Continuity |
|------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E114 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

 $\mathbf{6}.$ DETECT MALFUNCTIONING PART

Check the following.

< DTC/CIRCUIT DIAGNOSIS >

Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK ICC BRAKE SWITCH

Refer to EC-460, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 22.

NO >> Replace ICC brake switch. Refer to <u>CCS-19, "Component Parts Location"</u>.

8.CHECK ICC BRAKE SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake switch harness connector and ground.

| ICC brak | e switch | Ground | Condition | | Voltage (V) |
|-----------|----------------------------|--------------|--------------------|----------------|-----------------|
| Connector | Terminal | Giouna | | | |
| F114 | E114 1 Ground Clutch pedal | Clutch pedal | Slightly depressed | Approx. 0 | |
| E114 1 | Ι | Ground | Ciuton pedal | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 9.

9.CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD clutch switch harness connector and ground.

| ASCD clu | tch switch | Ground | Voltage |
|-----------|------------|--------|-----------------|
| Connector | | Ciouna | voltage |
| E108 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 11. NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Fuse block (J/B) connector E103

10 A fuse (No. 3)

• Harness for open or short between ASCD clutch switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

11. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.

Check the continuity between ASCD clutch switch harness connector and ICC brake switch harness connector.

| ASCD clutch switch | | ICC brake switch | | Continuity |
|--------------------|----------|--------------------|---|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E108 | 2 | E114 | 1 | Existed |

EC-458

| [VQ37VHR] | |
|-----------|--|
| [| |

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|--------------|
| 3. Also check harness for short to ground and short to power. | |
| Is the inspection result normal? | A |
| YES >> GO TO 12. NO >> Repair open circuit, short to ground or short to power in harness or connector | |
| 12.CHECK ASCD CLUTCH SWITCH | EC |
| | |
| Refer to <u>EC-461, "Component Inspection (ASCD Clutch Switch)"</u> . Is the inspection result normal? | |
| YES \rightarrow GO TO 22. | С |
| NO >> Replace ASCD clutch switch. Refer to <u>CCS-19, "Component Parts Location"</u> | , |
| 13. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT | ·II D |
| 1. Turn ignition switch OFF. | |
| 2. Disconnect ECM harness connector. | |
| 3. Check the continuity between ICC brake switch harness connector and ECM harnes | s connector. |
| ICC brake switch ECM | |
| Connector Terminal Connector Terminal | F |
| E114 2 M107 126 Existed | |
| 4. Also check harness for short to ground and short to power. | G |
| Is the inspection result normal? | 0 |
| YES >> GO TO 15. | |
| NO >> GO TO 14. | Н |
| 14.DETECT MALFUNCTIONING PART | |
| Check the following. | |
| Harness connectors E106, M6 Harness for open or short between ICC brake switch and ECM | |
| | |
| >> Repair open circuit, short to ground or short to power in harness or connecto | JJ |
| 15.check ICC BRAKE SWITCH | |
| Refer to EC-460, "Component Inspection (ICC Brake Switch)". | K |
| Is the inspection result normal? | |
| YES >> GO TO 22. | |
| NO >> Replace ICC brake switch. Refer to <u>CCS-19. "Component Parts Location"</u> . | L |
| 16.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT | |
| Turn ignition switch OFF. Disconnect stop lamp switch harness connector. | M |
| Disconnect stop lamp switch harness connector. Disconnect ICC brake hold relay harness connector. | |
| 4. Check the voltage between stop lamp switch harness connector and ground. | NI |
| | Ν |
| Stop lamp switch Ground Voltage | |
| Connector Terminal | 0 |
| E110 1 Ground Battery voltage | |
| 5. Check the voltage between ICC brake hold relay harness connector and ground. | Р |
| ICC brake hold relay | Г |
| Connector Terminal Ground Voltage | |
| | |

| 1 4 1 | | 1. | 0 |
|--------------------|-------------|-----------------|----|
| Is the inspe | ection resi | lt norma | 17 |
| <u>13 the mopt</u> | 20110111030 | <u>nt norma</u> | |

3

Ground Battery voltage

YES >> GO TO 18.

>> GO TO 17. NO

E51

< DTC/CIRCUIT DIAGNOSIS >

17. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between battery and stop lamp switch
- · Harness for open or short between battery and ICC brake hold relay

>> Repair open circuit or short to ground in harness or connectors.

18. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

| Stop lam | Stop lamp switch | | ECM | | |
|-----------|------------------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| E110 | 2 | M107 | 122 | Existed | |

3. Check the continuity between ICC brake hold relay harness connector and ECM harness connector.

| ICC brake | ICC brake hold relay | | ECM | |
|-----------|----------------------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E51 | 5 | M107 | 122 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 20.

NO >> GO TO 19.

19. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103, M2
- Harness for open or short between ECM and stop lamp switch
- Harness for open or short between ECM and ICC brake hold relay

>> Repair open circuit, short to ground or short to power in harness or connectors.

20. CHECK STOP LAMP SWITCH

Refer to EC-461, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace stop lamp switch. Refer to <u>BR-18, "Exploded View"</u>.

21. CHECK ICC BRAKE HOLD RELAY

Refer to EC-462, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 22.

NO >> Replace ICC brake hold relay.

22. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

1.CHECK ICC BRAKE SWITCH-I

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2013 G Convertible

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< DTC/CIRCUIT DIAGNOSIS >

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-7, "Inspection and Adjustment".

2. Check the continuity between ICC brake switch terminals under the following conditions.

| | Terminals | Condition | | Continuity |
|---|-----------|---------------|--------------------|-------------|
| - | 1 and 2 | 2 Brake pedal | Fully released | Existed |
| | | | Slightly depressed | Not existed |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace ICC brake switch. Refer to <u>CCS-19, "Component Parts Location"</u>.

Component Inspection (ASCD Clutch Switch)

1.CHECK ASCD CLUTCH SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch harness connector.
- 3. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | Clutch pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to <u>BR-7</u>, "Inspection and Adjustment".

2. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | Clutch pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD clutch switch. Refer to <u>CL-9</u>, "Exploded View".

Component Inspection (Stop Lamp Switch)

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.

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< DTC/CIRCUIT DIAGNOSIS >

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| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 2.

2. CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to <u>BR-7</u>, "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 |
| | Diake pedai | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18, "Exploded View"</u>.

Component Inspection (ICC Brake Hold Relay)

1. CHECK ICC BRAKE HOLD RELAY

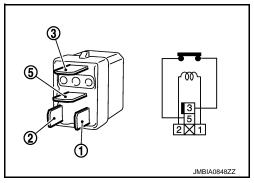
- 1. Turn ignition switch OFF.
- 2. Remove ICC brake hold relay.
- 3. Check the continuity between ICC brake hold relay terminals under the following conditions.

| Terminals | Condition | Continuity |
|-----------|---|-------------|
| 3 and 5 | 12V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake hold relay



P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P1574 ASCD VEHICLE SPEED SENSOR

Description

The ECM receives two vehicle speed signals via the CAN communication line. One is sent from "unified meter and A/C amp.", and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to <u>EC-74</u>, "System Description" for ASCD functions.

DTC Logic

DTC DETECTION LOGIC **NOTE**:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to <u>EC-354, "A/T MODELS : DTC Logic"</u> (A/T models) or <u>EC-355, "M/T MODELS : DTC Logic"</u> (M/T models).
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer F to EC-379, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | G |
|---------|---------------------------|---|---|---|
| P1574 | ASCD vehicle speed sensor | The difference between the two vehicle speed signals is out of the specified range. | Harness or connectors (The CAN communication line is open or shorted.) Unified meter and A/C amp. ABS actuator and electric unit (control unit) Wheel sensor TCM ECM | H |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).

2. Drive the vehicle at more than 40 km/h (25 MPH). CAUTION:

Always drive vehicle at a safe speed. NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. (If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3. Check DTC.

Is DTC detected?

YES >> Go to EC-463, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-154. "Diagnosis Description".

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P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

2. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to <u>BRC-27, "CONSULT Function"</u>.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-36, "CONSULT Function (METER/M&A)".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P1574 ICC VEHICLE SPEED SENSOR

Description

The ECM receives two vehicle speed signals via CAN communication line. One is sent from "unified meter and A/C amp.", and the other is from TCM (Transmission control module). The ECM uses these signals for ICC control. Refer to <u>CCS-16</u>, "System Description" for ICC functions.

DTC Logic

DTC DETECTION LOGIC **NOTE**:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to <u>EC-354, "A/T MODELS : DTC Logic"</u> (A/T models) or <u>EC-355, "M/T MODELS : DTC Logic"</u> (M/T models).
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-377, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-379, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | G |
|---------|--------------------------|---|---|---|
| P1574 | ICC vehicle speed sensor | The difference between the two vehicle speed signals is out of the specified range. | Harness or connectors (The CAN communication line is open or shorted.) Unified meter and A/C amp. ABS actuator and electric unit (control unit) Wheel sensor TCM ECM | H |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).

2. Drive the vehicle at more than 40 km/h (25 MPH). CAUTION:

Always drive vehicle at a safe speed. NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. (If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3. Check DTC.

Is DTC detected?

YES >> Go to EC-465, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-154, "Diagnosis Description".

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P1574 ICC VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

 $2. {\sf CHECK} \ {\sf DTC} \ {\sf WITH} \ "{\sf ABS} \ {\sf ACTUATOR} \ {\sf AND} \ {\sf ELECTRIC} \ {\sf UNIT} \ ({\sf CONTROL} \ {\sf UNIT})"$

Refer to <u>BRC-27, "CONSULT Function"</u>.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Check combination meter function. Refer to <u>MWI-36. "CONSULT Function (METER/M&A)"</u>.

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P1606 VVEL CONTROL MODULE

Description

The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|------------------------|---|---------------------|---|
| P1606 | VVEL control module | VVEL control module calculation function is malfunctioning. VVEL EEP-ROM system is malfunc- tioning. | VVEL control module | G |
| | | | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

| If DTC Confirmation Procedure has been previously | conducted, always perform the following procedure | | | |
|---|---|--|--|--|
| before conducting the next test. | | | | |

1. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON.

3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

Turn ignition switch ON and wait at least 1 second.
 Check DTC.

Is DTC detected?

YES >> Go to EC-467. "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-467, "DTC Logic"</u>.

Is the DTC P1606 displayed again?

- YES >> GO TO 2.
- NO >> INSPECTION END

2.REPLACE VVEL CONTROL MODULE

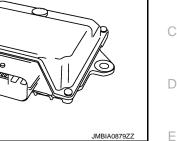
1. Replace VVEL control module. Refer to EC-38, "Component Parts Location".

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P1606 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P1607 VVEL CONTROL MODULE

Description

The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.

DTC Logic

DTC DETECTION LOGIC

| 0.002.1 | | | |
|--|---|---|------------------------------|
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
| P1607 | VVEL control module circuit | • The internal circuit of the VVEL con- trol module is malfunctioning. | VVEL control module |
| DTC CON | FIRMATION PROCEDURE | | |
| 1.PRECON | NDITIONING | | |
| before cond 1. Turn ign 2. Turn ign 3. Turn ign TESTING C | lucting the next test. nition switch OFF and wait at I nition switch ON. nition switch OFF and wait at I CONDITION: | least 10 seconds. | |
| Before per | forming the following proce | dure, confirm that battery voltag | e is more than 10 v at idle. |
| >> | GO TO 2. | | |
| 2.PERFOR | RM DTC CONFIRMATION PR | OCEDURE | |
| | ngine and let it idle for at least | 1 second. | |
| 2. Check | - | | |
| <u>Is DTC dete</u> YES >> | <u>ected ?</u> Go to <u>EC-469, "Diagnosis Pr</u> e | ocedure" | |
| | INSPECTION END | <u>.</u> | |
| Diagnosis | s Procedure | | INFOID:00000008156560 |
| 1.PERFOR | RM DTC CONFIRMATION PR | OCEDURE | |
| 1. Turn igi | nition switch ON. | | |
| 2. Erase D | - | _ | |
| | n DTC Confirmation Procedure C-469, "DTC Logic". | 9. | |
| | P1607 displayed again? | | |
| | GO TO 2. | | |
| ~ | INSPECTION END | | |
| ∠.REPLAC | E VVEL CONTROL MODULE | Ξ | |

1. Replace VVEL control module. Refer to EC-38, "Component Parts Location".

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P1607 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P1608 VVEL SENSOR POWER SUPPLY

DTC Logic

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[VQ37VHR]

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|--|---|--|--|
| P1608 | VVEL sensor power supply circuit | VVEL control module detects a voltage of power source for sensor is excessively low or high. | Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) VVEL control shaft position sensor VVEL control module |
| DTC CO | NFIRMATION PROCEDUR | E | |
| 1.PREC | ONDITIONING | | |
| before co 1. Turn 2. Turn 3. Turn TESTING | nducting the next test. ignition switch OFF and wait a ignition switch ON. ignition switch OFF and wait a cONDITION: | t least 10 seconds. | s perform the following procedure |
| ~ | >> GO TO 2. | | |
| | ORM DTC CONFIRMATION P | | |
| | ignition switch ON and wait at k DTC. | least 1 second. | |
| <u>Is DTC de</u> | | | |
| YES > | > Go to <u>EC-471, "Diagnosis F</u> >> INSPECTION END | Procedure". | |
| | sis Procedure | | INFOID:0000000815656 |
| 1. CHEC | K GROUND CONNECTION | | |
| 2. Chec Is the insp YES | ignition switch OFF. k ground connection M95, E46 <u>pection result normal?</u> >> GO TO 2. >> Repair or replace ground co | 6. Refer to Ground Inspection in <u>G</u> | -45, "Circuit Inspection". |
| | | OSITION SENSOR POWER SUPP | |
| | | | |
| 2. Turn | ignition switch ON. | ition sensor harness connector. control shaft position sensor harnes | s connector and ground. |
| | VVEL control shaft position sensor | | |

| VVEL | control shaft positior | Ground | Voltage (V) | |
|------|------------------------|----------|-------------|-------------|
| Bank | Connector | Terminal | Giouna | voltage (v) |
| 1 | F46 | 3 | | Approx. 5 |
| I | F40 | 6 | Ground | |
| 2 | F47 | 3 | Ground | |
| | Γ4/ | 6 | - | |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

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P1608 VVEL SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

3.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL control module harness connector.
- 3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

| VVEL co | VVEL control shaft position sensor | | | trol module | | |
|---------|------------------------------------|---|-----------|-------------|------------|---------|
| Bank | Connector Terminal | | Connector | Terminal | Continuity | |
| | E40 | 3 | | 9 | | |
| I | F46 | 6 | E16 | 22 | Eviated | |
| 2 | E 4 7 | 3 | E15 | EID | 7 | Existed |
| 2 | F47 | 6 | | 20 | | |

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F1, E3
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module.
- Go to <u>EC-18</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace.

8.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EC-38, "Component Parts Location".

2. Go to EC-472, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

P1608 VVEL SENSOR POWER SUPPLY

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|-----------|
| Refer to EC-22, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Reference of the second sec | |
| ment". | A |
| >> GO TO 2. | |
| 2. PERFORM IDLE AIR VOLUME LEARNING | EC |
| Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement". | |
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| >> END | |
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P1805 BRAKE SWITCH

Description

INFOID:000000008156564

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.

DTC Logic

INFOID:000000008156565

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 ex- tremely long time while the vehicle is being driv- en. | (Stop Jamp switch circuit is open or sport- |

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Fully depress the brake pedal for at least 5 seconds.
- 3. Erase the DTC.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>EC-474, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1. CHECK STOP LAMP SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check the stop lamp when depressing and releasing the brake pedal.

| Brake pedal | Stop lamp |
|--------------------|-----------------|
| Fully released | Not illuminated |
| Slightly depressed | Illuminated |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Disconnect stop lamp switch harness connector.
- 2. Check the voltage between stop lamp switch harness connector and ground.

| Stop lam | p switch | Ground | Voltage | |
|----------------------------------|----------|--------|-----------------|--|
| Connector Terminal | | Giounu | voltage | |
| E110 1 | | Ground | Battery voltage | |
| Is the inspection result normal? | | | | |

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)

P1805 BRAKE SWITCH

| : DTC/CIF | RCUIT DIA | GNOSIS > | [VQ37VHR] |
|--|---|--|---|
| Harness | for open o | r short between st | op lamp switch and battery |
| | | | |
| 4 | | | ground or short to power in harness or connectors. |
| +.CHECK | STOP LA | MP SWITCH INPL | JT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| | | amp switch harne harness connecto | |
| | | | lamp switch harness connector and ECM harness connector. |
| | | | |
| Stop lam | p switch | ECM | - Continuity |
| Connector | Terminal | Connector Terminal | |
| E110 | 2 | M107 122 | Existed |
| | | - | und and short to power. |
| | ection resu | | |
| | > GO TO 6 > GO TO 5 | | |
| - | | ICTIONING PART | |
| | | | |
| | following. ck (J/B) co | nnector E103, M2 | |
| Harness | for open o | r short between E | CM and stop lamp switch |
| | | | |
| > | > Repair op | pen circuit, short to | o ground or short to power in harness or connectors. |
| CHECK | STOP LA | MP SWITCH | |
| efer to <u>E</u> | <u>C-475, "Co</u> | mponent Inspectio | on (Stop Lamp Switch)". |
| s the insp | ection resu | <u>lt normal?</u> | |
| | > GO TO 7 | | Defer to DD 10. "Evaluated View" |
| - | • | Stop lamp switch. ITENT INCIDENT | Refer to <u>BR-18, "Exploded View"</u> . |
| | | | |
| efer to <u>G</u> | <u>I-42, "Inter</u> | <u>mittent Incident"</u> . | |
| | > INSPEC ⁻ | | |
| | | | |
| omnon | ent insp | action (Ston I | amp Switch) INFOID:00000008156567 |
| Sinpon | | | |
| • | STOP LA | · · | |
| CHECK | | MP SWITCH-I | |
| CHECK | gnition swit | MP SWITCH-I ch OFF. amp switch harne | |
| CHECK | gnition swit | MP SWITCH-I ch OFF. amp switch harne | ss connector. lamp switch terminals under the following conditions. |
| CHECK Turn ig Discor Check | gnition swit nnect stop the contin | MP SWITCH-I ch OFF. lamp switch harne uity between stop | lamp switch terminals under the following conditions. |
| CHECK Turn ig Discor Check | gnition swit nnect stop the contin | MP SWITCH-I ch OFF. amp switch harne uity between stop | lamp switch terminals under the following conditions. |
| CHECK Turn iç Discor Check | gnition swit nnect stop the contin | MP SWITCH-I ch OFF. lamp switch harne uity between stop Condition Fully released | lamp switch terminals under the following conditions. Continuity Not existed |
| CHECK Turn ig Discor Check Terminals | gnition swit nnect stop the contin Brake pedal | MP SWITCH-I ch OFF. amp switch harne uity between stop Condition Fully released Slightly depressed | lamp switch terminals under the following conditions. |
| CHECK Turn iq Discor Check Terminals 1 and 2 the insp | gnition swit nect stop the contin Brake pedal ection resu | MP SWITCH-I ch OFF. amp switch harne uity between stop Condition Fully released Slightly depressed It normal? | lamp switch terminals under the following conditions. Continuity Not existed |
| CHECK Turn iq Discor Check Terminals 1 and 2 the insp YES > | gnition swit nect stop the contin Brake pedal ection resu > INSPEC | MP SWITCH-I ch OFF. amp switch harne uity between stop Condition Fully released Slightly depressed It normal? FION END | lamp switch terminals under the following conditions. Continuity Not existed |
| CHECK Turn ig Discor Check Terminals 1 and 2 S the insp YES > NO > | gnition swit nect stop the contin Brake pedal ection resu > INSPEC ⁻ > GO TO 2 | MP SWITCH-I ch OFF. amp switch harne uity between stop Condition Fully released Slightly depressed It normal? FION END | lamp switch terminals under the following conditions. Continuity Not existed |

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| i anu z | Diake pedai | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18, "Exploded View"</u>.

< DTC/CIRCUIT DIAGNOSIS >

P2096, P2097, P2098, P2099 A/F SENSOR 1

Description

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|--|--|---|
| P2096 | POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too lean bank 1) | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period. | A/F sensor 1 (bank 1) A/F sensor 1 heater Heated oxygen sensor 2 (bank 1) |
| P2097 | POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too rich bank 1) | The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period. | Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks |
| P2098 | POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too lean bank 2) | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period. | A/F sensor 1 (bank 2) A/F sensor 1 heater Heated oxygen sensor 2 (bank 2) |
| P2099 | POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too rich bank 2) | The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period. | Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks |

DTC CONFIRMATION PROCEDURE

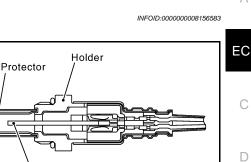
1.PRECONDITIONING

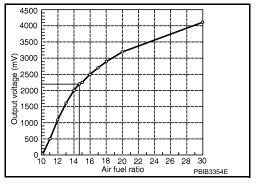
If DTC Confirmation Procedure has been previously conducted, always perform the following procedure P before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.





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< DTC/CIRCUIT DIAGNOSIS >

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
- 6. Let engine idle for 1 minute.
- 7. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
- 8. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-478, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008156585

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2

1. Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to <u>EM-34</u>, "<u>Removal and</u> <u>Installation</u>".

>> GO TO 3.

$\mathbf{3.}$ CHECK FOR EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas leak detected?

- YES >> Repair or replace.
- NO >> GO TO 4.
- **4.**CHECK FOR INTAKE AIR LEAK
- 1. Start engine and run it at idle.
- 2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 5.

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "MIXTURE RATIO SELF-LEARNING VALUE <u>CLEAR : Special Repair Requirement"</u>.
- 2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-259</u>, "Diagnosis <u>Procedure"</u> or <u>EC-263</u>, "Diagnosis Procedure".

NO >> GO TO 6.

6.CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.

- 2. Disconnect A/F sensor 1 harness connector.
- 3. Check harness connector for water.

Revision: 2012 July

P2098

P2099

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F20

| Wa | ater sho | ould not e | kit. | | | | A |
|---|---------------------|---------------------------|------------|------------|------------|------------------------------------|------|
| YES > NO > | > GO T > Repa | air or replac | e harness | | | | EC |
| | | ENSOR 1 I | | SUPPLY C | IRCUIT | | |
| | | switch ON. Itage betwo | | ensor 1 ha | rness con | nector and ground. | С |
| DTO | | A/F senso | r 1 | | N/ - H | | D |
| DTC | Bank | Connector | Terminal | Ground | Voltag | 3 | |
| P2096 P2097 | 1 | F3 | 4 | Ground | Battery vo | tage | Е |
| P2098 P2099 | 2 | F20 | 4 | Cround | Duttory ve | | |
| | | result norm | <u>al?</u> | | | | F |
| | > GO T > GO T | | | | | | |
| • | | U 8. FUNCTION | NING PAR | T | | | G |
| Check the • Harness | | ng. ctors E3, F | 1 | | | | |
| | | | tor E7 | | | | Н |
| 15 A fus Harness | e (NO. 4 for ope | 46) en or short | between A | A/F sensor | 1 and fus | | |
| | | | | | | | |
| > | > Repa | air or replac | e harness | s or conne | ctors. | | |
| 9. CHECI | K A/F S | ENSOR 1 I | NPUT SI | GNAL CIR | CUIT FOF | OPEN AND SHORT | J |
| | | switch OFF | | | | | |
| | | CM harnes | | | | prostor and COM barroos connector | |
| 3. Checi | c the co | | ween A/F | Sensor | namess o | nnector and ECM harness connector. | K |
| | | A/F sensor | 1 | EC | CM | | |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | L |
| P2096 | 4 | F2 | 1 | | 57 | | |
| P2097 | 1 | F3 | 2 | F102 | 61 | Existed | п.л. |
| Deece | | | 1 | FIUZ | 65 | LVISICO | M |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector Ν and ground.

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| DTC | | A/F sensor | 1 | Ground | Continuity |
|-------|---------------------|------------|----------|--------|-------------|
| DIC | Bank Connector Terr | | Terminal | Giouna | Continuity |
| P2096 | 1 | 1 F3 1 | | | |
| P2097 | | 15 | 2 | Ground | Not existed |
| P2098 | 2 | F20 | 1 | Ground | NUL EXISIEU |
| P2099 | 2 | F20 | 2 | | |

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< DTC/CIRCUIT DIAGNOSIS >

| DTC | | ECM | | Ground | Continuity | | |
|----------------|------|-----------|----------|--------|-------------|--|--|
| | Bank | Connector | Terminal | Giouna | | | |
| P2096 P2097 | 1 | | 57 | Ground | | | |
| | | F102 | 61 | | Not existed | | |
| P2098 P2099 | 2 | 1102 | 65 | Giouna | NUL EXISIEU | | |
| | 2 | | 66 | | | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK A/F SENSOR 1 HEATER

Refer to EC-174, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 13.

11.CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to EC-249, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 12.
- NO >> Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View".

12. CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace.

13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

Do you have CONSULT?

YES >> GO TO 14.

NO >> GO TO 15.

14.CONFIRM A/F ADJUSTMENT DATA

With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
- 3. Make sure that "0.000" is displayed on CONSULT screen.

Is "0.000" displayed?

YES >> INSPECTION END

NO >> GO TO 15.

15. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR</u> : <u>Special Repair Requirement</u>".

Do you have CONSULT?

| P2096, P2097, P2098, P2099 A/F SENSOR 1 | [VQ37VHR] | |
|--|-----------|----|
| < DTC/CIRCUIT DIAGNOSIS > YES >> GO TO 16. | | |
| NO >> INSPECTION END | | А |
| 16.confirm a/f adjustment data | | |
| With CONSULT 1. Turn ignition switch ON. 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT. 3. Make sure that "0.000" is displayed on CONSULT screen. | | EC |
| | | С |
| >> INSPECTION END | | _ |
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< DTC/CIRCUIT DIAGNOSIS >

P2122, P2123 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-380, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P2122 | Accelerator pedal posi- tion 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 posi- tion 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 perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds. 1.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- Check DTC. 2.

Is DTC detected?

YES >> Go to EC-482, "Diagnosis Procedure". >> INSPECTION END NO

Diagnosis Procedure

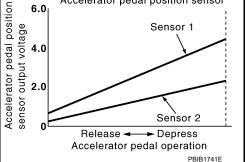
1.CHECK GROUND CONNECTION

Turn ignition switch OFF. 1.

Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection". 2.

Is the inspection result normal?

EC-482



6.0

Accelerator pedal position sensor

INFOID:00000008156568

INFOID:000000008156569

P2122, P2123 APP SENSOR

| < DTC/CIRCUIT DIAGNO | | | [VQ37VHR] |
|---|------------------|---|-----------|
| YES >> GO TO 2. | | | |
| NO >> Repair or repla | • | | |
| 2.CHECK APP SENSOR | | | |
| Disconnect accelerato Turn ignition switch OI | | n (APP) sensor harness connector. | E |
| | | sor harness connector and ground. | |
| | | - | |
| APP sensor | ound Voltage | (\) | |
| Connector Terminal | voltage | | |
| E112 5 Gro | ound Approx | . 5 | |
| Is the inspection result nor | mal? | | |
| YES >> GO TO 4. | | | |
| NO >> GO TO 3. | | | |
| 3.DETECT MALFUNCTION | JNING PART | | |
| Check the following. | E106 | | |
| Harness connectors M6, Harness for open or shore | | M and accelerator pedal position sensor | |
| | | | |
| >> Repair open c | ircuit, short to | ground or short to power in harness or connectors | S. |
| 4.CHECK APP SENSOR | 1 GROUND C | RCUIT FOR OPEN AND SHORT | |
| 1. Turn ignition switch OI | | | |
| Disconnect ECM harn | | | |
| 3. Check the continuity b | etween APP s | ensor harness connector and ECM harness conn | ector. |
| | | | |
| APP sensor | ECM | Continuity | |
| Connector Terminal Conne | | | |
| E112 4 M10 | - | Existed | |
| 4. Also check harness fo | | nd and short to power. | |
| Is the inspection result nor | mal? | | |
| YES >> GO TO 6. NO >> GO TO 5. | | | |
| 5.DETECT MALFUNCTION | | | |
| | | | |
| Check the following.Harness connectors M6, | F106 | | |
| | | M and accelerator pedal position sensor | |
| | | | |
| >> Repair open c | ircuit, short to | ground or short to power in harness or connectors | S. |
| 6.CHECK APP SENSOR | 1 INPUT SIG | NAL CIRCUIT FOR OPEN AND SHORT | |
| 1. Check the continuity b | etween APP s | ensor harness connector and ECM harness conn | ector. |
| | | | |
| APP sensor | ECM | Continuity | |
| Connector Terminal Conne | ector Terminal | | |
| E112 3 M10 | 07 97 | Existed | |
| 2. Also check harness fo | r short to grou | nd and short to power. | |
| Is the inspection result nor | <u>mal?</u> | | |
| YES >> GO TO 8. | | | |
| NO >> GO TO 7. | | | |
| 1 .DETECT MALFUNCTION | ONING PART | | |

P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK APP SENSOR

Refer to EC-484, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3. "Exploded View".
- 2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

10. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

3. Turn ignition switch ON.

4. Check the voltage ECM harness connector terminals as per the following.

| | ECM | | | | |
|-----------|-----------------------|----------|-------------------|-----------------|-------------|
| Connector | + | - | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| | 97 (APP sensor 1) | 100 | 100 | Fully released | 0.45 - 1.0 |
| M107 | | | Accelerator pedal | Fully depressed | 4.4 - 4.8 |
| MIO7 | 08 (APP concor 2) | · | | Fully released | 0.22 - 0.50 |
| | 98 (APP sensor 2) 104 | | | Fully depressed | 2.1 - 2.5 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Exploded View".

2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156572

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-19, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

EC-484

P2122, P2123 APP SENSOR

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| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--|---------------|
| PERFORM THROTTLE VALVE CLOSED POSITION LEARNING | |
| efer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair I | Requirement". |
| >> GO TO 3. | |
| B. PERFORM IDLE AIR VOLUME LEARNING | |
| Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement". | |
| >> END | |
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< DTC/CIRCUIT DIAGNOSIS >

P2127, P2128 APP SENSOR

Description

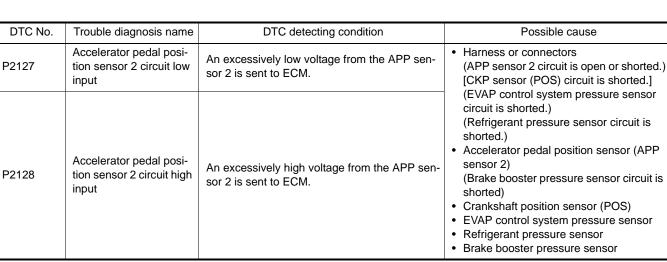
The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.

DTC Logic

DTC DETECTION LOGIC



DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON.

3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

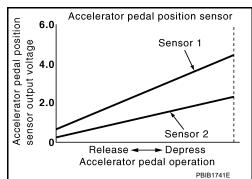
Is DTC detected?

- YES >> Go to EC-487, "Diagnosis Procedure".
- NO >> INSPECTION END

n 10 V at idle.

[VQ37VHR]

INFOID:000000008156573



P2127, P2128 APP SENSOR

| | | | P21 | 27, P2128 | APP SEN | ISOR | | |
|-----------------------------|---|--------------|---------------|----------------|--------------------|-----------------------|-----------------------|----|
| < DTC/CII | RCUIT DI | AGNOSIS | > | | | | [VQ37VHR] | |
| Diagnos | is Proce | edure | | | | | INFOID:00000008156575 | Λ |
| 1. CHECK | (GROUNI | | CTION | | | | | A |
| | gnition swi | | | | | | | EC |
| 2. Check Is the insp | | | | er to Ground I | nspection in | GI-45, "Circuit Inspe | <u>ection"</u> . | LU |
| • | > GO TO 2 | | <u>.</u> | | | | | |
| NO > | > Repair o | or replace g | - | | | | | С |
| 2.CHECK | (APP SEN | NSOR 2 P | OWER SL | JPPLY CIRCU | IIT-I | | | |
| | | | dal positio | n (APP) sens | or harness c | onnector. | | D |
| | gnition swi | | n APP ser | nsor harness o | connector an | d ground. | | |
| | | , | | | | U | | Е |
| APP | sensor | Ground | Voltage | (V) | | | | |
| Connector | | | | | | | | _ |
| E112 | 6 | Ground | Approx | c. 5 | | | | F |
| <u>Is the insp</u> YES > | SOCION SECTION SECT | | 2 | | | | | |
| | > GO TO : | | | | | | | G |
| 3.CHECH | K APP SEN | NSOR 2 P | OWER SL | JPPLY CIRCU | IIT-II | | | |
| | gnition swi | | | | | | | Н |
| | nnect ECN | | | | s connector | and ECM harness o | connector | |
| | | iany bothe | | | | | | 1 |
| APP : | sensor | EC | CM | Continuity | | | | |
| Connector | Terminal | Connector | Terminal | Continuity | | | | |
| E112 | 6 | M107 | 103 | Existed | | | | J |
| Is the insp | | | 2 | | | | | |
| | > GO TO | | | | | | | Κ |
| 4.DETEC | | | IG PART | | | | | |
| Check the | following. | | | | | | | L |
| Harness | connector | | | | unto u un o de lun | | | |
| Harness | for open c | or short de | tween EC | IN and accele | rator pedal p | osition sensor | | ЪЛ |
| > | > Repair o | pen circuit | t. | | | | | Μ |
| 5. CHECK | - | - | | CIRCUIT | | | | |
| | | | | | between the | e following terminals | | Ν |
| | | • | | | | | | |
| E | СМ | | | Sensor | | | | 0 |
| Connector | Terminal | | Name | | Connector | Terminal | | |
| F101 | 45 | | ster pressure | e sensor | E48 | 1 | | |
| | 46 | CKP sense | or (POS) | | F2 | 1 | | Ρ |

| E | CM | Sensor | | |
|-----------|----------|-------------------------------------|-----------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 |
| | 46 | CKP sensor (POS) | F2 | 1 |
| | 103 | APP sensor | E112 | 6 |
| M107 | 107 | EVAP control system pressure sensor | B30 | 3 |
| | | Refrigerant pressure sensor | E77 | 3 |

Is the inspection result normal?

YES >> GO TO 6.

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-296, "Component Inspection".)
- Brake booster pressure sensor (Refer to <u>EC-373, "Component Inspection"</u>.)
- EVAP control system pressure sensor (Refer to EC-330, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-531, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace malfunctioning component.

7.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E112 | 2 | M107 | 104 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8.

NO >> 00 10 0

8. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E112 | 1 | M107 | 98 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

10. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

11.CHECK APP SENSOR

Refer to EC-489, "Component Inspection".

Is the inspection result normal?

```
YES >> GO TO 13.
NO >> GO TO 12.
```

P2127, P2128 APP SENSOR

| < DTC/CIF | RCUIT DIAGNOS | | 21, F2120 A | | 1 | [VQ37VHR] |
|---|--|---------------|---------------------|--------------------|-------------------------|------------------------|
| 12.REPL | LACE ACCELER | ATOR PEDA | L ASSEMBLY | | | |
| 1. Replace accelerator pedal assembly. Refer to <u>ACC-3, "Exploded View"</u> . | | | | | | |
| 2. Go to | EC-489, "Special | Repair Requ | <u>uirement"</u> . | | | |
| > | > INSPECTION E | END | | | | |
| 13.сне | CK INTERMITTE | NT INCIDEN | Т | | | |
| Refer to <u>G</u> | I-45, "Circuit Insp | ection". | | | | |
| > | > INSPECTION E | -ND | | | | |
| - | ent Inspection | | | | | INFOID:000000008156576 |
| | (ACCELERATOR | | | D | | |
| | gnition switch OF | | STION SENSO | ĸ | | |
| 2. Recor | nect all harness | connectors d | lisconnected. | | | |
| | gnition switch ON < the voltage ECN | | nnector terminals | s as per the follo | wing. | |
| | 0 | | | • | <u> </u> | |
| | ECM | | Con | dition | | |
| Connector | + Terminal | – Terminal | Con | dition | Voltage (V) | |
| | | | | Fully released | 0.45 - 1.0 | |
| M107 | 97 (APP sensor 1) | 100 | Accelerator pedal | Fully depressed | 4.4 - 4.8 | |
| WHO? | 98 (APP sensor 2) | 104 | | Fully released | 0.22 - 0.50 | |
| ls the inse | ection result norn | nal? | | Fully depressed | 2.1 - 2.5 | |
| YES > | > INSPECTION E | | | | | |
| ~ | > GO TO 2. | | | | | |
| | CE ACCELERAT | | | 3 "Exploded \/ic | NA/ ^{II} | |
| | EC-484, "Special | | | | <u>.</u> . | |
| | > INSPECTION E | | | | | |
| | Repair Requir | | | | | |
| | | | | | | INFOID:000000008156577 |
| | ORM ACCELERA | | | | | |
| Refer to <u>E</u> | <u>C-19. "ACCELER</u> | ATOR PEDA | <u>L RELEASED P</u> | OSITION LEAR | NING : Special F | Repair Requirement". |
| > | > GO TO 2. | | | | | |
| 2.perfc | ORM THROTTLE | VALVE CLO | SED POSITION | LEARNING | | |
| Refer to <u>E</u> | <u>C-19, "THROTTL</u> | E VALVE CL | OSED POSITIO | N LEARNING : | <u>Special Repair R</u> | lequirement". |
| | > GO TO 3. | | | | | |
| • |) DRM IDLE AIR VC | OLUME LEAF | RNING | | | |
| | C-20. "IDLE AIR ' | | | al Repair Requi | 'ement" | |

Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-380, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P2138 | Accelerator pedal posi- tion sensor circuit range/ performance | Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2. | Harness or connectors (APP sensor 2 circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 2) (Brake booster pressure sensor circuit is shorted) Crankshaft position sensor (POS) EVAP control system pressure sensor Brake booster pressure sensor Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

Turn ignition switch OFF and wait at least 10 seconds. 1.

2. Turn ignition switch ON.

Turn ignition switch OFF and wait at least 10 seconds. 3.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

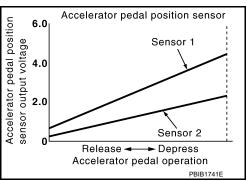
2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.

2. Check DTC.

Is DTC detected?

- YES >> Go to EC-491, "Diagnosis Procedure".
- >> INSPECTION END NO



[VQ37VHR]

| < DTC/CIRCUIT DIAGNO | | | |
|--|---|--|-----------------------|
| | SIS > | | [VQ37VHR] |
| Diagnosis Procedure | | | INF01D:00000008156580 |
| 1.CHECK GROUND CON | NECTION | | |
| Turn ignition switch OF Check around connect | | r to Ground Inspection in <u>GI-45, "Cir</u> | cuit Inspection" |
| s the inspection result norr | | | |
| YES >> GO TO 2. NO >> Repair or repla | | nation | |
| NO >> Repair or repla 2.CHECK APP SENSOR | - | | |
| | | n (APP) sensor harness connector. | |
| Turn ignition switch ON | l. | sor harness connector and ground. | |
| 5. Check the voltage betw | leen AFF Sei | sol namess connector and ground. | |
| APP sensor Grou | und Voltage | (\/) | |
| Connector Terminal | | | |
| E112 5 Grou | | . 5 | |
| <u>s the inspection result norr</u> YES >> GO TO 4. | <u>ııdı (</u> | | |
| NO >> GO TO 3. | | | |
| JETECT MALFUNCTIO | NING PART | | |
| heck the following. | | | |
| >> Repair open ci | cuit, short to | ground or short to power in harness | or connectors. |
| LCHECK APP SENSOR | 2 POWER SL | - | or connectors. |
| LCHECK APP SENSOR | 2 POWER SL I. | - | or connectors. |
| LCHECK APP SENSOR Turn ignition switch ON Check the voltage betw | 2 POWER SL I. | PPLY CIRCUIT-I | or connectors. |
| LCHECK APP SENSOR Turn ignition switch ON Check the voltage betw APP sensor | 2 POWER SL I. veen APP ser | PPLY CIRCUIT-I | or connectors. |
| LCHECK APP SENSOR Turn ignition switch ON Check the voltage betw APP sensor | 2 POWER SL I. veen APP ser und Voltage | PPLY CIRCUIT-I sor harness connector and ground. | or connectors. |
| APP sensor Connector Terminal E112 6 Grou | 2 POWER SU I. veen APP ser und Voltage und Approv | PPLY CIRCUIT-I sor harness connector and ground. | or connectors. |
| CHECK APP SENSOR Turn ignition switch ON Check the voltage betw APP sensor Connector Terminal E112 6 Grou s the inspection result norr YES >> GO TO 9. | 2 POWER SU I. veen APP ser und Voltage und Approv | PPLY CIRCUIT-I sor harness connector and ground. | or connectors. |
| Image: CHECK APP SENSOR Turn ignition switch ON Check the voltage betw APP sensor Connector Terminal E112 6 Grout Sthe inspection result norm YES >> GO TO 9. NO >> GO TO 5. | 2 POWER SL I. veen APP ser und Voltage und Approv nal? | PPLY CIRCUIT-I sor harness connector and ground. (V) .5 | or connectors. |
| APP sensor Connector Terminal E112 6 Grout Sthe inspection result norr YES >> GO TO 9. NO >> GO TO 5. CHECK APP SENSOR | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL | PPLY CIRCUIT-I sor harness connector and ground. (V) .5 | or connectors. |
| APP sensor Connector Terminal E112 6 Groups Sthe inspection result norregion YES >> GO TO 9. NO >> GO TO 5. CHECK APP SENSOR Turn ignition switch OF Disconnect ECM harne | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL F. sss connector | PPLY CIRCUIT-I | |
| APP sensor Connector Terminal E112 6 Groups Sthe inspection result norregion YES >> GO TO 9. NO >> GO TO 5. CHECK APP SENSOR Turn ignition switch OF Disconnect ECM harne | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL F. sss connector | PPLY CIRCUIT-I sor harness connector and ground. (V) .5 | |
| APP SENSOR APP SENSOR Connector Terminal E112 6 Grout Sthe inspection result norr YES >> GO TO 9. NO >> GO TO 5. Sthe CHECK APP SENSOR CHECK APP SENSOR . Turn ignition switch OF Disconnect ECM harnes Check the continuity be | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL F. ess connector etween APP s | PPLY CIRCUIT-I | |
| APP sensor Connector Terminal E112 6 Grou S the inspection result norr YES >> GO TO 9. NO >> GO TO 5. CHECK APP SENSOR Turn ignition switch OF Connect ECM harne | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL F. ess connector etween APP s ECM | PPLY CIRCUIT-I | |
| APP SENSOR APP sensor Connector Terminal E112 6 Groups Sthe inspection result norm YES > GO TO 9. NO > GO TO 5. D.CHECK APP SENSOR I. Turn ignition switch OF 2. Disconnect ECM harnes 3. Check the continuity be | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL F. 2 POWER SL 5. 2 POWER SL 5. 2 POWER SL 5. 2 POWER SL 5. 2 POWER SL 5. 2 POWER SL 5. 2 POWER SL 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. | PPLY CIRCUIT-I sor harness connector and ground. (V) 5 PPLY CIRCUIT-II ensor harness connector and ECM h | |
| 4.CHECK APP SENSOR 1. Turn ignition switch ON 2. Check the voltage betw APP sensor Connector Terminal E112 6 Grout s the inspection result norm YES > GO TO 9. NO >> GO TO 9. Sono Sono Sono Sono Sono Sono Sono Sono | 2 POWER SU I. veen APP ser und Voltage und Approx nal? 2 POWER SU F. ess connector etween APP s ECM Ctor Terminal 7 103 | PPLY CIRCUIT-I sor harness connector and ground. (V) .5 PPLY CIRCUIT-II ensor harness connector and ECM F Continuity | |
| 4. CHECK APP SENSOR 31. Turn ignition switch ON2. Check the voltage betwAPP sensorGroutConnectorTerminalE1126GroutIs the inspection result norrYES>> GO TO 9.NO>> GO TO 5.5. CHECK APP SENSOR 31. Turn ignition switch OF2. Disconnect ECM harned3. Check the continuity beAPP sensorConnectorTerminalConnectorTerminalConnectorTerminalE1126M10Is the inspection result norrYES>> GO TO 7. | 2 POWER SU I. veen APP ser und Voltage und Approx nal? 2 POWER SU F. ess connector etween APP s ECM Ctor Terminal 7 103 | PPLY CIRCUIT-I sor harness connector and ground. (V) .5 PPLY CIRCUIT-II ensor harness connector and ECM F Continuity | |
| 4.CHECK APP SENSOR 1. Turn ignition switch ON 2. Check the voltage betw APP sensor Connector Terminal E112 6 Grout s the inspection result norr YES > GO TO 9. NO >> GO TO 5. 5. D.CHECK APP SENSOR 1. Turn ignition switch OF 2. Disconnect ECM harned 3. Check the continuity be APP sensor Connector Terminal Connector Terminal Conne APP sensor Conne Conne E112 6 M10 s the inspection result norr Sthe inspection result norr | 2 POWER SL I. veen APP ser und Voltage und Approx nal? 2 POWER SL 5. 2 POWER SL 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. | PPLY CIRCUIT-I sor harness connector and ground. (V) .5 PPLY CIRCUIT-II ensor harness connector and ECM F Continuity | |

Check the following.

• Harness connectors M6, E106

< DTC/CIRCUIT DIAGNOSIS >

· Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit.

7.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | | |
|-----------|----------|-------------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 | |
| FIUI | 46 | CKP sensor (POS) | F2 | 1 | |
| | 103 | APP sensor | E112 | 6 | |
| M107 | 107 | EVAP control system pressure sensor | B30 | 3 | |
| | 107 | Refrigerant pressure sensor | E77 | 3 | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair short to ground or short to power in harness or connectors.

8. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-296. "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-373, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-330, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-531, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace malfunctioning component.

9.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP s | APP sensor | | ECM | | |
|-----------|------------|--------------------|-----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| F112 | 4 | M107 | 100 | Existed | |
| EIIZ | 2 | | 104 | Existed | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

10. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

• Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

EC-492

< DTC/CIRCUIT DIAGNOSIS >

| | sensor | EC | CM | Continuity | | | |
|--|--|---|--|--|---|------------------------------------|------------------------|
| Connector | Terminal | Connector | Terminal | Continuity | | | |
| E112 | 3 1 | M107 | 97 98 | Existed | | | |
| 2. Also d | check harne | ss for sho | ort to grou | nd and short to | power. | | |
| | ection resul | | <u>?</u> | | | | |
| - | > GO TO 1: > GO TO 1: | - | | | | | |
| | | | | Ŧ | | | |
| | ECT MALFU | JNCTION | NING PAR | | | | |
| | following. | M6 E10 |)6 | | | | |
| | | | | M and accelerat | tor pedal positior | sensor | |
| | | | | | | | |
| | | | t, short to | ground or short | to power in harn | ess or connecto | ors. |
| 13.CHE | CK APP SE | NSOR | | | | | |
| | C-493, "Coi | | | <u>ı"</u> . | | | |
| | ection resul | | <u>?</u> | | | | |
| | > GO TO 1 > GO TO 1 | | | | | | |
| | | | | _ ASSEMBLY | | | |
| 14.RFP | | | | | | | |
| | | | | | 3 "Exploded Vie | \ \ /" | |
| I. Repla | | tor pedal | assembly | | 3, "Exploded Vie | <u>w"</u> . | |
| 1. Repla 2. Go to | ce accelera <u>EC-494, "S</u> | tor pedal pecial Re | assembly pair Requ | | 3. "Exploded Vie | <u>w"</u> . | |
| 1. Repla 2. Go to | ice accelera <u>EC-494, "S</u> >> INSPECT | itor pedal pecial Re TION ENE | assembly epair Requ | <u>iirement"</u> . | 3. "Exploded Vie | <u>w"</u> . | |
| I. Repla 2. Go to | ce accelera <u>EC-494, "S</u> | itor pedal pecial Re TION ENE | assembly epair Requ | <u>iirement"</u> . | 3. "Exploded Vie | <u>w"</u> . | |
| 1. Repla 2. Go to > 1 5. СНЕ | ice accelera <u>EC-494, "S</u> >> INSPECT | itor pedal pecial Re ION ENE /ITTENT | assembly pair Requ D INCIDEN | <u>iirement"</u> . | 3. "Exploded Vie | <u>w"</u> . | |
| 1. Repla 2. Go to 3 1 5. CHE Refer to <u>G</u> | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Interr | tor pedal pecial Re ION ENE /ITTENT mittent Inc | assembly pair Requ D INCIDEN cident". | <u>iirement"</u> . | 3. "Exploded Vie | <u>w"</u> . | |
| I. Repla 2. Go to 15. CHE Refer to <u>G</u> | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Interr | tor pedal pecial Re ION ENE /ITTENT mittent Inc | assembly pair Requ D INCIDEN cident". | <u>iirement"</u> . | 3. "Exploded Vie | <u>w"</u> . | |
| I. Repla 2. Go to 15. CHE Refer to <u>G</u> | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Interr | tor pedal pecial Re ION ENE /ITTENT mittent Inc | assembly pair Requ D INCIDEN cident". | <u>iirement"</u> . | 3. "Exploded Vie | <u>w"</u> . | INFOID:000000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to <u>G</u> Compor | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Interr > INSPECT hent Inspe | tor pedal pecial Re ION ENE /ITTENT nittent Ind FION ENE ection | assembly pair Requ NCIDEN cident". | <u>ılirement"</u> . T | | <u>w"</u> . | INFOID:00000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to <u>G</u> 2 Compor 1.CHECI | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Interr > INSPECT hent Inspect < ACCELEF | tor pedal pecial Re ION ENE /ITTENT nittent Ind FION ENE ection | assembly pair Requ NCIDEN cident". | <u>iirement"</u> . | | <u>w"</u> . | INFOID:000000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to <u>C</u> 2 Compor 1.CHECI 1. Turn i 2. Reco | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Intern > INSPECT nent Inspect ACCELER gnition switch | tor pedal pecial Re TION ENE AITTENT mittent Ind TION ENE ection RATOR PI ch OFF. rness con | assembly pair Requ INCIDEN cident". | <u>ılirement"</u> . T | | <u>w"</u> . | INFOID:000000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to 2 Compor 1.CHECI 1. Turn i 2. Recoil 3. Turn i | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Intern > INSPECT nent Inspect ACCELER gnition switco nect all har gnition switco | TION ENE AITTENT MITTENT TION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION CON. | assembly pair Requin INCIDEN Dident". D EDAL PO | <u>iirement"</u> . T SITION SENSO isconnected. | R | | INFOID:00000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to 2 Compor 1.CHECI 1. Turn i 2. Recoil 3. Turn i | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Intern > INSPECT nent Inspect ACCELER gnition switco nect all har gnition switco | TION ENE AITTENT MITTENT TION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION ENE CION CON. | assembly pair Requin INCIDEN Dident". D EDAL PO | <u>iirement"</u> . T SITION SENSO isconnected. | | | INFOID:00000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to 2 Compor 1.CHECI 1. Turn i 2. Recoil 3. Turn i | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Intern > INSPECT nent Inspect ACCELER gnition switco nect all har gnition switco | tor pedal pecial Re TION ENE AITTENT mittent Ind TION ENE ection RATOR P ch OFF. rness con ch ON. e ECM ha | assembly pair Requin INCIDEN Dident". D EDAL PO | <u>iirement"</u> . T SITION SENSO isconnected. | R | | INFOID:00000008156581 |
| I. Repla 2. Go to 3 15.CHE Refer to <u>6</u> 3 Compor 1.CHECI 1. Turn i 2. Record 3. Turn i 4. Checl | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM GI-42, "Intern > INSPECT nent Inspect ACCELER gnition switc nect all har gnition switc (the voltage | tor pedal pecial Re TION ENE AITTENT mittent Ind TION ENE ection RATOR P ch OFF. rness con ch ON. e ECM ha | assembly pair Requin INCIDEN Dident". D EDAL PO | <u>uirement"</u> . T SITION SENSO isconnected. nnector terminals | R | | INFOID:000000008156581 |
| 1. Repla 2. Go to 15.CHE Refer to 2 Compor 1.CHECI 1. Turn i 2. Recoil 3. Turn i | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM GI-42, "Intern > INSPECT Nent Inspect ACCELER gnition switc ACCELER gnition switc (the voltage ECM | TION ENE AITTENT MITTENT Dittent Ind TION ENE ECTION Ch OFF. Thess con ch ON. E ECM ha | assembly pair Requin INCIDEN Dident". D EDAL PO | <u>uirement"</u> . T SITION SENSO isconnected. nnector terminals | R s as per the follo | wing. | INFOID:000000008156581 |
| I. Repla 2. Go to 3 15.CHE Refer to <u>6</u> 3 Compor 1.CHECI 1. Turn i 2. Record 3. Turn i 4. Checl | CE accelera <u>EC-494, "S</u> > INSPECT CK INTERM -> INSPECT -> INSPECT -> INSPECT -> INSPECT -> INSPECT | TION ENE FION ENE AITTENT mittent Ind FION ENE ection RATOR PI ch OFF. rness con ch ON. e ECM ha | assembly pair Requinations INCIDEN Dinectors di arness cor | <u>uirement"</u> . T SITION SENSO isconnected. nnector terminals | R s as per the follo | wing. | INFOID:000000008156581 |
| I. Repla 2. Go to 3 15.CHE Refer to G 3 Compor 1.CHECH 1. Turn i 2. Recon 3. Turn i 4. Chech Connector | ce accelera <u>EC-494, "S</u> > INSPECT CK INTERM 61-42, "Intern > INSPECT nent Inspect ACCELER gnition switc (ACCELER gnition switc (the voltage ECM + | TION ENE FION ENE AITTENT mittent Ind FION ENE ection RATOR PI ch OFF. rness con ch ON. e ECM ha | assembly pair Requinations INCIDEN cident". | IIIION SENSO | R s as per the follo dition | wing. Voltage (V) | INFOID:000000008156581 |
| 1. Repla 2. Go to 3 15.CHE Refer to <u>6</u> 3 Compor 1.CHECI 1. Turn i 2. Recor 3. Turn i 4. Checl | CE accelera <u>EC-494, "S</u> > INSPECT CK INTERM -> INSPECT -> INSPECT -> INSPECT -> INSPECT -> INSPECT | TION ENE FION ENE AITTENT mittent Inc TION ENE ection RATOR Pl ch OFF. rness con ch OF. rness con ch ON. e ECM ha M al nsor 1) | assembly pair Requinations INCIDEN Dinectors di arness cor | <u>uirement"</u> . T SITION SENSO isconnected. nnector terminals | R s as per the follo dition Fully released | wing. Voltage (V) 0.45 - 1.0 | INFOID:000000008156581 |

NO >> GO TO 2.

< DTC/CIRCUIT DIAGNOSIS >

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to <u>ACC-3, "Exploded View"</u>.

2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000008156582

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-19. "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-20, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

< DTC/CIRCUIT DIAGNOSIS > ASCD BRAKE SWITCH

Description

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to EC-74, "System Description" for the ASCD function.

Component Function Check

1.CHECK ASCD BRAKE SWITCH FUNCTION

With CONSULT

- Turn ignition switch ON. 1.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT. 2.
- 3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|---|--------------------|-----|
| BRAKE SW1 | Brake pedal (A/T) Brake pedal or clutch pedal (M/T) | Slightly depressed | OFF |
| DIVARE SWI | Brake pedal (A/T) Brake pedal and clutch pedal (M/T) | Fully released | ON |

Without CONSULT

- Turn ignition switch ON. 1.
- 2. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | | |
|-----------|----------------------------|----------|---|--------------------|-----------------|--|
| Connector | + | - | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| M107 | 126 | 128 | Brake pedal (A/T) Brake pedal or clutch pedal (M/T) | Slightly depressed | Approx. 0 | |
| WITO7 | (ASCD brake switch signal) | 120 | Brake pedal (A/T) Brake pedal and clutch pedal (M/T) | Fully released | Battery voltage | |

YES >> INSPECTION END

NO >> Go to EC-495, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Check which type of transmission the vehicle is equipped with.

Which type of transmission?

2.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect ASCD brake switch harness connector.

3. Turn ignition switch ON.

Check the voltage between ASCD brake switch harness connector and ground. 4.

| ASCD bra | ike switch | Ground | Voltage | |
|-----------|------------------|--------|-----------------|--|
| Connector | nnector Terminal | | voitage | |
| E109 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

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< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)

• Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

4.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| ASCD bra | ke switch | EC | M | Continuity |
|-----------|-----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E109 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK ASCD BRAKE SWITCH

Refer to EC-498, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace ASCD brake switch. Refer to <u>BR-18, "Exploded View"</u>.

CHECK ASCD CLUTCH SWITCH CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect ASCD brake switch harness connector.

- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD brake switch | | Ground | Condition | | Voltage (V) | |
|-------------------|----------|--------|--------------|--------------------|-----------------|--|
| Connector | Terminal | Giouna | Condition | | voltage (v) | |
| E109 1 | | Ground | Clutch pedal | Slightly depressed | Approx. 0 | |
| L103 | I | Ciouna | Clutch pedal | Fully released | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 8.

8.CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect ASCD clutch switch harness connector.

3. Turn ignition switch ON.

< DTC/CIRCUIT DIAGNOSIS >

| < DTC/CIRCUIT DI | AGNOSIS | S > | [VQ3/VHR] |
|---|---------------------------------|---------------------------|---|
| Check the voltage | ge betwee | en ASCD clu | tch switch harness connector and ground. |
| ASCD clutch switch | | | _ |
| Connector Terminal | Ground | Voltage | |
| E108 1 | Ground | Battery voltag | je |
| the inspection res | ult normal | ? | |
| YES >> GO TO | | | |
| | | | |
| DETECT MALFU | NCTIONI | NG PART | |
| heck the following. Fuse block (J/B) co | onnector F | =103 | |
| 10A fuse (No. 3) | | | |
| Harness for open of | or short be | etween ASC | D clutch switch and fuse |
| >> Popair (| | it or chort to | ground in harness or connectors. |
| | • | | PUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| | | | OT SIGNAL CIRCUITTOR OF EN AND SHORT |
| . Turn ignition swi | | veen ASCD | clutch switch harness connector and ASCD brake switch harness |
| connector. | | | |
| | | aka au itab | |
| ASCD clutch switch | Connector | rake switch r Terminal | Continuity |
| E108 2 | E109 | | Existed |
| | | | d and short to power. |
| s the inspection res | | • | |
| YES >> GO TO | | | |
| ' | • | | round or short to power in harness or connectors. |
| 1.CHECK ASCD | CLUTCH | SWITCH | |
| Refer to <u>EC-498, "C</u> | omponent | Inspection | (ASCD Clutch Switch)". |
| s the inspection res | | <u> ?</u> | |
| YES >> GO TO NO >> Replace | | utch switch | Refer to <u>CL-9, "Exploded View"</u> . |
| | | | PUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| | | | |
| Turn ignition swi Disconnect ECN | | connector. | |
| | nuity betw | een ASCD | brake switch harness connector and ECM harness connector. |
| | _ | | |
| ASCD brake switch | | CM | Continuity |
| Connector Terminal | Connector | | |
| E109 2 | M107 | 126 | Existed |
| | ' | + +: | d and short to power. |
| | | - | |
| s the inspection res | ult normal | - | |
| | <u>ult normal</u> 14. | - | |
| ls the inspection res YES >> GO TO | <u>ult normal</u> 14. 13. | <u> ?</u> | |

• Harness connectors E106, M6

• Harness for open or short between ECM and ASCD brake switch

< DTC/CIRCUIT DIAGNOSIS >

>> Repair open circuit, short to ground or short to power in harness or connectors.

14.CHECK ASCD BRAKE SWITCH

Refer to EC-498, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace ASCD brake switch. Refer to <u>BR-18, "Exploded View"</u>.

15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.

2. Disconnect ASCD brake switch harness connector.

3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | втаке редаг | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to <u>BR-7, "Inspection and Adjustment"</u>.

2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brako podal | Fully released | Existed |
| | Brake pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to <u>BR-18. "Exploded View"</u>.

Component Inspection (ASCD Clutch Switch)

INFOID:000000008156590

1.CHECK ASCD CLUTCH SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch harness connector.
- 3. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|---------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | Ciutori pedar | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to CL-6, "Inspection and Adjustment".

< DTC/CIRCUIT DIAGNOSIS >

2. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | Clutch pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD clutch switch. Refer to <u>CL-9</u>, "Exploded View".

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ASCD INDICATOR

< DTC/CIRCUIT DIAGNOSIS >

ASCD INDICATOR

Description

ASCD operation status is indicated by two indicators (CRUISE and SET) and CRUISE lamp on combination meter.

CRUISE indicator is displayed to indicate that ASCD system is ready for operation when MAIN switch on ASCD steering switch is turned ON.

SET indicator is displayed when the following conditions are met.

- CRUISE indicator is displayed.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET indicator is displayed during ASCD control.

Refer to EC-74, "System Description" for the ASCD function.

Component Function Check

INFOID:000000008156592

INFOID:00000008156593

1.CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

| ASCD INDICATOR | CON | SPECIFICATION | |
|-----------------------------------|--|--|------------|
| CRUISE LAMP • Ignition switch: ON | | MAIN switch: Pressed at the 1st time → at the 2nd time | $ON\toOFF$ |
| | MAIN switch: ON | ASCD: Operating | ON |
| SET LAMP | When vehicle speed is be- tween 40 km/h (25 MPH) and 144 km/h (89 MPH) | ASCD: Not operating | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>EC-500</u>, "Diagnosis Procedure".

Diagnosis Procedure

1. СНЕСК DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-36, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace combination meter. Refer to <u>MWI-110, "Exploded View"</u>.
- NO >> Repair or replace.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

COOLING FAN

| Descri | ption |
|--------|-------|
| 000011 | |

COOLING FAN CONTROL MODULE

Cooling fan control module receives ON/OFF pulse duty signal from IPDM E/R. Corresponding to this ON/OFF pulse duty signal, cooling fan control module sends cooling fan motor operating voltage to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

COOLING FAN MOTOR

Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

Component Function Check

1. CHECK COOLING FAN FUNCTION

With CONSULT Turn ignition switch ON. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.

3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT

- Perform IPDM E/R auto active test and check cooling fan motors operation, refer to <u>PCS-9</u>, "<u>Diagnosis</u> <u>Description</u>".
- 2. Make sure that cooling fan operates.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-501, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connector E37.
- 3. Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module harness connector and ground.

| Cooling fan co | Cooling fan control module | | Valtaga |
|----------------|----------------------------|---------|-----------------|
| Connector | Terminal | Ground | Voltage |
| E37 | 3 | Ground | Battery voltage |
| Is the inspec | tion result i | normal? | |
| | GO TO 2. | | |
| NO >> (| GO TO 7. | | |

2.CHECK COOLING FAN CONTROL MODULE GROUND CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between cooling fan control module harness connector and ground.

| Cooling fan co | ontrol module | Ground | Continuity | |
|----------------|---------------|--------|------------|--|
| Connector | Terminal | Ground | | |
| E37 | 1 | Ground | Existed | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to power in harness or connectors.

EC-501

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< DTC/CIRCUIT DIAGNOSIS >

3.CHECK IPDM E/R GROUND CIRCUIT

- 1. Disconnect IPDM E/R harness connectors E5, E6.
- 2. Check the continuity between IPDM E/R harness connector and ground.

| IPDM | E/R | Ground | Continuity | |
|-----------|----------|--------|------------|--|
| Connector | Terminal | Ground | | |
| E5 | 12 | Ground | Existed | |
| E6 | 41 | Ground | Existed | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to power in harness or connectors.

4.CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

- 1. Disconnect IPDM E/R harness connector E9.
- Check the continuity between IPDM E/R harness connector and cooling fan control module harness connector.

| IPDM | I E/R | Cooling fan c | Continuity | |
|--------------------|-------|---------------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| E9 | 97 | E37 | 2 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK COOLING FAN CONTROL MODULE OUTPUT SIGNAL CIRCUIT

1. Reconnect all harness connectors disconnected.

2. Disconnect cooling fan control module harness connectors E301, E302.

3. Turn ignition switch ON.

4. Check the voltage between cooling fan control module harness connector and ground.

| Cooling fan o | ontrol module | Ground | Voltage | |
|---------------|---------------|--------|-----------------|--|
| Connector | Terminal | Ground | voltage | |
| E301 | 4 | Ground | Battery voltage | |
| E302 | 6 | Ground | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace cooling fan control module. Refer to CO-17, "Exploded View".

6.CHECK COOLING FAN MOTORS -1 AND -2

Refer to EC-503. "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan motor. Refer to <u>CO-17, "Exploded View"</u>.

7. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

2. Disconnect cooling fan relay.

3. Turn ignition switch ON.

4. Check the voltage between cooling fan relay harness connector and ground.

EC-502

| Cooling | fan relay | | | <u> </u> | ŀ |
|---|----------------------|------------|-----------------|---|----|
| Connector | Terminal | Ground | Voltage | | |
| Connector | 2 | | | — | |
| E17 | 3 | Ground | Battery voltag | ge | E(|
| Is the insp | ection res | ult norma | ? | • | |
| YES > | > GO TO > GO TO | 9. | | | (|
| 8.DETEC | T MALFU | NCTION | ING PART | | |
| Check the | following. | | | | C |
| • 10A fuse | | | - - 7 | | |
| IPDM E/50A fusik | | | | | E |
| • Harness | for open of | or short b | | ng fan relay and fuse | |
| Harness | for open of | or short b | etween cooli | ng fan relay and battery | |
| | Donoir c | non oiro | uit abort to a | round or abort to now or in bornoop or connectore | F |
| ~ | • | - | - | round or short to power in harness or connectors. DDULE POWER SUPPLY CIRCUIT-III | |
| | | | | | C |
| | gnition swi | | rness conneo | ctor E6 | |
| | | | | fan relay harness connector and IPDM E/R harness connector. | |
| | | | - | | ŀ |
| Cooling | fan relay | IPI | DM E/R | Continuity | |
| Connector | Terminal | Connecto | or Terminal | Continuity | ļ |
| E17 | 1 | E6 | 42 | Existed | |
| 4. Check conne | | nuity betw | veen cooling | fan relay harness connector and cooling fan control module harness | |
| | | | | | |
| Cooling | fan relay | Cooling fa | an control modu | | |
| Connector | Terminal | Connect | or Terminal | - Continuity | k |
| E17 | 5 | E37 | 3 | Existed | |
| 5. Also c | heck harn | ess for sl | nort to groun | d and short to power. | l |
| Is the insp | ection res | ult norma | <u> ?</u> | | |
| | > GO TO | | | | |
| | | | | round or short to power in harness or connectors. | Ν |
| 10.сне | | | | | |
| | | | - | (Cooling Fan Relay)". | Ν |
| Is the insp | | | <u> ?</u> | | |
| | > GO TO > Replace | | an relav | | |
| | | - | | | C |
| | | | | | |
| Perform <u>G</u> | | | | | F |
| <u>Is the insp</u> YES >: | | | | PCS-32 "Exploded View" | Г |
| | | | harness cor | <u>PCS-32, "Exploded View"</u> . nnectors. | |
| | | | | Fan Motor) | |
| 1. СНЕСК | COOLIN | G FAN M | OTOR | | |
| | gnition swi | | | | |
| i. runnų | 9111011 SW | | | | |

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

- 2. Disconnect cooling fan control module harness connectors E301, E302.
- 3. Supply cooling fan control module terminals with battery voltage and check operation.

| Cooling fan control module | | | | | |
|----------------------------|-----------|----------|-----|------------------------|--|
| Motor | Connector | Terminal | | Operation | |
| | | (+) | (-) | | |
| 1 | E301 | 4 | 5 | Cooling fan operates. | |
| 2 | E302 | 6 | 7 | cooling fair operates. | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace cooling fan motor. Refer to <u>CO-17, "Exploded View"</u>.

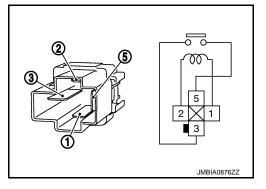
Component Inspection (Cooling Fan Relay)

INFOID:000000008156598

1. CHECK COOLING FAN RELAY

- 1. Turn ignition switch OFF.
- 2. Remove cooling fan relay.
- 3. Check the continuity between cooling fan relay terminals under the following conditions.

| Terminals | Conditions | Continuity |
|-----------|--|-------------|
| 3 and 5 | 12 V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan relay.

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

ELECTRICAL LOAD SIGNAL

Description

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication line.

Component Function Check

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

- 1. Turn ignition switch ON.
- 2. Connect CONSULT and select "DATA MONITOR" mode.
- 3. Select "LOAD SIGNAL" and check indication under the following conditions.

| Monitor item | Condition | | Indication | |
|----------------------------------|-----------------------------|-----|------------|--|
| | Rear window defogger switch | ON | ON | |
| LOAD SIGNAL | | OFF | OFF | |
| Is the inspection result normal? | | | | |
| YES SS GO TO 2 | | | | |

| 160 | ~~ 00 TO Z. | |
|-----|-------------------------|------------------------|
| NO | >> Go to <u>EC-505,</u> | "Diagnosis Procedure". |
| - | | - |

2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

| Monitor item | Condition | | Condition | | Indication |
|-----------------------------|--------------------|-----|-----------|--|------------|
| LOAD SIGNAL Lighting switch | ON at 2nd position | ON | | | |
| | OFF | OFF | | | |

Is the inspection result normal?

| YES | >> GO TO 3. | J |
|-----|---|---|
| NO | >> Go to EC-505. "Diagnosis Procedure". | |
| - | | |

${f 3.}$ CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

| Monitor item | Condition | | Indication |
|---------------|---------------------------|-----|------------|
| HEATER FAN SW | Heater fan control switch | ON | ON |
| | | OFF | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-505, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>EC-505, "Compo-nent 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 DEF-3, "Work Flow".

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ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

3.CHECK HEADLAMP SYSTEM

Refer to EXL-4, "Work Flow".

>> INSPECTION END

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to HAC-4, "Work Flow".

>> INSPECTION END

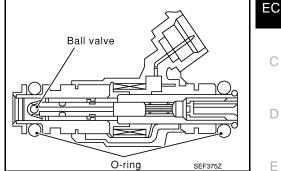
FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

FUEL INJECTOR

Description

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



Component Function Check

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.

NO >> Go to EC-507, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

With CONSULT

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

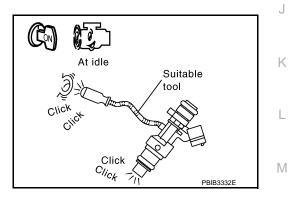
- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

| YES | >> INSPECTION END |
|-----|-------------------|
|-----|-------------------|

NO >> Go to EC-507, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:000000008156604

1.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between fuel injector harness connector and ground.

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[VQ37VHR]

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FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

| | 271/ | 'HR] |
|-------|------|------|
| 1 2 4 | 31 V | |

| Fuel injector | | Ground | Voltago | | |
|---------------|-----------|----------|---------|-------------------|--|
| Cylinder | Connector | Terminal | Giouna | Voltage | |
| 1 | F121 | 1 | | | |
| 2 | F122 | 1 | | | |
| 3 | F123 | 1 | Ground | Pattonyvoltago | |
| 4 | F124 | 1 | Giouna | d Battery voltage | |
| 5 | F125 | 1 | | | |
| 6 | F126 | 1 | | | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E3, F1
- Harness connectors F10, F120
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between fuel injector and fuse

>> Repair open circuit, short to ground or short to power in harness or connectors.

$\mathbf{3}$. 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 | F121 | 2 | | 89 | |
| 2 | F122 | 2 | | 85 | |
| 3 | F123 | 2 | F102 | 81 | Existed |
| 4 | F124 | 2 | F IUZ | 90 | EXISTED |
| 5 | F125 | 2 | | 86 | |
| 6 | F126 | 2 | | 82 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F10, F120
- Harness connectors F106, F107
- Harness for open or short between fuel injector and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK FUEL INJECTOR

Refer to <u>EC-509</u>, "Component Inspection". <u>Is the inspection result normal?</u>

| FUEL INJECTOR | | |
|--|------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| YES >> GO TO 6. | | |
| NO >> Replace malfunctioning fuel injector. Refer to <u>EM-37, "Exploded View"</u> . 6.CHECK INTERMITTENT INCIDENT | | А |
| | | |
| Refer to <u>GI-42, "Intermittent Incident"</u> . Is the inspection result normal? | | EC |
| YES >> Replace IPDM E/R. Refer to <u>PCS-32, "Removal and Installation"</u> . | | |
| NO >> Repair open circuit, short to ground or short to power in harness or connectors. | | С |
| Component Inspection | INFOID:000000008156605 | 0 |
| 1.CHECK FUEL INJECTOR | | D |
| 1. Turn ignition switch OFF. | | |
| Disconnect fuel injector harness connector. Check resistance between fuel injector terminals as follows. | | Е |
| | | |
| Terminals Resistance (Ω) | | |
| 1 and 2 11.1 - 14.3 [at 10 - 60°C (60 - 140°F)] | | F |
| Is the inspection result normal? YES >> INSPECTION END NO >> Replace malfunctioning fuel injector. Refer to <u>EM-37, "Removal and Installation"</u> . | | G |
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< DTC/CIRCUIT DIAGNOSIS > FUEL PUMP

Description

INFOID:000000008156606

[VQ37VHR]

| 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* | * | Fuel pump |

*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation | |
|----------------------------------|------------------------|--|
| Ignition switch is turned to ON. | Operates for 1 second. | |
| Engine running and cranking | Operates. | |
| When engine is stopped | Stops in 1.5 seconds. | |
| Except as shown above | Stops. | |

Component Function Check

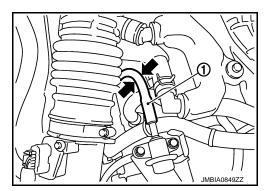
1.CHECK FUEL PUMP FUNCTION

- 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 >> <u>EC-510</u>, "Diagnosis Procedure".



Diagnosis Procedure

1.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ECM harness connector and ground.

| E | CM | Ground | Voltage |
|-----------|----------|--------|-----------------|
| Connector | Terminal | Gibuna | vollage |
| F101 | 22 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

INFOID:000000008156607

FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

Check the voltage between IPDM E/R harness connector and ground.

| IF | PDM E/R | | Gra | ound | Voltago | | | | | _ |
|--|--|---|--|--|---|------------|------------|--------------|-----------------|---|
| Connector | Te | erminal | GIC | bund | Voltage | | | | | |
| E7 | | 77 | Gro | ound | Battery voltage | | | | | |
| | GO TO 3. GO TO 10 | 0. | | т | | | | | | |
| Check the fo Harness co Harness co Harness fo | llowing. onnectors | s E3, F1 s F104, | F105 | | R and ECM | | | | | |
| >> F 1. CHECK F | • • | | | - | nd or short to por RCUIT-III | ver in hai | rness or o | connectors. | | |
| Disconne Turn igni | ect all har ect "fuel I ition swite | rness co level sei ch ON. | | and fue | nected. I pump" harness nsor unit and fue | | | onnector and | l ground. | |
| | 1 | | | | | | | | | |
| Fuel level sen and fuel pu | ump | Ground | | Vo | bltage | | | | | |
| and fuel pu | ump Ferminal | Ground | | oltage sho | oltage ould exist for 1 secor i is turned ON. | d | | | | |
| and fuel pu Connector T B22 s the inspect YES >> 0 | ump Ferminal 1 tion resul GO TO 8 GO TO 5 | Ground It norma | after igniti | oltage sho | ould exist for 1 secor | d | | | | |
| and fuel pu Connector T B22 s the inspect YES >> C NO >> C D.CHECK 1 | ump Terminal 1 GO TO 8 GO TO 5 5A FUSE ition switc ect 15A fu | Ground It norma | after igniti al? | oltage sho | ould exist for 1 secor | d | | | | _ |
| and fuel pu Connector T B22 S the inspect YES >> C D.CHECK 1 1. Turn igni 2. Disconne 3. Check 1 5 the inspect YES >> C | ump ferminal 1 tion resul GO TO 8. GO TO 8. GO TO 5. 5A FUSE ition switt ect 15A fuse. | Ground It norma ch OFF. use (No It norma | after igniti al? b. 41) from | oltage sho | ould exist for 1 secor | d | | | | _ |
| and fuel pu Connector T B22 S the inspect YES >> C D.CHECK 1 1. Turn igni 2. Disconne 3. Check 1 5 the inspect YES >> C | ump Terminal 1 3O TO 8 3O TO 5 5A FUSE ition swite ect 15A fuse. tion resul GO TO 6 Replace f | Ground It norma ch OFF. use (No It norma fuse. | after igniti al? b. 41) from al? | oltage sho ion switch | evid exist for 1 secon is turned ON. | d | | | | |
| and fuel pu Connector T B22 s the inspect YES >> C D.CHECK 1 1. Turn igni 2. Disconne 3. Check 1 5. the inspect YES >> C NO >> F D.CHECK F 1. Disconne 2. Check th | ump Terminal 1 3O TO 8 3O TO 5 3O TO 5 5A FUSE ition swite so to 5 5A fuse. tion resul GO TO 6 Replace f UEL PUM ect IPDM | Ground It norma ch OFF. use (No It norma fuse. MP PON I E/R ha uity bet | after igniti al? Al? VER SUF | n IPDM | evild exist for 1 secon is turned ON. E/R. | | "fuel leve | l sensor uni | t and fuel pump | |
| and fuel pu Connector T B22 s the inspect YES >> C D.CHECK 1 1. Turn igni 2. Disconne 3. Check 1 5. the inspect YES >> C NO >> F D.CHECK F 1. Disconne 2. Check th | ump Terminal 1 30 TO 8 30 TO 5 5A FUSE 5A FUSE ition switce ect 15A fuse. tion resul 30 TO 6 Replace f UEL PUI ect IPDM ne contin connector | Ground It norma | after igniti al? Al? VER SUF | n IPDM PPLY CI nnector DM E/R | E/R. RCUIT-IV E5. harness conne | | "fuel leve | l sensor uni | t and fuel pump | |
| and fuel pu Connector T B22 S the inspect YES >> 0 D.CHECK 1 1. Turn igni 2. Disconne 3. Check 1 S the inspect YES >> 0 NO >> F D.CHECK F 1. Disconne 2. Check th harness | ump Terminal 1 30 TO 8 30 TO 5 5A FUSE 5A FUSE ition switce ect 15A fuse. tion resul 30 TO 6 Replace f UEL PUI ect IPDM ne contin connector | Ground It norma ch OFF. use (No It norma fuse. MP PON I E/R ha uity bet or. Fue | after igniti al? Al? NER SUF WER SUF Inness cor ween IPE | n IPDM PPLY CI nnector DM E/R | E/R. BCUIT-IV E5. harness conne | | "fuel leve | l sensor uni | t and fuel pump | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 7.

FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E79, B75
- IPDM E/R harness connector E5
- Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.

2. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and ground.

| Fuel level sensor | unit and fuel pump | Ground | Continuity |
|-------------------|--------------------|--------|------------|
| Connector | Terminal | Ground | Continuity |
| B22 | 3 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 9.
- NO >> Repair open circuit or short to power in harness or connectors.

9.CHECK FUEL PUMP

Refer to EC-512, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace fuel pump. Refer to <u>FL-5, "Exploded View"</u>.

10.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to <u>PCS-32, "Exploded View"</u>.

NO >> Repair or replace harness or connectors.

Component Inspection

1.CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

| Terminals | Resistance (Ω) |
|-----------|----------------------------|
| 1 and 3 | 0.2 - 5.0 [at 25°C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump". Refer to <u>FL-6, "Removal and Installation"</u>.

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< DTC/CIRCUIT DIAGNOSIS >

ICC BRAKE SWITCH

Description

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to <u>CCS-16</u>, "System Description" for the ICC function.

Component Function Check

1. CHECK ICC BRAKE SWITCH FUNCTION

With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|---|--------------------|-----|
| BRAKE SW1 | Brake pedal (A/T) Brake pedal or clutch pedal (M/T) | Slightly depressed | OFF |
| BIARE SWI | Brake pedal (A/T) Brake pedal and clutch pedal (M/T) | Fully released | ON |

Without CONSULT

1. Turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | | |
|---|---|------------|---|--------------------|----------------------|-----|
| Connector | + | - | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | 1 |
| M107 | 126 | 128 | Brake pedal (A/T) Brake pedal or clutch pedal (M/T) | Slightly depressed | Approx. 0 | J |
| WI07 | (ICC brake switch signal) | 120 | Brake pedal (A/T) Brake pedal and clutch pedal (M/T) | Fully released | Battery voltage | K |
| Is the inspe | ection result normal? | | | | | |
| | INSPECTION END Go to <u>EC-513</u>, "Diagno | sis Proce | dure". | | | L |
| Diagnosi | s Procedure | | | | INFOID:0000000081566 | 612 |
| 1.INSPEC | TION START | | | | | M |
| Which type A/T >> | ch type of transmission th of transmission? • GO TO 2. • GO TO 7. | he vehicle | is equipped with. | | | Ν |
| 2.снеск | ICC BRAKE SWITCH F | OWER S | JPPLY CIRCUIT | | | 0 |
| Discon Turn ig | nition switch OFF. nect ICC brake switch h nition switch ON. the voltage between ICC | | nnector. vitch harness connector and gr | ound. | | Ρ |

| ICC brak | e switch | Ground | Voltage | |
|-----------|----------|--------|-----------------|--|
| Connector | Terminal | Ground | voltage | |
| E114 | 1 | Ground | Battery voltage | |

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< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

4. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brak | e switch | EC | Continuity | |
|-----------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E114 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

NO >> 00 10 3.

5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK ICC BRAKE SWITCH

Refer to EC-516, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace ICC brake switch. Refer to <u>CCS-19</u>, "Component Parts Location".

7. CHECK ICC BRAKE SWITCH CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect ICC brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake switch harness connector and ground.

| ICC brake switch | | Ground | Condition | | Voltage (V) | |
|------------------|----------|--------|--------------|--------------------|-----------------|--|
| Connector | Terminal | Ciouna | | Condition | | |
| E114 | 1 | Ground | Clutch pedal | Slightly depressed | Approx. 0 | |
| L114 | I | Giouna | Clutch pedal | Fully released | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 8.

8.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect ASCD clutch switch harness connector.

< DTC/CIRCUIT DIAGNOSIS >

3. Turn ignition switch ON.

4. Check the voltage between ASCD clutch switch harness connector and ground.

| | | | | J J |
|--|------------------------|-------------|----------------|---|
| ASCD clu | tch switch | | | — |
| Connector | Terminal | Ground | Voltage | |
| E108 | 1 | Ground | Battery volta | ge |
| s the inspe | ection res | ult norma | ? | |
| NO >> | GO TO GO TO | 9. | | |
| .DETEC | T MALFU | NCTIONI | NG PART | |
| Check the f | | | | |
| Fuse bloc 10 A fuse | | onnector | E103 | |
| | | or short be | etween ASC | CD clutch switch and fuse |
| | • | | | |
| >> | Repair c | pen circu | it or short to | ground in harness or connectors. |
| 10.снес | K ICC B | RAKE SW | /ITCH INPU | T SIGNAL CIRCUIT FOR OPEN AND SHORT-I |
| | nition swi | | | |
| | | | een ASCD | clutch switch harness connector and ICC brake switch harness con- |
| nector. | | | | |
| 1005 | 1 | 10.5 | | |
| ASCD clute | | | ake switch | Continuity |
| Connector | Terminal | Connecto | | |
| E108 | 2 | E114 | 1 | Existed |
| | | | • | id and short to power. |
| Is the inspe | | | <u> ?</u> | |
| | GO TO Repair c | | it short to a | round or short to power in harness or connectors. |
| 11.снес | | • | - | |
| | | | | |
| | | | - | (ASCD Clutch Switch)". |
| <u>Is the inspe</u> YES >> | GO TO | | <u>l (</u> | |
| | | | utch switch | Refer to CCS-19, "Component Parts Location". |
| | | | | T SIGNAL CIRCUIT FOR OPEN AND SHORT-II |
| | | | | |
| | nition swi nect ECN | | connector. | |
| | | | | ake switch harness connector and ECM harness connector. |
| | | | | |
| ICC brake | e switch | E | CM | Continuity |
| Connector | Terminal | Connecto | r Terminal | Continuity |
| E114 | 2 | M107 | 126 | Existed |
| 4. Also ch | neck harn | ess for sh | ort to grour | id and short to power. |
| Is the inspe | | | | |
| | GO TO | | | |
| | GOTO | | | |
| 13.dete | CT MALF | | NING PART | |

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ICC brake switch and ECM

EC-515

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< DTC/CIRCUIT DIAGNOSIS >

>> Repair open circuit, short to ground or short to power in harness or connectors.

14.CHECK ICC BRAKE SWITCH

Refer to EC-516, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace ICC brake switch. Refer to <u>CCS-19. "Component Parts Location"</u>.

15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:000000008156613

1.CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.

2. Disconnect ICC brake switch harness connector.

3. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | (| Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| T and Z | Diake pedai | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to <u>BR-7, "Inspection and Adjustment"</u>.

2. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | (| Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| 1 and 2 | Diake pedai | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch. Refer to <u>CCS-19, "Component Parts Location"</u>.

Component Inspection (ASCD Clutch Switch)

INFOID:000000008156614

1.CHECK ASCD CLUTCH SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch harness connector.
- 3. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| T and Z | Clutch pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD CLUTCH SWITCH-II

< DTC/CIRCUIT DIAGNOSIS >

1. Adjust ASCD clutch switch installation. Refer to <u>BR-7</u>, "Inspection and Adjustment".

2. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|--------------|--------------------|-------------|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| r anu z | Clutch pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD clutch switch. Refer to <u>CL-9</u>, "Exploded View".

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< DTC/CIRCUIT DIAGNOSIS >

IGNITION SIGNAL

Description

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

Component Function Check

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT: GO TO 2.

YES-2 >> Without CONSULT: GO TO 3.

No >> Go to <u>EC-518</u>, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

With CONSULT

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- 2. Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-518, "Diagnosis Procedure".

 $\mathbf{3}.$ CHECK IGNITION SIGNAL FUNCTION

Without CONSULT

- 1. Let engine idle.
- 2. Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

| | E | СМ | | |
|-------------|----------|-----------|----------|--------------------|
| | + | - | _ | Voltage signal |
| Connector | Terminal | Connector | Terminal | |
| | 11 | | | |
| | 12 | | | 50mSec/div |
| E404 | 15 | N407 | 100 | |
| F101 | 16 | M107 | 128 | ÷ |
| | 19 | | | |
| | 20 | | | 2V/div JMBIA0035GB |

NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-518, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.

2. Check the voltage between ECM harness connector terminals as per the following.

INFOID:000000008156617

INFOID:00000008156615

INFOID:000000008156616

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

| | ECM | | | |
|--|---|---|--|---|
| Connector | + | - | Volt | tage |
| Connector | Terminal | Termina | al | |
| M107 | 125 | 128 | Battery | voltage |
| | | ult normal? | 2 | |
| | GO TO 2 | | anosia Dra | a a dura " |
| | | | agnosis Pro | PPLY CIRCUIT-II |
| | | | WER SUP | |
| | nition swi | | ness conne | ector |
| | nition swi | | | |
| Check | the voltag | e betweei | n condense | er harness connector and ground. |
| 0 | | | | |
| Connector | lenser Terminel | Ground | Voltage | 9 |
| F8 | Terminal 1 | Ground | Battony volt | |
| - | | | Battery volt | |
| • | GO TO 5 | <u>ult normal?</u> 5 | <u>r</u> | |
| | GO TO 3 | | | |
| CHECK | IGNITION | | WER SUP | PPLY CIRCUIT-III |
| | | | | |
| Turn io | nition swi | tch OFF. | | |
| Discon | | /I E/R harr | ness conne | |
| Discon | nect IPDN | /I E/R harr | | ector E7. E/R harness connector and condenser harness connector. |
| . Discon . Check | nect IPDN the contir | /I E/R harr uity betwe | een IPDM E | |
| Discon Check IPDM | nect IPDN the contir E/R | I E/R harr uity betwe Cond | en IPDM E | |
| Discon Check IPDM Connector | nect IPDN the contir E/R Terminal | I E/R harr nuity betwee Cond Connector | een IPDM E enser Terminal | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 | nect IPDN the contir E/R Terminal 53 | A E/R harr nuity between Cond Connector F8 | een IPDM E enser Terminal 1 | E/R harness connector and condenser harness connector. Continuity Existed |
| Discon Check IPDM Connector E7 Also ch | nect IPDM the contir E/R Terminal 53 neck harne | A E/R harr nuity between Cond Connector F8 ess for sho | een IPDM E enser Terminal 1 ort to groun | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 Also ch the inspe | nect IPDN the contir E/R Terminal 53 neck harno ection resu | A E/R harr nuity between Cond Connector F8 ess for sho ult normal? | een IPDM E enser Terminal 1 ort to groun | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 Also ch the inspection (ES >> | nect IPDN the contir E/R Terminal 53 neck harno ection resu | A E/R harr ouity between Connector F8 ess for sho ult normal? C-156, "Dia | een IPDM E enser Terminal 1 ort to groun | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 Also ch the inspective (ES >> NO >> | E/R Terminal 53 heck harne ection results Go to EC > GO TO 4 | A E/R harr ouity between Connector F8 ess for sho ult normal? C-156, "Dia | een IPDM E enser Terminal 1 ort to groun 2 agnosis Pro | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 Also ch the inspective YES >> YO >> DETEC heck the | E/R Terminal 53 heck harne cotion resu Go to EC GO TO 4 T MALFU following. | A E/R harr nuity between Connector F8 ess for should connector F8 ess for should f1 f1 f1 f1 f1 f1 f1 f1 f1 f1 f1 f1 f1 | een IPDM E enser Terminal 1 ort to groun 2 agnosis Pro | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 Also ch the inspective (ES >> NO >> .DETEC heck the Harness | E/R Terminal 53 heck harne ection resu Go to EC GO TO 4 T MALFU following. connector | A E/R harr ouity between Connector F8 ess for sho ult normal? C-156, "Dia t. NCTIONIN s E3, F1 | een IPDM E enser Terminal 1 ort to groun 2 agnosis Pro | E/R harness connector and condenser harness connector. Continuity Existed and and short to power. Cocedure". |
| Discon Check IPDM Connector E7 Also ch the inspective YES YES NO DETEC heck the Harness | E/R Terminal 53 heck harne ection resu Go to EC GO TO 4 T MALFU following. connector | A E/R harr ouity between Connector F8 ess for sho ult normal? C-156, "Dia t. NCTIONIN s E3, F1 | een IPDM E enser Terminal 1 ort to groun 2 agnosis Pro | E/R harness connector and condenser harness connector. |
| Discon Check IPDM Connector E7 Also ch the inspective YES NO DETEC heck the Harness Harness | nect IPDM the contin | A E/R harr nuity between Connector F8 ess for should connector F8 ess for should f5 ess f5 ess f5 | een IPDM E enser Terminal 1 ort to groun 2 agnosis Pro IG PART tween IPDM | E/R harness connector and condenser harness connector. Continuity Existed and and short to power. Cocedure". M E/R and condenser |
| Discon Check IPDM Connector E7 Also ch the inspe YES >> NO >> DETEC heck the Harness Harness | nect IPDM the contin | A E/R harr ouity between Cond Connector F8 ess for sho <u>alt normal?</u> C-156, "Dia C-156, "D | een IPDM E enser Terminal 1 ort to groun agnosis Pro IG PART tween IPDN t, short to g | E/R harness connector and condenser harness connector. Continuity Existed ad and short to power. Decedure". M E/R and condenser ground or short to power in harness or connectors. |
| Discon Check IPDM Connector E7 Also ch the inspe YES >> NO >> ODETEC heck the Harness Harness | nect IPDM the contin | A E/R harr ouity between Cond Connector F8 ess for sho lt normal? C-156, "Dia C-156, "Dia | een IPDM E enser Terminal 1 ort to groun agnosis Pro IG PART tween IPDN t, short to g | E/R harness connector and condenser harness connector. Continuity Existed and and short to power. Cocedure". M E/R and condenser |
| Discon Check IPDM Connector E7 Also ch the inspe YES >> NO >> DETEC heck the Harness Harness Harness | nect IPDM the contin | A E/R harr ouity between Connector F8 ess for sho alt normal? C-156, "Dia c-156, "Dia c-15 | een IPDM E enser Terminal 1 ort to groun agnosis Pro IG PART tween IPDM t, short to g DUND CIRC | E/R harness connector and condenser harness connector. Continuity Existed ad and short to power. Decedure". M E/R and condenser ground or short to power in harness or connectors. CUIT FOR OPEN AND SHORT |
| Discon Check IPDM Connector E7 Also ch the inspe YES >> NO >> ODETEC heck the Harness Harness Harness SO.CHECK | nect IPDM the contin | A E/R harr ouity between Connector F8 ess for sho alt normal? C-156, "Dia c-156, "Dia c-15 | een IPDM E enser Terminal 1 ort to groun agnosis Pro IG PART tween IPDM t, short to g DUND CIRC | E/R harness connector and condenser harness connector. Continuity Existed ad and short to power. Decedure". M E/R and condenser ground or short to power in harness or connectors. |
| Discon Check IPDM Connector E7 Also ch the inspe YES >> NO >> ODETEC heck the Harness Harness Harness SO.CHECK | nect IPDM the contin | A E/R harr ouity between Connector F8 ess for shore alt normal? C-156, "Dia c-156, "Dia c- | een IPDM E enser Terminal 1 ort to groun agnosis Pro IG PART tween IPDM t, short to g DUND CIRC een conden | E/R harness connector and condenser harness connector. Continuity Existed ad and short to power. Decedure". M E/R and condenser ground or short to power in harness or connectors. CUIT FOR OPEN AND SHORT |
| Discon Check IPDM Connector E7 Also ch the inspective YES >> NO >> OETEC heck the Harness Harness CHECK Turn ig Check | nect IPDM the contin | A E/R harr ouity between Connector F8 ess for sho alt normal? C-156, "Dia c-156, "Dia c-15 | een IPDM E enser Terminal 1 ort to groun agnosis Pro IG PART tween IPDM t, short to g DUND CIRC | E/R harness connector and condenser harness connector. Continuity Existed ad and short to power. Decedure". M E/R and condenser ground or short to power in harness or connectors. CUIT FOR OPEN AND SHORT |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit or short to power in harness or connectors.

< DTC/CIRCUIT DIAGNOSIS >

6.CHECK CONDENSER

Refer to EC-522. "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace condenser.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

1. Reconnect all harness connectors disconnected.

- 2. Disconnect ignition coil harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ignition coil harness connector and ground.

| - | | | | |
|----------|--------------|----------|---------|-----------------|
| | Ignition coi | Ground | Voltage | |
| Cylinder | Connector | Terminal | Ground | voltage |
| 1 | F11 | 3 | | |
| 2 | F12 | 3 | | |
| 3 | F13 | 3 | Ground | Battery voltage |
| 4 | F14 | 3 | Ground | Ballery vollage |
| 5 | F15 | 3 | 1 | |
| 6 | F16 | 3 | 1 | |
| | | | | |

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

Harness connector F1

• Harness for open or short between ignition coil and harness connector F1

>> Repair or replace harness or connectors.

9. Check ignition coil ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Check the continuity between ignition coil harness connector and ground.

| | Ignition coi | I | Ground | Continuity |
|----------|--------------|----------|--------|------------|
| Cylinder | Connector | Terminal | Ground | Continuity |
| 1 | F11 | 2 | | |
| 2 | F12 | 2 | • | |
| 3 | F13 | 2 | Ground | Existed |
| 4 | F14 | 2 | Ground | EXISIED |
| 5 | F15 | 2 | • | |
| 6 | F16 | 2 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit or short to power in harness or connectors.

10. Check ignition coil output signal circuit for open and short

1. Disconnect ECM harness connector.

2. Check the continuity between ignition coil harness connector and ECM harness connector.

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

| | Ignition coil | | EC | M | 0 | - | | | | | | |
|--|---|---|--|--|---------------------------------------|---------|---------|-----------------|------------------|---------------|---------------|------------|
| Cylinder | Connector | Terminal | Connector | Terminal | Continuity | | | | | | | |
| 1 | F11 | 1 | | 20 | | - | | | | | | |
| 2 | F12 | 1 | - | 16 | | | | | | | | |
| 3 | F13 | 1 | E101 | 12 | Evictod | | | | | | | |
| 4 | F14 | 1 | F101 | 11 | Existed | | | | | | | |
| 5 | F15 | 1 | | 15 | | | | | | | | |
| 6 | F16 | 1 | | 19 | | | | | | | | |
| 3. Also | check harr | ness for s | hort to grou | und and sl | hort to pow | ver. | | | | | | |
| | pection res | | <u>al?</u> | | | | | | | | | |
| | >> GO TO | | | | | | | | | | | |
| | >> GO TO | | | _ | | | | | | | | |
| | ECT MAL | | NING PAR | | | | | | | | | |
| | e following | | | | | | | | | | | |
| | s connecto s for open | | | nition coil : | and ECM | | | | | | | |
| | | | etti ooni iyi | | | | | | | | | |
| | >> Repair | open circi | uit, short to | ground o | r short to p | oower i | n harne | ss or c | onnector | s. | | |
| | • | - | | - | ANSISTOR | | - | | | | | |
| | | | | | Coil with F | | Transis | tor)" | | | | |
| | pection res | | - | | | | 1101313 | <u>ior</u> . | | | | |
| s the ins | | suut norma | al? | | | | | | | | | |
| | | | <u>al?</u> | | | | | | | | | |
| YES | | 13. | | tion coil w | vith power t | transis | or. Ref | er to <u>El</u> | <u>Л-46, "Е</u> | <u>kplode</u> | ed View". | |
| YES NO | | 13. e malfunc | tioning igni | | vith power t | transis | or. Ref | er to <u>El</u> | <u>/I-46, "Е</u> | kplode | ed View". | |
| үез NO 13. сні | >> GO TO >> Replace ECK INTEF | 13. e malfunc RMITTEN | tioning igni T INCIDEN | | rith power t | transis | or. Ref | er to <u>El</u> | <u>/I-46, "Е</u> | kplode | ed View". | |
| үез NO 13. сні | >> GO TO >> Replace | 13. e malfunc RMITTEN | tioning igni T INCIDEN | | ith power t | transis | or. Ref | er to <u>El</u> | <u>Л-46, "Е</u> | <u>kplode</u> | ed View". | |
| YES NO 13. CHI Refer to g | >> GO TO >> Replace ECK INTEF | 13. e malfunc RMITTEN ermittent I | tioning igni T INCIDEN ncident". | | vith power t | transis | or. Ref | er to <u>El</u> | <u>Л-46, "Е</u> | <u>kplode</u> | ed View". | |
| YES NO I 3. CHI Refer to <u>j</u> | >> GO TO >> Replace ECK INTEF GI-42, "Inte >> INSPEC | 13. e malfunc RMITTEN ermittent I | tioning igni T INCIDEN ncident". | IT | | | | | <u>Л-46, "Е</u> | kplode | | |
| YES NO 3. CHI Refer to <u>1</u> | >> GO TO >> Replace ECK INTEF GI-42, "Inte >> INSPEC | 13. e malfunc RMITTEN ermittent I | tioning igni T INCIDEN ncident". | IT | th power t | | | | <u>Л-46, "Е</u> | <u>kplode</u> | ed View". | |
| YES NO 13.CHI Refer to y | >> GO TO >> Replace ECK INTEF GI-42, "Inte >> INSPEC | 13. e malfunc RMITTEN ermittent I CTION EN pection | tioning igni T INCIDEN <u>ncident"</u> . ND (Ignition | IT Coil wi | th Powe | er Tra | | | <u>Л-46, "Е</u> | <u>xplode</u> | | |
| YES NO 13.CHI Refer to P Compo | >> GO TO >> Replace ECK INTEF GI-42, "Inte >> INSPE(nent Ins | 13. e malfunc RMITTEN ermittent I CTION EN pection | tioning igni T INCIDEN <u>ncident"</u> . ND (Ignition | IT Coil wi | th Powe | er Tra | | | <u>Л-46, "Е</u> | kplode | | |
| YES NO 13.CHI Refer to P Compo 1.CHEC | >> GO TO >> Replace ECK INTEF GI-42. "Inte >> INSPEC nent Ins CK IGNITIC ignition sw | 13. malfunc MITTEN crmittent I CTION EN pection N COIL V vitch OFF. tion coil h | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>Л-46, "Е</u> | <u>xplode</u> | | |
| YES NO 13.CHI Refer to P Compo 1.CHEC | >> GO TO >> Replace ECK INTEF GI-42. "Inte >> INSPEC nent Ins CK IGNITIC ignition sw | 13. malfunc MITTEN crmittent I CTION EN pection N COIL V vitch OFF. tion coil h | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor | IT Coil wi ER TRAN | th Powe | er Tra | nsisto | | <u>Л-46, "Е</u> | <u>kplode</u> | | |
| YES NO 13. CHI Refer to P Compo 1. CHEC . Turn 2. Disc 3. Chec | >> GO TO >> Replace ECK INTEF GI-42, "Inte >> INSPEC nent Ins CK IGNITIC ignition sw connect igni ck resistance | 13. emalfunc RMITTEN ermittent I CTION EN pection N COIL V vitch OFF. tion coil h ce betwee | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition o | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>Л-46, "E</u> | <u>xplode</u> | | |
| YES NO 13.CHI Refer to Compo 1.CHEC . Turn 2. Disc 3. Chec Terminal | >> GO TO >> Replace ECK INTEF GI-42, "Inte >> INSPEC nent Ins K IGNITIC ignition sw onnect igni ck resistance s Resistance | 13. MITTEN MITTEN Trinittent I CTION EN Pection N COIL V Vitch OFF. tion coil h ce betwee | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition of 25°C (77°F)] | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>Л-46, "Е</u> | <u>kplode</u> | | |
| YES NO 13. CHI Refer to y Compo 1. CHEC . Turn 2. Disc 3. Chec Terminal 1 and 2 | >> GO TO >> Replace ECK INTEF GI-42. "Inter >> INSPEC nent Ins CK IGNITIC ignition sw onnect igni ck resistant s Resistant | 13. emalfunc RMITTEN ermittent I CTION EN pection N COIL V vitch OFF. tion coil h ce betwee | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition of 25°C (77°F)] | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>//-46, "E</u> | <u>kplode</u> | | |
| YES NO I 3.CHI Refer to 9 Compo I.CHEC . Turn 2. Disc 3. Chec Terminal 1 and 2 1 and 3 | >> GO TO >> Replace ECK INTEF GI-42, "Inter >> INSPEC nent Ins K IGNITIC ignition sw onnect igni ck resistant s Resistant | 13. MITTEN MITTEN Trinittent I CTION EN Pection N COIL V Vitch OFF. tion coil h ce betwee | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition o | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>Л-46, "Е</u> | <u>kplode</u> | | |
| YES NO I 3.CHI Refer to y Compo I.CHEC . Turn 2. Disc 3. Chec Terminal 1 and 2 1 and 3 2 and 3 | >> GO TO >> Replace ECK INTEF GI-42. "Inter >> INSPEC nent Ins CK IGNITIC ignition sw onnect igni ck resistant s Resistant | 13. MITTEN MITTEN CTION EN Pection N COIL V itch OFF. tion coil h ce betwee nce (Ω) [at 2 Except 0 o | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition of $25^{\circ}C (77^{\circ}F)$] r ∞ | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>Л-46, "E</u> | <u>kplode</u> | | |
| YES NO I 3.CHI Refer to 9 Compo I.CHEC . Turn 2. Disc 3. Chec Terminal 1 and 2 1 and 3 2 and 3 5 the ins | >> GO TO >> Replace ECK INTEF GI-42. "Inte >> INSPEC nent Ins CK IGNITIC ignition sw onnect igni ck resistant s Resistant s Resistant pection res | 13. MITTEN AMITTEN | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition of $25^{\circ}C (77^{\circ}F)$] r ∞ | IT Coil wi ER TRAN | th Power | er Tra | nsisto | | <u>Л-46, "Е</u> | <u>kplode</u> | | |
| YES NO I 3.CHI Refer to 9 Compo I.CHEC . Turn 2. Disc 3. Chec Terminal 1 and 2 1 and 3 2 and 3 5 the ins YES | >> GO TO >> Replace ECK INTEF GI-42, "Inter >> INSPEC nent Ins K IGNITIC ignition sw onnect igni ck resistant s Resistant s Resistant pection res >> GO TO | 13. MITTEN AMITTEN | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition of $25^{\circ}C (77^{\circ}F)$] r ∞ | IT Coil wi ER TRAN nector. coil termin | th Power ISISTOR-I als as per t | er Trai | owing. | r) | | | INFOID:000000 | 0008156618 |
| YES NO J3. CHI Refer to y Compo I. CHEC . Turn 2. Disc 3. Chec Terminal 1 and 2 1 and 3 2 and 3 2 and 3 S the ins YES NO | >> GO TO >> Replace ECK INTEF GI-42, "Inter >> INSPEC nent Ins CK IGNITIC ignition sw connect igni ck resistant s Resistant ck resistant s Resistant pection res >> GO TO >> Replace | 13. e malfunc RMITTEN ermittent I CTION EN pection N COIL V ritch OFF. tion coil h ce betwee nce (Ω) [at 2 Except 0 o Except 0 cult norma 2. e malfunc | tioning igni T INCIDEN ncident". ND (Ignition VITH POW arness cor en ignition of $25^{\circ}C (77^{\circ}F)$] r ∞) al? tioning igni | IT Coil wi ER TRAN nector. coil termin | th Power | transis | owing. | r) | | | INFOID:000000 | 0008156618 |

Perform the following procedure in a place where with no combustible objects and good ventilation.

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
 NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 4. Start engine.
- 5. After engine stalls, crank it two or three times to release all fuel pressure.
- 6. Turn ignition switch OFF.
- 7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 8. Remove ignition coil and spark plug of the cylinder to be checked.
- 9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 10. Connect spark plug and harness connector to ignition coil.
- 11. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- During the operation, always stay 0.5 m (1.6 ft) or more away from the spark plug and ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

When the gap is less than 13 mm (0.52 in), spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-46, "Exploded View".

Component Inspection (Condenser)

1.CHECK CONDENSER

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser harness connector.

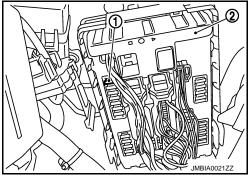
3. Check resistance between condenser terminals as per the following.

| Terminals | Resistance (M Ω) |
|-----------|--------------------------|
| 1 and 2 | Above 1 [at 25°C (77°F)] |

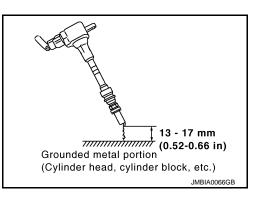
Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.



[VQ37VHR]





Revision: 2012 July

MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

MALFUNCTION INDICATOR LAMP

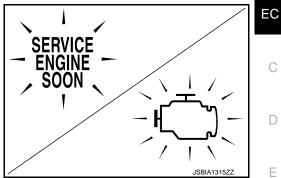
Description

The Malfunction Indicator Lamp (MIL) is located on the combination meter.

The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.

When the engine is started, the MIL should turn off. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.

For details, refer to <u>EC-134. "DIAGNOSIS DESCRIPTION : Malfunc-</u> tion Indicator Lamp (MIL)".



Component Function Check

| 1. CHECK MIL FUNCTION | F |
|--|----|
| Turn ignition switch ON. Make sure that MIL illuminates. <u>Is the inspection result normal?</u> YES >> INSPECTION END NO >> Go to <u>EC-523, "Diagnosis Procedure"</u>. | G |
| Diagnosis Procedure | 11 |
| 1.CHECK DTC | I |
| Check that DTC UXXXX is not displayed. <u>Is the inspection result normal?</u> YES >> GO TO 2. NO >> Perform trouble diagnosis for DTC UXXXX. 2.CHECK DTC WITH "UNIFIED METER AND A/C AMP." | J |
| Refer to <u>MWI-36, "CONSULT Function (METER/M&A)"</u> . | Κ |
| Is the inspection result normal? YES >> GO TO 3. NO >> Repair or replace. 3.CHECK INTERMITTENT INCIDENT | L |
| Refer to GI-42, "Intermittent Incident". | Μ |
| <u>Is the inspection result normal?</u> YES >> Replace combination meter. Refer to <u>MWI-111, "Removal and Installation"</u> . NO >> Repair or replace. | Ν |

INFOID:000000008156620

INFOID:000000008156621

А

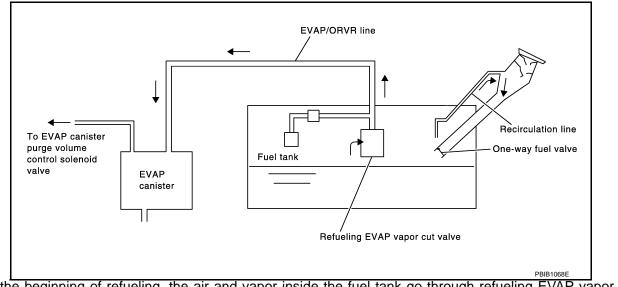
Ο

Ρ

< DTC/CIRCUIT DIAGNOSIS >

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

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.
- Never smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Always 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-595, "Inspection".
- Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Never kink or twist hose and tube when they are installed.
- Never tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leaks at connections.
- Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

Component Function Check

INFOID:000000008156624

INFOID:00000008156625

[VQ37VHR]

INFOID:000000008156623

1.CHECK ORVR FUNCTION

Check whether the following symptoms are present.

- Fuel odor from EVAP canister is strong.
- Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Are any symptoms present?

YES >> Go to <u>EC-524</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

Check whether the following symptoms are present. A: Fuel odor from EVAP canister is strong.

| ON BOARD REFUELING VAPOR RECOVERY (ORVR) < DTC/CIRCUIT DIAGNOSIS > [VQ37V | HR1 |
|--|--------------------|
| B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling. | |
| Which symptom is present? | A |
| A >> GO TO 2. | |
| B >> GO TO 7. | EC |
| 2.CHECK EVAP CANISTER | |
| Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure se attached. | nsor |
| Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure se attached. | ensor ^C |
| The weight should be less than 2.2 kg (4.9 lb). | D |
| Is the inspection result normal? YES >> GO TO 3. | |
| NO $>>$ GO TO 4. | |
| 3. CHECK IF EVAP CANISTER IS SATURATED WITH WATER | E |
| Check if water will drain from EVAP canister (1). | |
| • 2 : EVAP canister vennt control valve | F |
| Does water drain from the EVAP canister? | - |
| YES >> GO TO 4. NO >> GO TO 6. | |
| NO >> GO TO 6. | (|
| | |
| | ŀ |
| | |
| PBIB2731 | IE |
| 4. REPLACE EVAP CANISTER | |
| Replace EVAP canister with a new one. Refer to FL-14, "Removal and Installation". | |
| | |
| >> GO TO 5. | |
| 5. DETECT MALFUNCTIONING PART | |
| Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection. | ŀ |
| · · Densir er replace EVAD bess. Defer to EM 20. "Evaleded View" | |
| >> Repair or replace EVAP hose. Refer to <u>EM-29, "Exploded View"</u> . | L |
| | |
| Refer to EC-527, "Component Inspection". | Ν |
| Is the inspection result normal? | ľ |
| YES >> INSPECTION END NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to <u>FL-11</u> , " <u>Removal and Installat</u> | tion". |
| 7. CHECK EVAP CANISTER | |
| Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure se | neor |
| attached. | |
| Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure se attached. | ensor |
| The weight should be less than 2.2 kg (4.9 lb). <u>Is the inspection result normal?</u> | F |
| YES >> GO TO 8. | |
| NO >> GO TO 9. | |
| | |

8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

< DTC/CIRCUIT DIAGNOSIS >

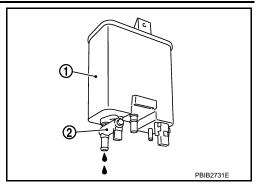
[VQ37VHR]

Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 9. NO >> GO TO 11.



9.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-14, "Exploded View".

>> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to EM-29, "Exploded View".

11.CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace hoses and tubes.

12.CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

- YES >> GO TO 13.
- NO >> Replace filler neck tube.

13. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-527. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11, "Removal and Installation".

14.CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube.

15.CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 16.

```
NO >> Repair or replace one-way fuel valve with fuel tank. Refer to FL-11, "Removal and Installation".
```

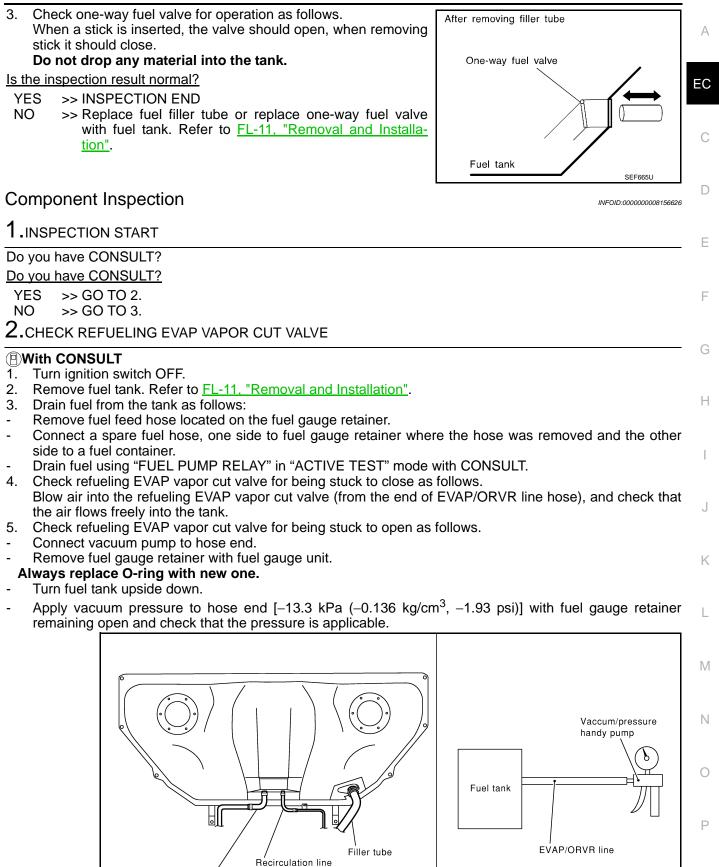
16.CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.

2. Remove fuel filler tube and hose.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



Is the inspection result normal? YES >> INSPECTION END

Revision: 2012 July

EVÁP/ORVR line

PBIB1035E

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11. "Removal and Installation".

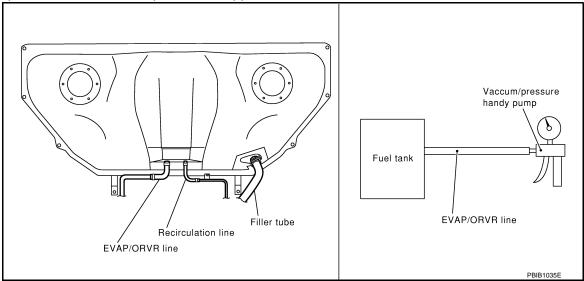
3.CHECK REFUELING EVAP VAPOR CUT VALVE

Without CONSULT

- 1. Turn ignition switch OFF.
- 2. Remove fuel tank. Refer to FL-11, "Removal and Installation".
- 3. Drain fuel from the tank as follows:
- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container.
- 4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
- Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- 5. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm³, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11, "Removal and Installation".

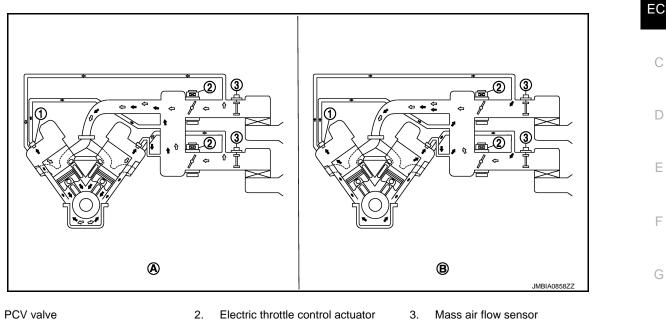
< DTC/CIRCUIT DIAGNOSIS >

POSITIVE CRANKCASE VENTILATION

Description

INFOID:000000008156627

[VQ37VHR]



A. Normal condition

B. Hi-load condition

<⊓ : Fresh air

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E : Blow-by air

This system returns blow-by gas to the intake manifold.

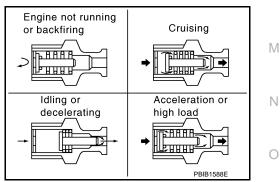
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



Component Inspection

INFOID:000000008156628

1.CHECK PCV VALVE

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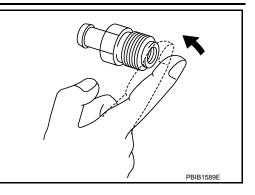
POSITIVE CRANKCASE VENTILATION

< DTC/CIRCUIT DIAGNOSIS >

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace PCV valve. Refer to <u>EM-46, "Exploded View"</u>.

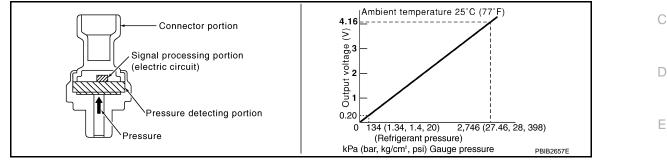


< DTC/CIRCUIT DIAGNOSIS >

REFRIGERANT PRESSURE SENSOR

Description

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 FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | |
|-----------|---|-----------------|-------------|---------------------|
| Connector | + | - | Voltage (V) | |
| Connector | Terminal | Terminal | | |
| M107 | 105 (Refrigerant pressure sensor signal) | 112 | 1.0 - 4.0 | |
| YES >> | ection result normal? • INSPECTION END • Go to <u>EC-531, "Diagnosis Proc</u> | <u>edure"</u> . | | |
| Diagnosi | s Procedure | | | INF0ID:000000081566 |
| | | | | |

1.CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF.
- 2. Turn ignition switch OFF.
- 3. Check ground connection M95. Refer to Ground Inspection in <u>GI-45, "Circuit Inspection"</u>.

Is the inspection result normal?

NO >> Repair or replace ground connection.

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between refrigerant pressure sensor harness connector and ground.

| Ground | Voltage (V) |
|--------------------|-------------|
| Connector Terminal | 3. |
| E77 3 Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3. INFOID:000000008156629

INFOID:000000008156630

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REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

• Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| Refrigerant pre | essure sensor | ECM | | Continuity | |
|-----------------|--------------------|------|----------|------------|--|
| Connector | Connector Terminal | | Terminal | Continuity | |
| E77 | 1 | M107 | 112 | Existed | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

| YES | >> GO TO 6. |
|-----|-------------|
| NO | >> GO TO 5. |

5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

• Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| Refrigerant pre | essure sensor | ECM | | Continuity | |
|-----------------|---------------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| E77 | 2 | M107 | 105 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

• Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to HAC-128, "Removal and Installation".

NO >> Repair or replace.

ECU DIAGNOSIS INFORMATION ECM

Reference Value

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- 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 TIM-ING 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 | Co | Values/Status | |
|-----------------|---|--|--------------------------------------|
| ENG SPEED | Run engine and compare CONSUL | Almost the same speed as the tachometer indication | |
| MAS A/F SE-B1 | See EC-148, "Description". | | |
| MAS A/F SE-B2 | See EC-148, "Description". | | |
| B/FUEL SCHDL | See EC-148, "Description". | | |
| A/F ALPHA-B1 | See EC-148, "Description". | | |
| A/F ALPHA-B2 | See EC-148, "Description". | | |
| COOLAN TEMP/S | Ignition switch: ON | | Indicates engine coolant temperature |
| A/F SEN1 (B1) | Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| A/F SEN1 (B2) | Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| HO2S2 (B1) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | 0 - 0.3 V ←→ Approx. 0.6 1.0 V | |
| HO2S2 (B2) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | 0 - 0.3 V ←→ Approx. 0.6 1.0 V | |
| HO2S2 MNTR (B1) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | $LEAN \longleftrightarrow RICH$ | |
| HO2S2 MNTR (B2) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | $LEAN \leftarrow \rightarrow RICH$ | |
| VHCL SPEED SE | Turn drive wheels and compare CO tion. | Almost the same speed as speedometer indication | |
| BATTERY VOLT | Ignition switch: ON (Engine stopped | 11 - 14 V | |
| ACCEL SEN 1 | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.00 V |
| AUGEL OLIN I | (Engine stopped) | Accelerator pedal: Fully depressed | 4.4 - 4.8 V |

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< ECU DIAGNOSIS INFORMATION >

| Monitor Item | Co | ondition | Values/Status |
|---------------------------|---|--|---|
| ACCEL SEN 2*1 | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.00 V |
| ACCEL SEN 2 | (Engine stopped) | Accelerator pedal: Fully depressed | 4.3 - 4.8 V |
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 1-B1 | (Engine stopped)Selector lever: D (A/T) or 1st (M/T) | Accelerator pedal: Fully depressed | Less than 4.75 V |
| 4 | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 2-B1* ¹ | (Engine stopped)Selector lever: D (A/T) or 1st (M/T) | Accelerator pedal: Fully depressed | Less than 4.75 V |
| FUEL T/TMP SE | Ignition switch: ON | | Indicates fuel tank tempera ture |
| INT/A TEMP SE | Ignition switch: ON | | Indicates intake air temper- ature |
| EVAP SYS PRES | Ignition switch: ON | | Approx. 1.8 - 4.8 V |
| FUEL LEVEL SE | Ignition switch: ON | | Depending on fuel level of fuel tank |
| START SIGNAL | • Ignition switch: $ON \rightarrow START \rightarrow OI$ | N | $OFF \rightarrow ON \rightarrow OFF$ |
| | Ignition switch: ON | Accelerator pedal: Fully released | ON |
| CLSD THL POS | (Engine stopped) | Accelerator pedal: Slightly depressed | OFF |
| | | Air conditioner switch: OFF | OFF |
| AIR COND SIG | Engine: After warming up, idle the engine | Air conditioner switch: ON (Compressor operates.) | ON |
| | | Selector lever: P or N (A/T), Neutral (M/T) | ON |
| P/N POSI SW | Ignition switch: ON | Selector 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 |
| LOAD SIGNAL | Ignition switch: ON | Rear window defogger switch: ON and/or Lighting switch: 2nd position | ON |
| | | Rear window defogger switch and lighting switch: OFF | OFF |
| IGNITION SW | • Ignition switch: $ON \rightarrow OFF \rightarrow ON$ | | $ON \rightarrow OFF \rightarrow ON$ |
| | Engine: After warming up, idle the | Heater fan switch: ON | ON |
| HEATER FAN SW | engine | Heater fan switch: OFF | OFF |
| | | Brake pedal: Fully released | OFF |
| BRAKE SW | Ignition switch: ON | Brake pedal: Slightly depressed | ON |
| | Engine: After warming up Selector lever: P or N (A/T), Neu- | Idle | 2.0 - 3.0 msec |
| INJ PULSE-B1 | tral (M/T)Air conditioner switch: OFFNo load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | Idle | 2.0 - 3.0 msec |
| INJ PULSE-B2 | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | Idle | 7° BTDC |
| IGN TIMING | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | 2,000 rpm | 25° - 45° BTDC |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | Co | ondition | Values/Status | |
|---------------------------|--|---|-------------------|---|
| | Engine: After warming up | ldle | 5% - 35% | - |
| CAL/LD VALUE | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | 2,500 rpm | 5% - 35% | E |
| | Engine: After warming up | Idle | 2.0 - 6.0 g/s | _ |
| MASS AIRFLOW | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | 2,500 rpm | 7.0 - 20.0 g/s | _ |
| PURG VOL C/V | Engine: After warming up Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF | Idle (Accelerator pedal: Not depressed even slightly, after engine starting.) | 0% | _ |
| | No load | 2,000 rpm | - | |
| INT/V TIM (B1) | Engine: After warming up Selector lever: P or N (A/T), Neutral (M/T) | Idle | – 5 - 5°CA | _ |
| | Air conditioner switch: OFF No load | 2,000 rpm | Approx. 0 - 30°CA | _ |
| | Engine: After warming up Selector lever: P or N (A/T), Neu- | Idle | – 5 - 5°CA | _ |
| INT/V TIM (B2) | Selector level: For N (A/F), Neu- tral (M/T) Air conditioner switch: OFF No load | 2,000 rpm | Approx. 0 - 30°CA | |
| INT/V SOL (B1) | Engine: After warming up | Idle | 0 - 2% | _ |
| | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | 2,000 rpm | Approx. 0 - 50% | |
| INT/V SOL (B2) | Engine: After warming up Selector lever: P or N (A/T), Neutral (M/T) | Idle | 0 - 2% | _ |
| | Air conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% | |
| TP SEN 1-B2 | Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | More than 0.36 V | _ |
| IF SEN I-DZ | Selector lever: D (A/T) or 1st (M/T) | Accelerator pedal: Fully depressed | Less than 4.75 V | |
| | Ignition switch: ON (Engine standed) | Accelerator pedal: Fully released | More than 0.36 V | _ |
| ΓΡ SEN 2-B2* ¹ | (Engine stopped) • Selector lever: D (A/T) or 1st (M/T) | Accelerator pedal: Fully depressed | Less than 4.75 V | |
| | • Engine: After warming 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 sEngine running or cranking | ON | _ | |
| | Except above | | OFF | _ |
| /ENT CONT/V | Ignition switch: ON | | OFF | _ |
| THRTL RELAY | Ignition switch: ON | | ON | _ |
| HO2S2 HTR (B1) | - Engine: After warming up | - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at | | |
| | • Engine speed: Above 3,600 rpm | | OFF | _ |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | Co | ondition | Values/Status |
|-------------------------|---|---|---|
| HO2S2 HTR (B2) | Engine speed: Below 3,600 rpm aft Engine: After warming up Keeping the engine speed between idle for 1 minute under no load | ON | |
| | Engine speed: Above 3,600 rpm | | OFF |
| VEHICLE SPEED | Turn drive wheels and compare CC tion. | NSULT value with the speedometer indica- | Almost the same speed as the speedometer indication |
| IDL A/V LEARN | Engine: Running | Idle air volume learning has not been per- formed yet. | YET |
| | | Idle air volume learning has already been performed successfully. | CMPLT |
| ENG OIL TEMP | Engine: After warming up | | More than 70°C (158°F) |
| TRVL AFTER MIL | Ignition switch: ON | Vehicle has traveled after MIL has illumi- nated. | 0 - 65,535 km (0 - 40,723 miles) |
| A/F S1 HTR (B1) | Engine: After warming up, idle the e (More than 140 seconds after starti | | 4 - 100% |
| A/F S1 HTR (B2) | Engine: After warming up, idle the e (More than 140 seconds after starti | | 4 - 100% |
| AC PRESS SEN | Engine: IdleBoth A/C switch and blower fan swi | itch: ON (Compressor operates) | 1.0 - 4.0 V |
| VHCL SPEED SE | Turn drive wheels and compare CC tion. | NSULT value with the speedometer indica- | Almost the same speed as the speedometer indication |
| SET VHCL SPD | Engine: Running ASCD: Operating | | The preset vehicle speed is displayed |
| | | MAIN switch: Pressed | ON |
| MAIN SW | Ignition switch: ON | MAIN switch: Released | OFF |
| CANCEL SW | | 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 | | RESUME/ACCELERATE switch: Re- leased | OFF |
| SET SW | Ignition switch: ON | SET/COAST switch: Pressed | ON |
| 3ET 3W | • Ignition switch. ON | SET/COAST switch: Released | OFF |
| BRAKE SW1 | | Brake pedal: Fully released | ON |
| (ICC/ASCD brake switch) | Ignition switch: ON | Brake pedal: Slightly depressed | OFF |
| BRAKE SW2 | Ignition switch: ON | Brake pedal: Fully released | OFF |
| (Stop lamp switch) | - | Brake pedal: Slightly depressed | ON |
| VHCL SPD CUT | Ignition switch: ON | NON | |
| LO SPEED CUT | Ignition switch: ON | NON | |
| AT OD MONITOR | Ignition switch: ON | OFF | |
| AT OD CANCEL | Ignition switch: ON | | OFF |
| SET LAMP | Set switch: ON Vehicle Speed: Between 40 km/h (25 MPH) and 144 km/h (20 MPH) | SET/COAST switch: Pressed SET/COAST switch: Released | ON OFF |
| CRUISE LAMP | | (25 MPH) and 144 km/h (89 MPH)SET/COAST switch: Releasedgnition switch: ONMAIN switch: Pressed at the 1st time \rightarrow at the 2nd time | |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | C | ondition | Values/Status |
|---------------------------------|---|---|-----------------------|
| BAT CUR SEN | Engine speed: Idle Battery: Fully charged*² Selector lever: P or N (A/T), Neutra Air conditioner switch: OFF No load | Approx. 2,600 - 3,500 mV | |
| ALT DUTY | Engine: Idle | | 0 - 80% |
| ATOM PRES SEN | This item is displayed but is not ap | plicable to this model. | <u> </u> |
| BRAKE BST PRES SE | This item is displayed but is not ap | plicable to this model. | |
| | Engine: After warming up | Idle | Approx. 0.25 - 1.40 V |
| VVEL POSITION SEN-B1 | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0.25 - 4.75 V |
| | Engine: After warming up | Idle | Approx. 0.25 - 1.40 V |
| VVEL POSITION SEN-B2 | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0.25 - 4.75 V |
| | Engine: After warming up | Idle | Approx. 0 - 20 deg |
| VVEL TIM-B1 | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| | Engine: After warming up | Idle | Approx. 0 - 20 deg |
| VVEL TIM-B2 tral (M • Air co | Selector lever: P or N (A/T), Neutral (M/T) Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| | Ignition switch: OFF → ON (After warming up) | VVEL learning has not been performed yet. | YET |
| VVEL LEARN | | VVEL learning has already been per- formed successfully. | DONE |
| VVEL SEN LEARN- B1 | VVEL learning has already been pe | erformed successfully | Approx. 0.30 - 0.80 V |
| VVEL SEN LEARN- B2 | VVEL learning has already been pe | erformed successfully | Approx. 0.30 - 0.80 V |
| A/F ADJ-B1 | Engine: Running | | -0.330 - 0.330 |
| A/F ADJ-B2 | Engine: Running | | -0.330 - 0.330 |
| FAN DUTY | Engine: Running | | 0 - 100% |
| ALT DUTY SIG | Power generation voltage variable | control: Operating | ON |
| | Power generation voltage variable | control: Not operating | OFF |
| EVAP LEAK DIAG | Ignition switch: ON | Depending on condition of EVAP leak diagnosis | |
| EVAP DIAG READY | Ignition switch: ON (READY) | Depending on ready condi- tion of EVAP leak diagnosis | |
| | DTC P0139 self-diagnosis (delayed) | d response) has not been performed yet. | INCMP |
| HO2 S2 DIAG1 (B1) | DTC P0139 self-diagnosis (delayed response) has already been performed successfully. | | CMPLT |
| | DTC P0159 self-diagnosis (delayed) | d response) has not been performed yet. | INCMP |
| HO2 S2 DIAG1 (B2) | DTC P0159 self-diagnosis (delayed successfully. | d response) has already been performed | CMPLT |

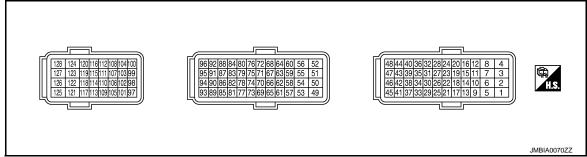
< ECU DIAGNOSIS INFORMATION >

| Monitor Item | Condition | Values/Status |
|-------------------|--|---------------|
| | DTC P0139 self-diagnosis (slow response) has not been performed yet. | INCMP |
| HO2 S2 DIAG2 (B1) | DTC P0139 self-diagnosis (slow response) has already been performed successfully. | CMPLT |
| | DTC P0159 self-diagnosis (slow response) has not been performed yet. | INCMP |
| HO2 S2 DIAG2 (B2) | DTC P0159 self-diagnosis (slow response) has already been performed successfully. | CMPLT |
| A/F SEN1 DIAG1 | DTC P015A and P015B self-diagnosis incomplete. | INCMP |
| (B1) | DTC P015A and P015B self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG1 | DTC P015C and P015D self-diagnosis incomplete. | INCMP |
| (B2) | DTC P015C and P015D self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG2 | DTC P014C and P014D self-diagnosis incomplete. | INCMP |
| (B1) | DTC P014C and P014D self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG2 | DTC P014E and P014F self-diagnosis incomplete. | INCMP |
| (B2) | DTC P014E and P014F self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG3 | The vehicle condition is not within the diagnosis range of DTC P014C, P014D, P015A or P015B. | ABSNT |
| (B1) | The vehicle condition is within the diagnosis range of DTC P014C, P014D, P015A or P015B. | PRSNT |
| A/F SEN1 DIAG3 | The vehicle condition is not within the diagnosis range of DTC P014E, P014F, P015C or P015D. | ABSNT |
| (B2) | The vehicle condition is within the diagnosis range of DTC P014E, P014F, P015C or P015D. | PRSNT |
| THRTL STK CNT B1 | This item is displayed but is not applicable to this model. | |

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to <u>PG-3</u>, "<u>How to</u> <u>Handle Battery</u>".

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- ECM is located behind the instrument assist lower panel. For this inspection, remove passenger side instrument lower panel.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| | nal No. e color) | Description | | Condition | Value | / |
|-----------|---------------------|--|------------------|--|--|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) | E |
| 1 (W) | 128 (B) | A/F sensor 1 heater (bank 1) | Output | [Engine is running] Warm-up condition Idle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★ 50mSec/div 50mSec/div 50/div JMBIA0030GB | (|
| 2 | 128 | Throttle control motor | Output | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully depressed | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div 500µSec/div JMBIA0031GB | [|
| (G) (B) | (B) | (Open) (bank 1) | n) (bank 1) | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: Fully released | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div JMBIA0032GB | ŀ |
| 3 (R) | 128 (B) | Throttle control motor power supply (bank 1) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | , |
| 4 (BR) | 128 (B) | Throttle control motor (Close) (bank 1) | Output | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500µSec/div € 5V/div JMBIA0033GB | ŀ |
| 5 (W) | 128 (B) | A/F sensor 1 heater (bank 2) | Output | [Engine is running] Warm-up condition Idle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★ 50mSec/div 50mSec/div 50/div JMBIA0030GB | 1 |
| 8 (B) | | ECM ground | _ | | _ | (|

Ρ

< ECU DIAGNOSIS INFORMATION >

| | inal No. e color) | Description | | Condition | Value | |
|------------|----------------------|---|--|---|---|--------------------------------|
| + | | Signal name | Input/ Output | | (Approx.) | |
| 11 (GR) | | Ignition signal No. 4 | | [Engine is running] | 0 - 0.2 V★ 50mSec/div | |
| 12 (L) | | Ignition signal No. 3 | | Warm-up condition Idle speed NOTE: | | |
| 15 (V) | 128 | Ignition signal No. 5 | Output | The pulse cycle changes depending on rpm at idle | 2V/div JMBIA0035GB | |
| 16 (G) | (B) | Ignition signal No. 2 | Output | | 0.1 - 0.4 V★ 50mSec/div | |
| 19 (SB) | | Ignition signal No. 6 | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | | |
| 20 (Y) | | Ignition signal No. 1 | | | | |
| 17 (P) | 128 (B) | Heated oxygen sensor 2 heater (bank 1) | Output | [Engine is running] Engine speed: Below 3,600 rpm after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 10 V★ 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div | |
| | | | | | [Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm | BATTERY VOLTAGE (11 - 14 V) |
| | | | | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) | |
| | 128 (B) | | [Engine is running]Warm-up conditionEngine speed: 2,000rpm | 7 - 12 V★ | | |

< ECU DIAGNOSIS INFORMATION >

| | | nal No. e color) | Description | | Condition | Value | А |
|---|-----------|---------------------|--|----------------------------------|---|---|-------------|
| | + | | Signal name | Input/ Output | Condition | (Approx.) | |
| | 21 | 128 | EVAP canister purge vol- | | [Engine is running]Idle speedAccelerator pedal: Not depressed even slightly, after engine starting | BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div € 10V/div JMBIA0039GB | C D |
| (| GR) | (B) | ume control solenoid valve | Output | [Engine is running] Engine speed: About 2,000 rpm (More than 100 seconds after starting engine) | BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div € 10V/div JMBIA0040GB | E F G |
| | 22 (R) | 128 (B) | Fuel pump relay | Output | [Ignition switch: ON] For 1 second after turning ignition switch ON [Engine is running] [Ignition switch: ON] More than 1 second after turning ignition switch ON | 0 - 1.5 V BATTERY VOLTAGE (11 - 14 V) | H |
| | 24 (P) | 128 (B) | ECM relay (Self shut-off) | Output | [Engine is running] [Ignition switch: OFF] A few seconds after turning ignition switch OFF [Ignition switch: OFF] More than a few seconds after turning ignition switch OFF | 0 - 1.5 V BATTERY VOLTAGE (11 - 14 V) | J |
| | 25 (O) | 128 (B) | Throttle control motor re- lay | Output | [Ignition switch: ON \rightarrow OFF] | 0 - 1.0 V ↓ BATTERY VOLTAGE (11 - 14 V) ↓ 0 V 0 - 1.0 V | L |
| | 28 BR) | 128 (B) | VVEL actuator motor re- lay abort signal [VVEL control module] | Output | [Ignition switch: ON] [Engine is running] • Warm-up condition • Idle speed | 0 V | Ν |
| | | | | | [Engine is running] • Warm-up condition • Idle speed | BATTERY VOLTAGE (11 - 14 V) | 0 |
| _ | 29 (G) | 128 (B) | Intake valve timing con- trol solenoid valve (bank 2) | trol solenoid valve (bank Output | [Engine is running] • Warm-up condition • Engine speed: 2,000rpm | 7 - 12 V★ | Ρ |

< ECU DIAGNOSIS INFORMATION >

| | inal No. e color) | Description | | Condition | Value |
|------------|----------------------|---|------------------|---|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 30 | 40 | Throttle position sensor 1 (bank 1) | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released | More than 0.36 V |
| (Y) | (R) | | mpar | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: Fully depressed | Less than 4.75 V |
| 31 | 48 | Throttle position sensor | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released | More than 0.36 V |
| (R) | (B) | 1 (bank 2) | input | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: Fully depressed | Less than 4.75 V |
| 33 (SB) | 128 (B) | Heated oxygen sensor 2 heater (bank 2) | Output | [Engine is running] Engine speed: Below 3,600 rpm after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 10 V★ 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div JMBIA0037GB |
| | | | | [Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm | BATTERY VOLTAGE (11 - 14 V) |
| 34 | 40 | Throttle position sensor 2 (bank 1) | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released | Less than 4.75 V |
| (B) | (R) | | | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully depressed | More than 0.36 V |
| 35 | 48 | Throttle position sensor | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released | Less than 4.75 V |
| (W) | (B) | 2 (bank 2) | πραι | [Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully depressed | More than 0.36 V |
| 36 (O) | | Sensor ground [Brake booster pressure sensor] | _ | _ | _ |

< ECU DIAGNOSIS INFORMATION >

| | inal No. e color) | Description | | Condition | Value | A | | |
|------------|----------------------|---|------------------|---|---|--|-------|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) | | | |
| 37 | 47 | Crankshaft position sen- | | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 4.0 - 5.0 V★ 1mSec/div 2V/div JMBIA0041GB | C D | | |
| (W) | (Y) | sor (POS) | Input | [Engine is running] • Engine speed: 2,000 rpm | 4.0 - 5.0 V★ 1mSec/div 2V/div JMBIA0042GB | E | | |
| 38 | 96 (D) | Manifold absolute pres- | | | Input | [Engine is running] • Warm-up condition • Idle speed | 1.2 V | G |
| (O) | (P) | sure (MAP) sensor | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.5 V | Η | | |
| 39 | 36 | Brake booster pressure | Input | [Engine is running]Warm-up conditionIdle speedBrake pedal: Fully released | 1.2 V | I | | |
| (P) | (O) | sensor | mput | [Engine is running]Warm-up conditionIdle speedBrake pedal: Fully depressed | 3.0 V | J | | |
| 40 (R) | _ | Sensor ground [Throttle position sensor (bank 1)] | _ | _ | _ | r X | | |
| 43 (G) | 48 (B) | Sensor power supply [Throttle position sensor (bank 2)] | _ | [Ignition switch: ON] | 5 V | L | | |
| 44 (L) | 40 (R) | Sensor power supply [Throttle position sensor (bank 1)] | _ | [Ignition switch: ON] | 5 V | Μ | | |
| 45 (LG) | 36 (O) | Sensor power supply [Brake booster pressure sensor] | | [Ignition switch: ON] | 5 V | Ν | | |
| 46 (R) | 47 (Y) | Sensor power supply [Crankshaft position sensor (POS)] | | [Ignition switch: ON] | 5 V | 0 | | |
| 47 (Y) | _ | Sensor ground [Crankshaft position sensor (POS)] | | _ | _ | Ρ | | |
| 48 (B) | _ | Sensor ground [Throttle position sensor (bank 2)] | | _ | _ | | | |

< ECU DIAGNOSIS INFORMATION >

| | inal No. e color) | Description | | Condition | Value |
|------------|----------------------|---|------------------|--|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 49 (GR) | 128 (B) | Throttle control motor (Close) (bank 2) | Output | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div 500µSec/div 500µSec/div |
| 50 (V) | 128 (B) | Throttle control motor (Open) (bank 2) | Output | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: Fully depressed | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div 500µSec/div JMBIA0031GB |
| (*) | (В) | (Open) (bank 2) | | [Ignition switch: ON] Engine stopped Selector lever: D (A/T) or 1st (M/T) Accelerator pedal: Fully released | 0 - 14 V★ 500μSec/div 50/μSec/div 50/μSec/div 50/μSec/div 50/μSec/div |
| 52 (R) | 128 (B) | Throttle control motor power supply (bank 2) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 53 (W) | 128 (B) | Ignition switch | Input | [Ignition switch: OFF] [Ignition switch: ON] | 0 V BATTERY VOLTAGE (11 - 14 V) |
| 54 (Y) | | CAN communication line [VVEL control module] | Input/ output | _ | |
| 55 (LG) | _ | CAN communication line [VVEL control module] | Input/ output | _ | _ |
| 57 (L) | 128 (B) | A/F sensor 1 (bank 1) | Input | [Ignition switch: ON] | 2.2 V |
| 59 | 128 (B) | Camshaft position sen- sor (PHASE) (bank 1) | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div € 2V/div JMBIA0045GB |
| (O) | | | mput | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 5 2V/div JMBIA0046GB |

< ECU DIAGNOSIS INFORMATION >

| | nal No. color) | Description | | Condition | Value |
|------------|-------------------|--|------------------|---|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 60 (G) | 96 (P) | Sensor power supply [Camshaft position sen- sor (PHASE) (bank 1), Manifold absolute pres- sure (MAP) sensor, Pow- er steering pressure sensor] | _ | [Ignition switch: ON] | 5 V |
| 61 (R) | 128 (B) | A/F sensor 1 (bank 1) | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.8 V Output voltage varies with air fuel ratio. |
| 63 92 | 92 | Camshaft position sen- | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div 5 2V/div JMBIA0045GB |
| (L) | (G) | sor (PHASE) (bank 2) | niput | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 20mSec/div 20v/div JMBIA0046GB |
| 64 (SB) | 92 (G) | Sensor power supply [Camshaft position sen- sor (PHASE) (bank 2), Battery current sensor] | _ | [Ignition switch: ON] | 5 V |
| 65 (LG) | 128 (B) | A/F sensor 1 (bank 2) | Input | [Ignition switch: ON] | 2.2 V |
| 66 (V) | 128 (B) | A/F sensor 1 (bank 2) | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.8 V Output voltage varies with air fuel ratio. |
| 67 (P) | 68 (LG) | Intake air temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with intake air temperature. |
| 68 (LG) | _ | Sensor ground [Mass air flow sensor (bank 1), Intake air tem- perature sensor] | _ | _ | _ |
| 69 (W) | 128 (B) | Knock sensor (bank 2) | Input | [Engine is running] • Idle speed | 2.5 V*1 |
| 71 (Y) | 84 (B) | Engine coolant tempera- ture sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine coolant temperature. |
| 72 (—) | _ | Sensor ground (Knock sensor) | _ | _ | _ |
| 73 (W) | 128 (B) | Knock sensor (bank 1) | Input | [Engine is running] • Idle speed | 2.5 V* ¹ |

< ECU DIAGNOSIS INFORMATION >

| | nal No. e color) | Description | | Oraclitica | Value |
|------------|---------------------|--|------------------|---|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 76 (W) | 128 (B) | Heated oxygen sensor 2 (bank 1) | Input | [Engine is running] Revving engine from idle to 3,000 rpm quickly after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| 77 | 68 | Mass air flow sensor | Input | [Engine is running] • Warm-up condition • Idle speed | 0.7 - 1.2 V |
| (SB) | (LG) | (bank 1) | | [Engine is running]Warm-up conditionEngine speed: 2,500 rpm | 1.3 - 1.7 V |
| 78 (G) | 84 (B) | Engine oil temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine oil temperature. |
| 79 | 94 | Mass air flow sensor | laaut | [Engine is running] • Warm-up condition • Idle speed | 0.7 - 1.2 V |
| (BR) | (Y) | (bank 2) | Input | [Engine is running]Warm-up conditionEngine speed: 2,500 rpm | 1.3 - 1.7 V |
| 80 (O) | 128 (B) | Heated oxygen sensor 2 (bank 2) | Input | [Engine is running] Revving engine from idle to 3,000 rpm quickly after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| 81 (R) | | Fuel injector No. 3 | | | BATTERY VOLTAGE (11 - 14 V)★ |
| 82 (V) | | Fuel injector No. 6 | | [Engine is running] • Warm-up condition • Idle speed NOTE: | 50mSec/div |
| 85 (BR) | | Fuel injector No. 2 | | The pulse cycle changes depending on rpm at idle | |
| 86 (W) | 128 (B) | Fuel injector No. 5 | Output | | 10V/div JMBIA0047GB BATTERY VOLTAGE (11 - 14 V)★ |
| 89 (GR) | | Fuel injector No. 1 | | [Engine is running] • Warm-up condition • Engine speed: 2,000 rpm | 50mSec/div |
| 90 (O) | | Fuel injector No. 4 | ector No. 4 | - Engine speed. 2,000 tpttt | 10V/div JMBIA0048GB |
| 84 (B) | _ | Sensor ground (Heated oxygen sensor 2, Engine coolant tem- perature sensor, Engine oil temperature sensor) | _ | _ | _ |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| | nal No. e color) | Description | | Que dition | Value | | |
|------------|---------------------|--|------------------|---|---|-------------|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) | | |
| 87 | 96 | Power steering pressure | Quitout | [Engine is running] • Steering wheel: Being turned | 0.5 - 4.5 V | E | |
| (Y) | (P) | sensor | Output | [Engine is running] • Steering wheel: Not being turned | 0.4 - 0.8 V | - | |
| 91 (SB) | 95 (G) | Battery current sensor | Input | [Engine is running] Battery: Fully charged^{*2} Idle speed | 2.6 - 3.5 V | - | |
| 92 (G) | _ | Sensor ground [Camshaft position sen- sor (PHASE) (bank 2)] | _ | _ | _ | - | |
| 93 (P) | 128 (B) | Power supply for ECM (Back-up) | Input | [Ignition switch: OFF] | BATTERY VOLTAGE (11 - 14 V) | - | |
| 94 (Y) | | Sensor ground [Mass air flow sensor (bank 2)] | _ | _ | _ | - | |
| 95 (G) | | Sensor ground (Battery current sensor) | | _ | - | - | |
| 96 (P) | _ | Sensor ground [Camshaft position sen- sor (PHASE) (bank 1), Manifold absolute pres- sure (MAP) sensor, Pow- er steering pressure sensor] | _ | | _ | _ | |
| 97 | 100 | Accelerator pedal posi- | lasut | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released | 0.45 - 1.00 V | - | |
| (R) | (W) | | tion sensor 1 | Input | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed | 4.2 - 4.8 V | _ |
| 98 | 104 | | Input | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released | 0.22 - 0.50 V | - | |
| (P) | (GR) | | input | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed | 2.1 - 2.5 V | _ | |
| 99 (L) | 100 (W) | Sensor power supply (Accelerator pedal posi- tion sensor 1) | _ | [Ignition switch: ON] | 5 V | - | |
| 100 (W) | | Sensor ground (Accelerator pedal posi- tion sensor 1) | _ | _ | _ | - | |

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< ECU DIAGNOSIS INFORMATION >

| | nal No. e color) | Description | | Condition | Value |
|-------------|---------------------|---|------------------|---|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| | | | | [Ignition switch: ON] • ICC steering switch: OFF | 4.3 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| 101 | 108 | ICC steering switch | | [Ignition switch: ON] • CANCEL switch: Pressed | 1.3 V |
| (SB) | (Y) | (models with ICC sys- tem) | Input | [Ignition switch: ON] RESUME/ACCELERATE switch: Pressed | 3.7 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 3 V |
| | | | | [Ignition switch: ON] • DISTANCE switch: Pressed | 2.2 V |
| | | | | [Ignition switch: ON] • ASCD steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| 101 (SB) | 108 (Y) | ASCD steering switch (models with ASCD sys- tem) | Input | [Ignition switch: ON] • CANCEL switch: Pressed | 1 V |
| () | | | | [Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed | 3 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 2 V |
| 102 (G) | 112 (R) | EVAP control system pressure sensor | Input | [Ignition switch: ON] | 1.8 - 4.8 V |
| 103 (G) | 104 (GR) | Sensor power supply (Accelerator pedal posi- tion sensor 2) | _ | [Ignition switch: ON] | 5 V |
| 104 (GR) | _ | Sensor ground (Accelerator pedal posi- tion sensor 2) | | _ | _ |
| 105 (L) | 112 (R) | Refrigerant pressure sensor | Input | [Engine is running] Warm-up condition Both A/C switch and blower fan motor switch: ON (Compressor operates) | 1.0 - 4.0 V |
| 106 (LG) | 128 (B) | Fuel tank temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with fuel tank temperature. |
| 107 (BR) | 112 (R) | Sensor power supply (EVAP control system pressure sensor, Refrig- erant pressure sensor) | | [Ignition switch: ON] | 5 V |
| 108 (Y) | _ | Sensor ground (ASCD/ICC steering switch) | _ | | _ |
| 109 | 128 (P) | PNP signal | Input | [Ignition switch: ON] • Selector lever: P or N (A/T), Neutral (M/ T) | BATTERY VOLTAGE (11 - 14 V) |
| (G) | (B) | | | [Ignition switch: ON] • Selector lever: Except above | 0 V |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| | inal No. e color) | Description | | Condition | Value | А |
|--------------------------|----------------------|---|------------------|---|--|--------|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 110 | 128 | Engine speed output sig- | Output | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 1 V★ 10mSec/div € 2V/div JMBIA0076GB | C D |
| (BR) | (B) | nal | Output | [Engine is running] • Engine speed is 2,000 rpm | 1 V★ 10mSec/div € 2V/div JMBIA0077GB | E |
| 112 (R) | _ | Sensor ground (EVAP control system pressure sensor, Refrig- erant pressure sensor) | _ | _ | _ | G |
| 113 (P) | _ | CAN communication line | Input/ Output | _ | _ | Н |
| 114 (L) | _ | CAN communication line | Input/ Output | _ | _ | I |
| 117 (V) | 128 (B) | Data link connector | Input/ Output | _ | _ | |
| 121 (LG) | 128 (B) | EVAP canister vent con- trol valve | Output | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | J |
| 122 (P) | 128 (B) | Stop lamp switch | Input | [Ignition switch: OFF] • Brake pedal: Fully released [Ignition switch: OFF] • Brake pedal: Slightly depressed | 0 V BATTERY VOLTAGE (11 - 14 V) | К |
| 123 (B) 124 (B) | | ECM ground | _ | _ | _ | L |
| 125 (R) | 128 (B) | Power supply for ECM | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | 111 |
| 126 (BR) | 128 (B) | ICC brake switch (mod- els with ICC system) ASCD brake switch (models with ASCD sys- tem) | Input | [Ignition switch: ON] • Brake pedal: Slightly depressed [Ignition switch: ON] • Brake pedal: Fully released | 0 V BATTERY VOLTAGE (11 - 14 V) | N O |
| 127 (B) 128 (B) | | ECM ground | _ | _ | | Ρ |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

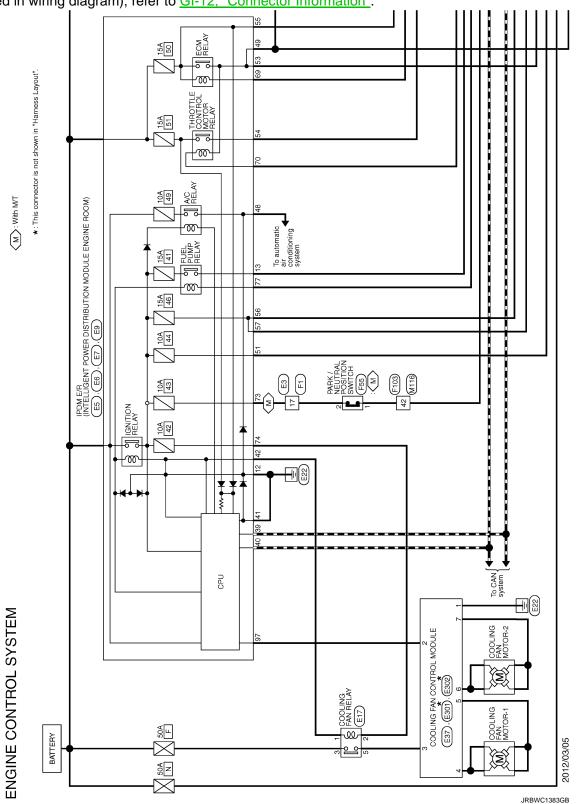
*1: This may vary depending on internal resistance of the tester.

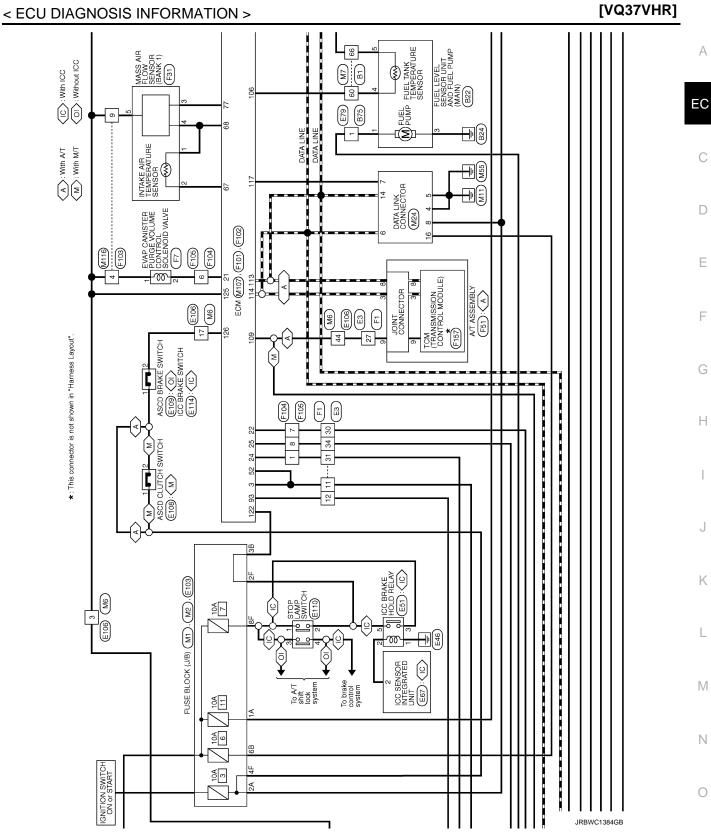
*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to <u>PG-3, "How to</u> <u>Handle Battery"</u>.

Wiring Diagram - ENGINE CONTROL SYSTEM -

INFOID:000000008156633

For connector terminal arrangements, harness layouts, and alphabets in a \bigcirc (option abbreviation; if not described in wiring diagram), refer to <u>GI-12, "Connector Information"</u>.





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< ECU DIAGNOSIS INFORMATION >

STEERING SWITCH

RES / ACCEL

0_0

CANCEL

20

on / OFF)

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10 10 10 10 10 10

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*: This connector is not shown in "Harness Layout"

(<u>_</u>

16 COMBINATION SWITCH SWITCH SPIRAL CABLE 32 M36. (M30)

34

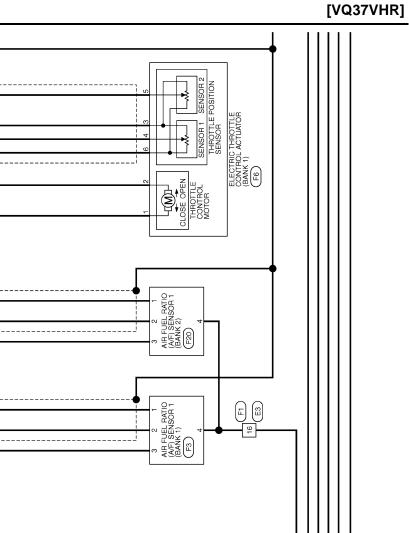
40

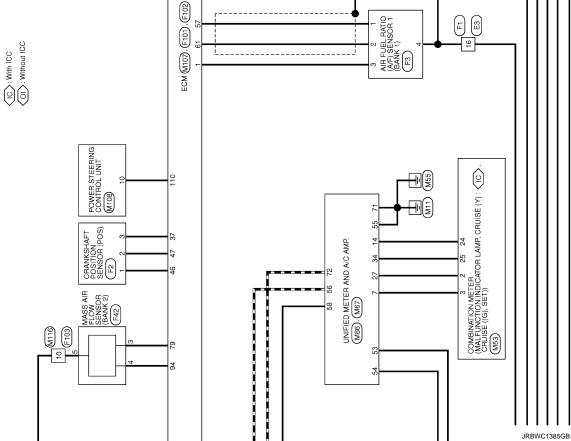
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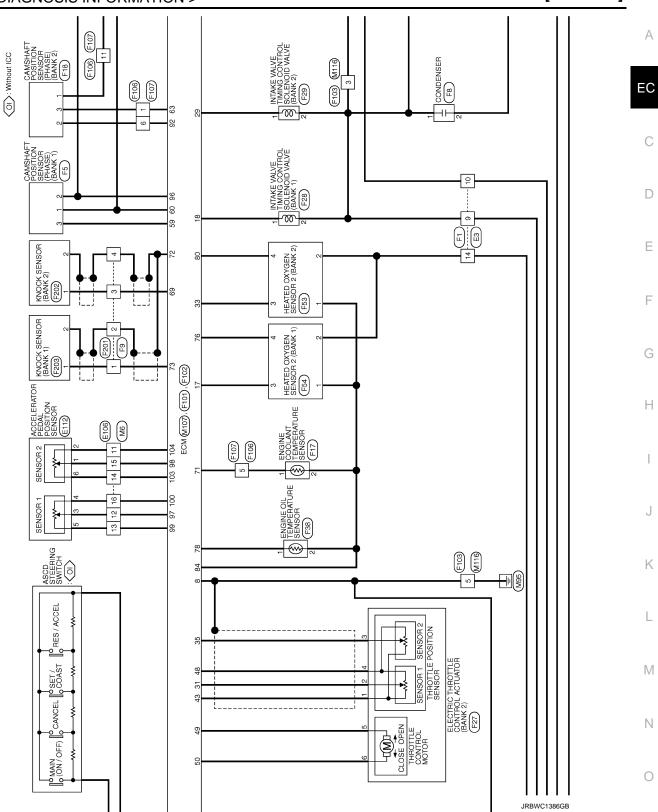




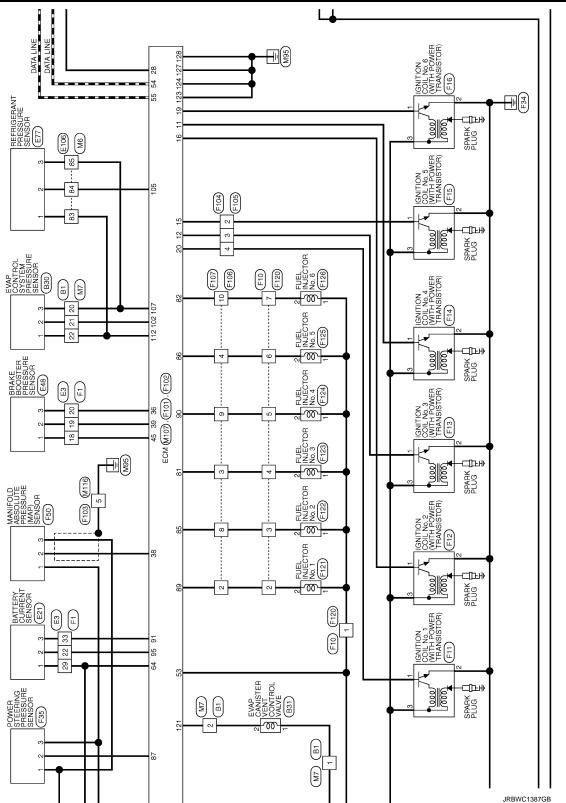
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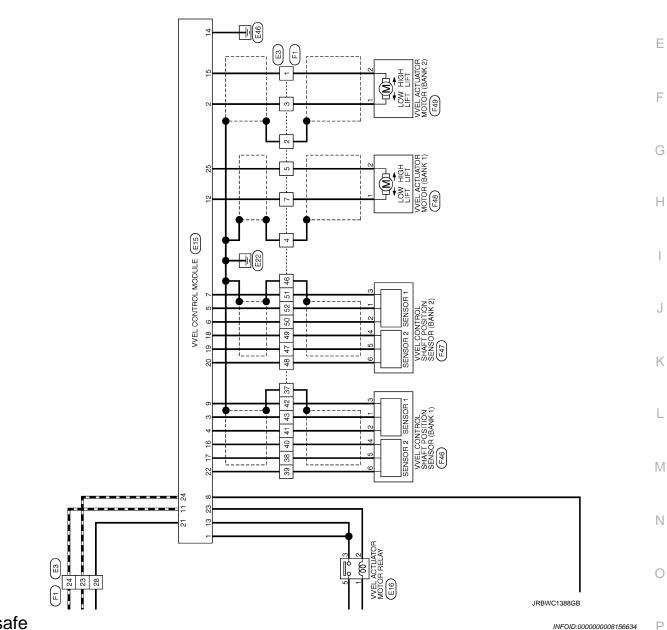


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Fail safe

NON DTC RELATED ITEM



А

EC

С

D

| Engine operating condition in fail-safe mode | Detected items | Remarks | Reference page |
|--|---------------------------------------|--|-------------------|
| Engine speed will not rise more than 2,500 rpm due to the fuel cut | Malfunction indicator lamp circuit | When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the mal- function. | <u>EC-523</u> |

DTC RELATED ITEM

| DTC No. | Detected items | Engine operating condition in fail-safe mode | | | | |
|--|--|---|--|--|--|--|
| U1003 U1024 | Can communication circuit | VVEL actuator motor relay is turned off, and VVEL value is become at a minimam angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | | | |
| P0011 P0021 | Intake valve timing control | The signal is not energized to the intake valve tin control does not function. | ning control solenoid valve and the valve | | | |
| P0102 P0103 P010C P010D | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | |
| P0117 P0118 | Engine coolant tempera- ture sensor circuit | Engine coolant temperature will be determined b CONSULT displays the engine coolant temperature | | | | |
| | | Condition | Engine coolant temperature decided (CONSULT display) | | | |
| | | Just as ignition switch is turned ON or START | 40°C (104°F) | | | |
| | | Approx 4 minutes or more after engine starting | 80°C (176°F) | | | |
| | | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) | | | |
| | | When the fail-safe system for engine coolant temperature sensor is activated, the cooling far operates while engine is running. | | | | |
| P0122 P0123 P0222 P0223 P0227 P0228 P1239 P2132 P2133 P2135 | Throttle position sensor | The ECM controls the electric throttle control actu der for the idle position to be within +10 degrees. The ECM regulates the opening speed of the thro dition. Therefore, the acceleration will be poor. | | | | |
| P0500 | Vehicle speed sensor | The cooling fan operates (Highest) while engine | is running. | | | |
| P0524 | Engine oil pressure | The signal is not energized to the intake valve tin control does not function. Engine speed will not rise more than 2,400 rpm of | - | | | |
| P0605 | ECM | (When ECM calculation function is malfunctioning:) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ECM deactivates ASCD operation. | | | | |
| P0607 | ECM | VVEL actuator motor relay is turned off, and VVE Engine speed will not rise more than 2,500 rpm of | 5 | | | |
| P0643 | Sensor power supply | ECM stops the electric throttle control actuator co opening (approx. 5 degrees) by the return spring | - | | | |

< ECU DIAGNOSIS INFORMATION >

| DTC No. | Detected items | Engine operating condition | ion in fail-safe mode | | |
|---|---|---|---|-------|--|
| P1087 P1088 | VVEL control function | | /VEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | |
| P1089 P1092 | VVEL control shaft position sensor | VVEL value is maintained at a fixed angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut | | | |
| P1608 | VVEL control shaft position sensor | | VVEL actuator motor relay is turned off, and VVEL value is become at a minimam angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut | | |
| P1090 P1093 | VVEL actuator motor | VVEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | | |
| | | VVEL actuator motor relay is turned off, and VV Engine speed will not rise more than 3,500 rpm | | D | |
| P1091 | VVEL actuator motor relay | VVEL actuator motor relay is turned off, and VV Engine speed will not rise more than 3,500 rpm | | | |
| P1233 P2101 | Electric throttle control function | ECM stops the electric throttle control actuator c opening (approx. 5 degrees) by the return spring | | E | |
| P1236 P2118 | Throttle control motor | ECM stops the electric throttle control actuator c opening (approx. 5 degrees) by the return spring | | F | |
| P1238 P2119 | Electric throttle control ac- tuator | (When electric throttle control actuator does not malfunction:) ECM controls the electric throttle actuator by req position. The engine speed will not rise more that | gulating the throttle opening around the idle | G | |
| | | (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 de- grees or less. | | | |
| | | (When ECM detects the throttle valve is stuck open:)While the vehicle is being driven, it slows down gradually because of fuel cut. After the vehicle stops, the engine stalls.The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more. | | | |
| P1290 P2100 P2103 | Throttle control motor relay | ECM stops the electric throttle control actuator c opening (approx. 5 degrees) by the return spring | | J | |
| P1606 | VVEL control module | VVEL actuator motor relay is turned off, and VV Engine speed will not rise more than 3,500 rpm | | K | |
| P1805 | Brake switch | ECM controls the electric throttle control actuator range. Therefore, acceleration will be poor. | r by regulating the throttle opening to a small | L | |
| | | Vehicle condition | Driving condition | | |
| | | When engine is idling | Normal | M | |
| | | When accelerating | Poor acceleration | : V I | |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | The ECM controls the electric throttle control act der for the idle position to be within +10 degrees The ECM regulates the opening speed of the thr dition. Therefore, the acceleration will be poor. | 5. | Ν | |

DTC Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

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< ECU DIAGNOSIS INFORMATION >

| Priority | Detected items (DTC) |
|----------|--|
| 1 | U0101 U1001 U1003 CAN communication line |
| | U1024 VVEL CAN communication line |
| | P0102 P0103 P010C P010D Mass air flow sensor |
| | P010A Manifold absolute pressure (MAP) sensor |
| | P0111 P0112 P0113 P0127 Intake air temperature sensor |
| | P0116 P0117 P0118 P0125 Engine coolant temperature sensor |
| | P0122 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throttle position sensor |
| | P0128 Thermostat function |
| | P0181 P0182 P0183 Fuel tank temperature sensor |
| | P0196 P0197 P0198 Engine oil temperature sensor |
| | P0327 P0328 P0332 P0333 Knock sensor |
| | P0335 Crankshaft position sensor (POS) |
| | P0340 P0345 Camshaft position sensor (PHASE) |
| | P0460 P0461 P0462 P0463 Fuel level sensor |
| | P0500 Vehicle speed sensor |
| | P0555 Brake booster pressure sensor |
| | • P0605 P0607 ECM |
| | P0643 Sensor power supply |
| | P0705 Transmission range switch |
| | P0850 Park/neutral position (PNP) switch |
| | P1089 P1092 P1608 VVEL control shaft position sensor |
| | P1606 P1607 VVEL control module |
| | P1550 P1551 P1552 P1553 P1554 Battery current sensor |
| | • P1610 - P1615 NATS |
| | P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| Priority | Detected items (DTC) | |
|----------|--|---|
| 2 | P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater | - |
| | P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater | |
| | P0075 P0081 Intake valve timing control solenoid valve | |
| | P0130 P0131 P0132 P014C P014D P014E P014F P0150 P0151 P0152 P015A P015B P015C P015D P2096 P2097 P2098 | |
| | P2099 Air fuel ratio (A/F) sensor 1 | |
| | P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 | |
| | P0441 EVAP control system purge flow monitoring P0443 P0444 P0445 EVAP canister purge volume control solenoid valve | |
| | P0443 P0443 EVAP canister purge volume control solehold valve P0447 P0448 EVAP canister vent control valve | |
| | P0451 P0452 P0453 EVAP control system pressure sensor | |
| | P0550 Power steering pressure sensor | |
| | P0603 ECM power supply | |
| | • P0710 P0717 P0720 P0729 P0730 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 | |
| | P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches | |
| | P1087 P1088 VVEL system | |
| | P1090 P1093 VVEL actuator motor | |
| | P1091 VVEL actuator motor relay | |
| | P1217 Engine over temperature (OVERHEAT) | |
| | P1233 P2101 Electric throttle control function | |
| | P1236 P2118 Throttle control motor | |
| | P1290 P2100 P2103 Throttle control motor relay P1805 Brake switch | |
| 0 | | - |
| 3 | P0011 P0021 Intake valve timing control P0101 P010B Mass air flow sensor | |
| | P0101 P010B Mass all now sensor P0171 P0172 P0174 P0175 Fuel injection system function | |
| | P0300 - P0306 Misfire | |
| | P0420 P0430 Three way catalyst function | |
| | P0456 EVAP control system (VERY SMALL LEAK) | |
| | P0506 P0507 Idle speed control system | |
| | P050A P050E Cold start control | |
| | P0524 Engine oil pressure | |
| | P100A P100B VVEL system | |
| | P1148 P1168 Closed loop control | |
| | P1211 TCS control unit | |
| | P1212 TCS communication line | |
| | P1238 P2119 Electric throttle control actuator | |
| | P1564 ICC steering switch / ASCD steering switch | |
| | P1568 ICC command value | |
| | | |
| | P1572 ICC brake switch / ASCD brake switch P1574 ICC vehicle speed sensor / ASCD vehicle speed sensor | |

\times :Applicable —: Not applicable

| DTC* | 1 | Items | SRT | | | Permanent DTC | Reference | N | | |
|------------------------------|--------------------|--|---------------|--|-----------------------------------|---------------|---------------|----------|------|--|
| CONSULT GST* ² | ECM* ³ | | code Trip MIL | | | | Trip MIL | | page | |
| U0101 | 0101* ⁵ | CAN COMM CIRCUIT | _ | 1 | (A/T models) — (M/T models) | В | <u>EC-162</u> | - 1 (| | |
| U1001 | 1001* ⁵ | CAN COMM CIRCUIT | _ | 1 (with ASCD) 1 or 2 (with ICC) | _ | _ | <u>EC-163</u> | F | | |
| U1003 | 1003 | CAN COMM CIRCUIT | — | 2 | — | — | <u>EC-164</u> | | | |
| U1024 | 1024 | VVEL CAN COMM CIRCUIT | — | 1 | × | В | <u>EC-166</u> | | | |
| P0000 | 0000 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | _ | _ | Flashing* ⁸ | _ | _ | _ | | |

< ECU DIAGNOSIS INFORMATION >

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| DTC*1 | | Items | ODT | | | Permanent DTC | Reference |
|------------------------------|-------------------|------------------------|-------------|------|-----|---------------------|---------------|
| CONSULT GST* ² | ECM* ³ | (CONSULT screen terms) | SRT code | Trip | MIL | group* ⁴ | page |
| P0011 | 0011 | INT/V TIM CONT-B1 | × | 2 | × | В | <u>EC-168</u> |
| P0021 | 0021 | INT/V TIM CONT-B2 | × | 2 | × | В | <u>EC-168</u> |
| P0031 | 0031 | A/F SEN1 HTR (B1) | | 2 | × | В | <u>EC-172</u> |
| P0032 | 0032 | A/F SEN1 HTR (B1) | | 2 | × | В | <u>EC-172</u> |
| P0037 | 0037 | HO2S2 HTR (B1) | | 2 | × | В | <u>EC-175</u> |
| P0038 | 0038 | HO2S2 HTR (B1) | | 2 | × | В | <u>EC-175</u> |
| P0051 | 0051 | A/F SEN1 HTR (B2) | | 2 | × | В | <u>EC-172</u> |
| P0052 | 0052 | A/F SEN1 HTR (B2) | | 2 | × | В | <u>EC-172</u> |
| P0057 | 0057 | HO2S2 HTR (B2) | _ | 2 | × | В | <u>EC-175</u> |
| P0058 | 0058 | HO2S2 HTR (B2) | | 2 | × | В | <u>EC-175</u> |
| P0075 | 0075 | INT/V TIM V/CIR-B1 | | 2 | × | В | <u>EC-178</u> |
| P0081 | 0081 | INT/V TIM V/CIR-B2 | _ | 2 | × | В | <u>EC-178</u> |
| P0101 | 0101 | MAF SEN/CIRCUIT-B1 | | 2 | × | В | <u>EC-181</u> |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | | 1 | × | В | <u>EC-187</u> |
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | | 1 | × | В | <u>EC-187</u> |
| P010A | 010A | ABSL PRES SEN/CIRC | | 2 | × | В | <u>EC-193</u> |
| P010B | 010B | MAF SEN/CIRCUIT-B2 | | 2 | × | В | <u>EC-181</u> |
| P010C | 010C | MAF SEN/CIRCUIT-B2 | | 1 | × | В | <u>EC-187</u> |
| P010D | 010D | MAF SEN/CIRCUIT-B2 | | 1 | × | В | <u>EC-187</u> |
| P0111 | 0111 | IAT SENSOR1 B1 | | 2 | × | Α | <u>EC-197</u> |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | | 2 | × | В | <u>EC-200</u> |
| P0113 | 0113 | IAT SEN/CIRCUIT-B1 | | 2 | × | В | EC-200 |
| P0116 | 0116 | ECT SEN/CIRC | | 2 | × | A | <u>EC-203</u> |
| P0117 | 0117 | ECT SEN/CIRC | | 1 | × | A | <u>EC-206</u> |
| P0118 | 0118 | ECT SEN/CIRC | | 1 | × | В | EC-206 |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | _ | 1 | × | В | <u>EC-209</u> |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | | 1 | × | В | <u>EC-209</u> |
| P0125 | 0125 | ECT SENSOR | | 2 | × | В | EC-213 |
| P0127 | 0127 | IAT SENSOR-B1 | | 2 | × | В | <u>EC-216</u> |
| P0128 | 0128 | THERMSTAT FNCTN | _ | 2 | × | A | <u>EC-218</u> |
| P0130 | 0130 | A/F SENSOR1 (B1) | | 2 | × | Α | <u>EC-221</u> |
| P0131 | 0131 | A/F SENSOR1 (B1) | | 2 | × | В | <u>EC-225</u> |
| P0132 | 0132 | A/F SENSOR1 (B1) | | 2 | × | В | EC-228 |
| P0137 | 0137 | HO2S2 (B1) | × | 2 | × | A | EC-231 |
| P0138 | 0138 | HO2S2 (B1) | × | 2 | × | А | <u>EC-237</u> |
| P0139 | 0139 | HO2S2 (B1) | × | 2 | × | A | <u>EC-245</u> |
| P014C | 014C | A/F SENSOR1 (B1) | × | 2 | × | A | EC-252 |
| P014D | 014D | A/F SENSOR1 (B1) | × | 2 | × | А | EC-252 |
| P014E | 014E | A/F SENSOR1 (B2) | × | 2 | × | A | <u>EC-252</u> |
| P014F | 014F | A/F SENSOR1 (B2) | × | 2 | × | А | EC-252 |
| P0150 | 0150 | A/F SENSOR1 (B2) | | 2 | × | Α | EC-221 |
| P0151 | 0151 | A/F SENSOR1 (B2) | — | 2 | × | В | EC-225 |

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[VQ37VHR]

| DTC* | 1 | Itomo | 0.07 | | | Permanent DTC | Poforonco | ^ |
|------------------------------|-------------------|---------------------------------|-------------|------|-----|---------------------|-------------------|-------|
| CONSULT GST* ² | ECM* ³ | Items (CONSULT screen terms) | SRT code | Trip | MIL | group ^{*4} | Reference page | A |
| P0152 | 0152 | A/F SENSOR1 (B2) | _ | 2 | × | В | <u>EC-228</u> | EC |
| P0157 | 0157 | HO2S2 (B2) | × | 2 | × | A | <u>EC-231</u> | |
| P0158 | 0158 | HO2S2 (B2) | × | 2 | × | A | <u>EC-237</u> | _ |
| P0159 | 0159 | HO2S2 (B2) | × | 2 | × | A | <u>EC-245</u> | С |
| P015A | 015A | A/F SENSOR1 (B1) | × | 2 | × | A | <u>EC-252</u> | - |
| P015B | 015B | A/F SENSOR1 (B1) | × | 2 | × | A | <u>EC-252</u> | D |
| P015C | 015C | A/F SENSOR1 (B2) | × | 2 | × | A | EC-252 | |
| P015D | 015D | A/F SENSOR1 (B2) | × | 2 | × | A | <u>EC-252</u> | - |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | — | 1 | × | В | <u>EC-258</u> | E |
| P0172 | 0172 | FUEL SYS-RICH-B1 | — | 2 | × | В | EC-262 | - |
| P0174 | 0174 | FUEL SYS-LEAN-B2 | — | 2 | × | В | EC-258 | F |
| P0175 | 0175 | FUEL SYS-RICH-B2 | _ | 2 | × | В | EC-262 | Г |
| P0181 | 0181 | FTT SENSOR | _ | 2 | × | A and B | EC-266 | - |
| P0182 | 0182 | FTT SEN/CIRCUIT | _ | 2 | × | В | <u>EC-270</u> | G |
| P0183 | 0183 | FTT SEN/CIRCUIT | _ | 2 | × | В | <u>EC-270</u> | - |
| P0196 | 0196 | EOT SENSOR | _ | 2 | × | A and B | <u>EC-273</u> | |
| P0197 | 0197 | EOT SEN/CIRC | _ | 2 | × | В | <u>EC-277</u> | - H |
| P0198 | 0198 | EOT SEN/CIRC | _ | 2 | × | В | <u>EC-277</u> | - |
| P0222 | 0222 | TP SEN 1/CIRC-B1 | _ | 1 | × | В | <u>EC-280</u> | - |
| P0223 | 0223 | TP SEN 1/CIRC-B1 | | 1 | × | В | <u>EC-280</u> | - |
| P0227 | 0227 | TP SEN 2/CIRC-B2 | | 1 | × | В | EC-209 | - |
| P0228 | 0228 | TP SEN 2/CIRC-B2 | | 1 | × | В | EC-209 | J |
| P0300 | 0300 | MULTI CYL MISFIRE | _ | 1 | × | В | EC-284 | - |
| P0301 | 0301 | CYL 1 MISFIRE | _ | 2 | × | В | EC-284 | K |
| P0302 | 0302 | CYL 2 MISFIRE | _ | 2 | × | В | EC-284 | |
| P0303 | 0303 | CYL 3 MISFIRE | _ | 2 | × | В | EC-284 | - |
| P0304 | 0304 | CYL 4 MISFIRE | _ | 2 | × | В | EC-284 | L |
| P0305 | 0305 | CYL 5 MISFIRE | _ | 2 | × | В | EC-284 | - |
| P0306 | 0306 | CYL 6 MISFIRE | _ | 2 | × | В | EC-284 | Л. Л. |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | _ | 2 | _ | _ | EC-290 | M |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | _ | 2 | _ | | EC-290 | - |
| P0332 | 0332 | KNOCK SEN/CIRC-B2 | _ | 2 | _ | | EC-290 | N |
| P0333 | 0333 | KNOCK SEN/CIRC-B2 | _ | 2 | _ | | EC-290 | - |
| P0335 | 0335 | CKP SEN/CIRCUIT | | 2 | × | В | EC-293 | |
| P0340 | 0340 | CMP SEN/CIRC-B1 | _ | 2 | × | В | EC-297 | - 0 |
| P0345 | 0345 | CMP SEN/CIRC-B2 | _ | 2 | × | В | EC-297 | - |
| P0420 | 0420 | TW CATALYST SYS-B1 | × | 2 | × | A | <u>EC-301</u> | P |
| P0430 | 0430 | TW CATALYST SYS-B2 | × | 2 | × | A | <u>EC-301</u> | - |
| P0441 | 0441 | EVAP PURG FLOW/MON | × | 2 | × | A | EC-306 | - |
| P0443 | 0443 | PURG VOLUME CONT/V | | 2 | × | A | EC-311 | - |
| P0444 | 0444 | PURG VOLUME CONT/V | _ | 2 | × | В | EC-316 | - |
| P0445 | 0445 | PURG VOLUME CONT/V | _ | 2 | × | В | <u>EC-316</u> | - |
| | I | 1 | 1 | 1 | 1 | 1 | | - |

Revision: 2012 July

2013 G Convertible

< ECU DIAGNOSIS INFORMATION >

| DTC* | 1 | lterre | ODT | | | Permanent DTC | Deferrer |
|------------------------------|-------------------|-----------------------------------|-----------------|--------|--|---------------------|---|
| CONSULT GST* ² | ECM* ³ | Items (CONSULT screen terms) | SRT code | Trip | MIL | group* ⁴ | Reference page |
| P0447 | 0447 | VENT CONTROL VALVE | _ | 2 | × | В | <u>EC-319</u> |
| P0448 | 0448 | VENT CONTROL VALVE | _ | 2 | × | В | EC-323 |
| P0451 | 0451 | EVAP SYS PRES SEN | — | 2 | × | А | <u>EC-327</u> |
| P0452 | 0452 | EVAP SYS PRES SEN | — | 2 | × | В | EC-331 |
| P0453 | 0453 | EVAP SYS PRES SEN | _ | 2 | × | В | <u>EC-336</u> |
| P0456 | 0456 | EVAP VERY SML LEAK | ×* ⁷ | 2 | × | А | EC-342 |
| P0460 | 0460 | FUEL LEV SEN SLOSH | | 2 | × | Α | EC-348 |
| P0461 | 0461 | FUEL LEVEL SENSOR | _ | 2 | × | В | EC-350 |
| P0462 | 0462 | FUEL LEVL SEN/CIRC | _ | 2 | × | В | <u>EC-352</u> |
| P0463 | 0463 | FUEL LEVL SEN/CIRC | | 2 | × | В | <u>EC-352</u> |
| P0500 | 0500 | VEH SPEED SEN/CIRC* ⁶ | _ | 2 | × | В | <u>EC-354</u> (A/T models) <u>EC-355</u> (M/T mod- els) |
| P0506 | 0506 | ISC SYSTEM | | 2 | × | В | <u>EC-358</u> |
| P0507 | 0507 | ISC SYSTEM | — | 2 | × | В | <u>EC-360</u> |
| P050A | 050A | COLD START CONTROL | — | 2 | × | А | <u>EC-360</u> |
| P050E | 050E | COLD START CONTROL | | 2 | × | А | <u>EC-360</u> |
| P0524 | 0524 | ENGINE OIL PRESSURE | — | 2 | × | В | <u>EC-364</u> |
| P0550 | 0550 | PW ST P SEN/CIRC | — | 2 | _ | — | <u>EC-367</u> |
| P0555 | 0555 | BRAKE BSTR PRES SEN/CIRC | | 1 | × | В | <u>EC-370</u> |
| P0603 | 0603 | ECM BACK UP/CIRCUIT | _ | 2 | × | В | <u>EC-375</u> |
| P0605 | 0605 | ECM | — | 1 or 2 | \times or — | В | <u>EC-377</u> |
| P0607 | 0607 | ECM | _ | 1 | _ | В | <u>EC-379</u> |
| P0643 | 0643 | SENSOR POWER/CIRC | | 1 | — | В | <u>EC-380</u> |
| P0705 | 0705 | T/M RANGE SWITCH A | _ | 1 | × (A/T models) — (M/T models) | В | <u>TM-167</u> |
| P0710 | 0710 | FLUID TEMP SENSOR A | _ | 2 | × (A/T models) — (M/T models) | В | <u>TM-169</u> |
| P0717 | 0717 | INPUT SPEED SENSOR A | _ | 2 | × | В | <u>TM-171</u> |
| P0720 | 0720 | OUTPUT SPEED SENSOR*6 | _ | 2 | × | В | <u>TM-173</u> |
| P0729 | 0729 | 6GR INCORRECT RATIO | | 2 | × | В | <u>TM-177</u> |
| P0730 | 0730 | INCORRECT GR RATIO | _ | 2 | (A/T models) — (M/T models) | В | <u>TM-179</u> |
| P0731 | 0731 | 1GR INCORRECT RATIO* ⁹ | — | 2 | × (A/T models) — (M/T models) | В | <u>TM-181</u> |

< ECU DIAGNOSIS INFORMATION >

| DTC*1 | | | 0.07 | | | Dermanent DTC | 5.4 | Λ | |
|------------------------------|-------------------|---------------------------------|-------------|------|--|--------------------------------------|-------------------|----|--|
| CONSULT GST* ² | ECM* ³ | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group* ⁴ | Reference page | A | |
| P0732 | 0732 | 2GR INCORRECT RATIO | _ | 2 | (A/T models) — (M/T models) | В | <u>TM-183</u> | EC | |
| P0733 | 0733 | 3GR INCORRECT RATIO | | 2 | × | В | <u>TM-185</u> | С | |
| P0734 | 0734 | 4GR INCORRECT RATIO | _ | 2 | × | В | <u>TM-187</u> | | |
| P0735 | 0735 | 5GR INCORRECT RATIO | — | 2 | × | В | <u>TM-189</u> | D | |
| P0740 | 0740 | TORQUE CONVERTER | _ | 2 | × (A/T models) — (M/T models) | (A/T models) — B | | E | |
| P0744 | 0744 | TORQUE CONVERTER | - | 2 | × (A/T models) — (M/T models) | В | <u>TM-193</u> | F | |
| P0745 | 0745 | PC SOLENOID A | _ | 2 | × | В | <u>TM-195</u> | | |
| P0750 | 0750 | SHIFT SOLENOID A | | 2 | × | В | <u>TM-196</u> | G | |
| P0775 | 0775 | PC SOLENOID B | | 2 | × | В | <u>TM-197</u> | | |
| P0780 | 0780 | SHIFT | _ | 2 | (A/T models) — (M/T models) | В | <u>TM-198</u> | Н | |
| P0795 | 0795 | PC SOLENOID C | | 2 | × | В | <u>TM-200</u> | | |
| P0850 | 0850 | P-N POS SW/CIRCUIT | _ | 2 | × | В | <u>EC-383</u> | | |
| P100A | 100A | VVEL SYSTEM-B1 | _ | 2 | × | В | <u>EC-387</u> | | |
| P100B | 100B | VVEL SYSTEM-B2 | _ | 2 | × | В | EC-387 | J | |
| P1087 | 1087 | VVEL SYSTEM-B1 | — | 1 | × | В | <u>EC-391</u> | | |
| P1088 | 1088 | VVEL SYSTEM-B2 | _ | 1 | × | В | <u>EC-391</u> | K | |
| P1089 | 1089 | VVEL POS SEN/CIRC-B1 | | 1 | × | В | <u>EC-392</u> | _ | |
| P1090 | 1090 | VVEL ACTR MOT-B1 | — | 1 | × | В | <u>EC-396</u> | | |
| P1091 | 1091 | VVEL ACTR MOT PWR | — | 2 | × | В | <u>EC-400</u> | | |
| P1092 | 1092 | VVEL POS SEN/CIRC-B2 | — | 1 | × | В | <u>EC-392</u> | _ | |
| P1093 | 1093 | VVEL ACTR MOT-B2 | — | 1 | × | В | <u>EC-396</u> | M | |
| P1148 | 1148 | CLOSED LOOP-B1 | — | 1 | × | А | <u>EC-403</u> | _ | |
| P1168 | 1168 | CLOSED LOOP-B2 | — | 1 | × | A | <u>EC-403</u> | _ | |
| P1211 | 1211 | TCS C/U FUNCTN | — | 2 | — | — | <u>EC-404</u> | N | |
| P1212 | 1212 | TCS/CIRC | — | 2 | — | — | <u>EC-405</u> | _ | |
| P1217 | 1217 | ENG OVER TEMP | _ | 1 | × | В | <u>EC-406</u> | 0 | |
| P1225 | 1225 | CTP LEARNING-B1 | _ | 2 | — | — | <u>EC-410</u> | _ | |
| P1226 | 1226 | CTP LEARNING-B1 | — | 2 | _ | — | <u>EC-412</u> | _ | |
| P1233 | 1233 | ETC FNCTN/CIRC-B2 | — | 1 | × | В | <u>EC-414</u> | Ρ | |
| P1234 | 1234 | CTP LEARNING-B2 | _ | 2 | _ | — | <u>EC-410</u> | - | |
| P1235 | 1235 | CTP LEARNING-B2 | — | 2 | — | — | <u>EC-412</u> | _ | |
| P1236 | 1236 | ETC MOT-B2 | _ | 1 | × | В | <u>EC-418</u> | | |
| P1238 | 1238 | ETC ACTR-B2 | _ | 1 | × | В | <u>EC-421</u> | - | |
| P1239 | 1239 | TP SENSOR-B2 | — | 1 | × | В | <u>EC-423</u> | | |

< ECU DIAGNOSIS INFORMATION >

| DTC* ¹ | | Itomo | 0.0.7 | | | Dormonont DTC | D (|
|------------------------------|-------------------|---------------------------------|-------------|--------|--|--------------------------------------|---|
| CONSULT GST* ² | ECM* ³ | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group ^{*4} | Reference page |
| P1290 | 1290 | ETC MOT PWR-B2 | _ | 1 | × | В | <u>EC-426</u> |
| P1550 | 1550 | BAT CURRENT SENSOR | — | 2 | — | _ | <u>EC-428</u> |
| P1551 | 1551 | BAT CURRENT SENSOR | | 2 | _ | — | <u>EC-431</u> |
| P1552 | 1552 | BAT CURRENT SENSOR | | 2 | _ | — | EC-431 |
| P1553 | 1553 | BAT CURRENT SENSOR | | 2 | — | — | <u>EC-434</u> |
| P1554 | 1554 | BAT CURRENT SENSOR | — | 2 | — | — | <u>EC-437</u> |
| P1564 | 1564 | ASCD SW | _ | 1 | _ | _ | <u>EC-441</u> (with ASCD) <u>EC-444</u> (with ICC) |
| P1568 | 1568 | ICC COMMAND VALUE | _ | 1 | _ | — | <u>EC-447</u> |
| P1572 | 1572 | ASCD BRAKE SW | _ | 1 | | | <u>EC-448</u> (with ASCD) <u>EC-455</u> (with ICC) |
| P1574 | 1574 | ASCD VHL SPD SEN | _ | 1 | | | <u>EC-463</u> (with ASCD) <u>EC-465</u> (with ICC) |
| P1606 | 1606 | VVEL CONTROL MODULE | _ | 1 or 2 | × | В | <u>EC-467</u> |
| P1607 | 1607 | VVEL CONTROL MODULE | _ | 1 | × | В | <u>EC-469</u> |
| P1608 | 1608 | VVEL SENSOR POWER/CIRC | | 1 | × | В | <u>EC-471</u> |
| P1610 | 1610 | LOCK MODE | — | 2 | — | _ | <u>SEC-32</u> |
| P1611 | 1611 | ID DISCARD, IMM-ECM | _ | 2 | _ | — | <u>SEC-33</u> |
| P1612 | 1612 | CHAIN OF ECM-IMMU | | 2 | — | | <u>SEC-35</u> |
| P1614 | 1614 | CHAIN OF IMMU-KEY | _ | 2 | — | | <u>SEC-36</u> |
| P1615 | 1615 | DIFFERENCE OF KEY | | 2 | — | | <u>SEC-39</u> |
| P1730 | 1730 | INTERLOCK | _ | 2 | × (A/T models) — (M/T models) | В | <u>TM-205</u> |
| P1734 | 1734 | 7GR INCORRECT RATIO | _ | 2 | × (A/T models) — (M/T models) | В | <u>TM-207</u> |
| P1805 | 1805 | BRAKE SW/CIRCUIT | | 2 | — | _ | <u>EC-474</u> |
| P2096 | 2096 | POST CAT FUEL TRIM SYS B1 | _ | 2 | × | А | <u>EC-477</u> |
| P2097 | 2097 | POST CAT FUEL TRIM SYS B1 | — | 2 | × | А | <u>EC-477</u> |
| P2098 | 2098 | POST CAT FUEL TRIM SYS B2 | — | 2 | × | A | <u>EC-477</u> |
| P2099 | 2099 | POST CAT FUEL TRIM SYS B2 | — | 2 | × | A | <u>EC-477</u> |
| P2100 | 2100 | ETC MOT PWR-B1 | _ | 1 | × | В | <u>EC-426</u> |
| P2101 | 2101 | ETC FNCTN/CIRC-B1 | | 1 | × | В | <u>EC-414</u> |
| P2103 | 2103 | ETC MOT PWR | | 1 | × | В | <u>EC-426</u> |
| P2118 | 2118 | ETC MOT-B1 | _ | 1 | × | В | <u>EC-418</u> |
| P2119 | 2119 | ETC ACTR-B1 | — | 1 | × | В | <u>EC-421</u> |
| P2122 | 2122 | APP SEN 1/CIRC | _ | 1 | × | В | <u>EC-482</u> |
| P2123 | 2123 | APP SEN 1/CIRC | — | 1 | × | В | <u>EC-482</u> |

< ECU DIAGNOSIS INFORMATION >

INFOID:00000008496967

| DTC*1 | | 1 | ltems | SRT | | | Permanent DTC | Reference | А |
|-------|------------------------------|-------------------|------------------------|------|------|-----|---------------------|---------------|----|
| _ | CONSULT GST* ² | ECM* ³ | (CONSULT screen terms) | code | Trip | MIL | group* ⁴ | page | |
| _ | P2127 | 2127 | APP SEN 2/CIRC | _ | 1 | × | В | <u>EC-486</u> | EC |
| _ | P2128 | 2128 | APP SEN 2/CIRC | — | 1 | × | В | <u>EC-486</u> | |
| _ | P2132 | 2132 | TP SEN 1/CIRC-B2 | — | 1 | × | В | <u>EC-280</u> | |
| _ | P2133 | 2133 | TP SEN 1/CIRC-B2 | — | 1 | × | В | <u>EC-280</u> | С |
| _ | P2135 | 2135 | TP SENSOR-B1 | _ | 1 | × | В | <u>EC-423</u> | |
| _ | P2138 | 2138 | APP SENSOR | — | 2 | × | В | <u>EC-490</u> | D |
| _ | P2713 | 2713 | PC SOLENOID D | — | 2 | × | В | <u>TM-215</u> | |
| _ | P2722 | 2722 | PC SOLENOID E | — | 2 | × | В | <u>TM-216</u> | |
| _ | P2731 | 2731 | PC SOLENOID F | — | 2 | × | В | <u>TM-217</u> | Е |
| | P2807 | 2807 | PC SOLENOID G | — | 2 | × | В | <u>TM-218</u> | |
| | | - | _ | | | | | | |

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by SAE J2012/ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: Refer to EC-31, "Description", "PERMANENT DIAGNOSTIC TROUBLE CODE (PERMANENT DTC)".

*5: The troubleshooting for this DTC needs CONSULT.

*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

*7: SRT code will not be set if the self-diagnostic result is NG.

*8: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status". H

*9: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

The following is the information specified in Service \$06 of SAE J1979/ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.

The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

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< ECU DIAGNOSIS INFORMATION >

| | | | | | e and Test mit | |
|------|------|---|-------|-----|--------------------------|---|
| Item | OBD- | Self-diagnostic test item | DTC | | display) | Description |
| Item | MID | | DIC | TID | Unitand Scaling ID | Description |
| | | | P0131 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0131 | 84H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0130 | 85H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0130 | 86H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0133 | 87H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0133 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2096 | 89H | 84H | The amount of shift in air fuel ratio |
| | | Air fuel ratio (A/F) sensor 1 (Bank 1) | P2097 | 8AH | 84H | The amount of shift in air fuel ratio |
| | | | P0130 | 8BH | 0BH | Difference in sensor output voltage |
| | 01H | | P0133 | 8CH | 83H | Response gain at the limited frequency |
| | | | P014C | 8DH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014C | 8EH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014D | 8FH | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| HO2S | | | P014D | 90H | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P015A | 91H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015A | 92H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015B | 93H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P015B | 94H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P0138 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | 0011 | Heated oxygen sensor 2 | P0137 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | 02H | (Bank 1) | P0138 | 80H | 0CH | Sensor output voltage |
| | | | P0139 | 81H | 0CH | Difference in sensor output voltage |
| | | | P0139 | 82H | 11H | Rear O2 sensor delay response diag- nosis |
| | | | 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 |

< ECU DIAGNOSIS INFORMATION >

| | OBD- | | | li | e and Test mit display) | | A |
|------|-------|---|-------|-----|-------------------------------|---|-----|
| Item | MID | Self-diagnostic test item | DTC | TID | Unitand Scaling ID | Description | EC |
| | | | P0151 | 83H | 0BH | Minimum sensor output voltage for test cycle | С |
| | | | P0151 | 84H | 0BH | Maximum sensor output voltage for test cycle | |
| | | | P0150 | 85H | 0BH | Minimum sensor output voltage for test cycle | D |
| | | | P0150 | 86H | 0BH | Maximum sensor output voltage for test cycle | - E |
| | | | P0153 | 87H | 04H | Response rate: Response ratio (lean to rich) | |
| | | | P0153 | 88H | 04H | Response rate: Response ratio (rich to lean) | F |
| | | | P2098 | 89H | 84H | The amount of shift in air fuel ratio | |
| | | | P2099 | 8AH | 84H | The amount of shift in air fuel ratio | G |
| | | | P0150 | 8BH | 0BH | Difference in sensor output voltage | - |
| | 05H | Air fuel ratio (A/F) sensor 1 (Bank 2) | P0153 | 8CH | 83H | Response gain at the limited frequency | |
| | | | P014E | 8DH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 | H |
| | | | P014E | 8EH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 | |
| | | | P014F | 8FH | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 | _ |
| HO2S | | | P014F | 90H | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 | J |
| | | | P015C | 91H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 | K |
| | | | P015C | 92H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 | _ |
| | | | P015D | 93H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 | L |
| | | | P015D | 94H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 | M |
| | | | P0158 | 07H | 0CH | Minimum sensor output voltage for test cycle | |
| | 0.011 | Heated oxygen sensor 2 | P0157 | 08H | 0CH | Maximum sensor output voltage for test cycle | Ν |
| | 06H | (Bank 2) | P0158 | 80H | 0CH | Sensor output voltage | - |
| | | | P0159 | 81H | 0CH | Difference in sensor output voltage | 0 |
| | | | P0159 | 82H | 11H | Rear O2 sensor delay response diag- nosis | - |
| | | | P0163 | 07H | 0CH | Minimum sensor output voltage for test cycle | Ρ |
| | 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 | _ |

< ECU DIAGNOSIS INFORMATION >

| ltem | OBD- | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description | |
|---------------|------|--|-------|---|--------------------------|--|--|
| | MID | Sen-ulagnostic test item | DIC | TID | Unitand Scaling ID | Description | |
| | | | P0420 | 80H | 01H | O2 storage index | |
| | 21H | Three way catalyst function | P0420 | 82H | 01H | Switching time lag engine exhaust in- dex value | |
| | 2111 | (Bank1) | P2423 | 83H | 0CH | Difference in 3rd O2 sensor output voltage | |
| CATA- | | | P2423 | 84H | 84H | O2 storage index in HC trap catalyst | |
| LYST | | Three way catalyst function (Bank2) | P0430 | 80H | 01H | O2 storage index | |
| | 22H | | P0430 | 82H | 01H | Switching time lag engine exhaust in- dex value | |
| | | | P2424 | 83H | 0CH | Difference in 3rd O2 sensor output voltage | |
| | | | P2424 | 84H | 84H | O2 storage index in HC trap catalyst | |
| | 31H | EGR function | P0400 | 80H | 96H | Low flow faults: EGR temp change rate (short term) | |
| | | | P0400 | 81H | 96H | Low flow faults: EGR temp change rate (long term) | |
| EGR SYSTEM | | | 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 | |

< ECU DIAGNOSIS INFORMATION >

| | OBD- | | | Test value and Test limit (GST display) | | |
|----------------|------|--|------------------------------------|---|--------------------------|---|
| Item | MID | Self-diagnostic test item | DTC | TID | Unitand Scaling ID | Description |
| | | | P0011 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | | | P0014 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | | | P0011 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | 35H | VVT Monitor (Bank1) | P0014 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | 0011 | | P100A | 84H | 10H | VEL slow response diagnosis |
| | | | P1090 | 85H | 10H | VEL servo system diagnosis |
| | | | P0011 | 86H | 9DH | VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis) |
| /VT | | | Advanced: P052A Retarded: P052B | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis) |
| SYSTEM | | 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) |
| | 36H | | P0021 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0024 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | | | P100B | 84H | 10H | VEL slow response diagnosis |
| | | | P1093 | 85H | 10H | VEL servo system diagnosis |
| | | | P0021 | 86H | 9DH | VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis) |
| | | | Advanced: P052C Retarded: P052D | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis) |
| | 39H | EVAP control system leak (Cap Off) | P0455 | 80H | 0CH | Difference in pressure sensor output voltage before and after pull down |
| | 3BH | EVAP control system leak (Small leak) | P0442 | 80H | 05H | Leak area index (for more than 0.04 inch) |
| EVAP SYSTEM | | | P0456 | 80H | 05H | Leak area index (for more than 0.02 inch) |
| | 3CH | EVAP control system leak (Very small leak) | P0456 | 81H | FDH | Maximum internal pressure of EVAP system during monitoring |
| | | | P0456 | 82H | FDH | Internal pressure of EVAP system at the end of monitoring |
| | 3DH | Purge flow system P0441 | | 83H | 0CH | Difference in pressure sensor output voltage before and after vent control valve close |

< ECU DIAGNOSIS INFORMATION >

| ltem | OBD- | Self-diagnostic test item | | Test value and Test limit (GST display) | | | |
|-------------------------|------|---|---------------------------------------|---|--------------------------|--|--|
| | MID | | DTC | TID | Unitand Scaling ID | Description | |
| | 41H | A/F sensor 1 heater (Bank 1) | Low Input: P0031 High Input: P0032 | 81H | 0BH | Converted value of heater electric cur- rent to voltage | |
| | 42H | Heated oxygen sensor 2 heat- er (Bank 1) | Low Input: P0037 High Input: P0038 | 80H | 0CH | Converted value of heater electric cur- rent to voltage | |
| O2 SEN- SOR | 43H | Heated oxygen sensor 3 heat- er (Bank 1) | P0043 | 80H | 0CH | Converted value of heater electric cur- rent to voltage | |
| HEATER | 45H | A/F sensor 1 heater (Bank 2) | Low Input: P0051 High Input: P0052 | 81H | 0BH | Converted value of heater electric cur- rent to voltage | |
| | 46H | Heated oxygen sensor 2 heat- er (Bank 2) | Low Input: P0057 High Input: P0058 | 80H | 0CH | Converted value of heater electric cur- rent to voltage | |
| | 47H | Heated oxygen sensor 3 heat- er (Bank 2) | P0063 | 80H | 0CH | Converted value of heater electric cur- rent to voltage | |
| | 71H | 1H Secondary air system | 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 | | | P2448 | 83H | 01H | Secondary air injection system high airflow | |
| | | | Bank1: P2440 Bank2: P2442 | 84H | 01H | Secondary air injection system switch- ing valve stuck open | |
| | | | P2440 | 85H | 01H | Secondary air injection system switch- ing valve stuck open | |
| | | | P2444 | 86H | 01H | Secondary air injection system pump stuck on | |
| | | | P0171 or P0172 | 80H | 2FH | Long term fuel trim | |
| | 81H | Fuel injection system function (Bank 1) | P0171 or P0172 | 81H | 24H | The number of lambda control clamped | |
| FUEL | | | P117A | 82H | 03H | Cylinder A/F imbalance monitoring | |
| SYSTEM | | | P0174 or P0175 | 80H | 2FH | Long term fuel trim | |
| | 82H | Fuel injection system function (Bank 2) | P0174 or P0175 | 81H | 24H | The number of lambda control clamped | |
| | | | P117B | 82H | 03H | Cylinder A/F imbalance monitoring | |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| | OBD- | Self-diagnostic test item | 570 | Test value and Test limit (GST display) | | | A |
|---------|------|----------------------------|---------------|---|--|--|----|
| Item | MID | | DTC – | TID | Unitand Scaling ID | Description | EC |
| | | | P0301 | 80H | 24H | Misfiring counter at 1000 revolution of the first cylinder | С |
| | | | P0302 | 81H | 24H | Misfiring counter at 1000 revolution of the second cylinder | 0 |
| | | | P0303 | 82H | 24H | Misfiring counter at 1000 revolution of the third cylinder | D |
| | | | P0304 | 83H | 24H | Misfiring counter at 1000 revolution of the fourth cylinder | Е |
| | | | P0305 | 84H | 24H | Misfiring counter at 1000 revolution of the fifth cylinder | |
| | | | P0306 | 85H | 24H | Misfiring counter at 1000 revolution of the sixth cylinder | F |
| | | Multiple cylinder misfires | P0307 | 86H | 24H | Misfiring counter at 1000 revolution of the seventh cylinder | 0 |
| | | | P0308 | 87H | 24H | Misfiring counter at 1000 revolution of the eighth cylinder | G |
| | | | P0300 | 88H | 24H | Misfiring counter at 1000 revolution of the multiple cylinders | Н |
| MICEIDE | | | P0301 | 89H | 24H | Misfiring counter at 200 revolution of the first cylinder | |
| MISFIRE | A1H | | P0302 | 8AH | 24H | Misfiring counter at 200 revolution of the second cylinder | |
| | | | P0303 | 8BH | 24H | Misfiring counter at 200 revolution of the third cylinder | J |
| | | | P0304 | 8CH | 24H | Misfiring counter at 200 revolution of the fourth cylinder | |
| | | | P0305 | 8DH | 24H | Misfiring counter at 200 revolution of the fifth cylinder | K |
| | | | P0306 | 8EH | 24H | Misfiring counter at 200 revolution of the sixth cylinder | L |
| | | | P0307 | 8FH | 24H | Misfiring counter at 200 revolution of the seventh cylinder | |
| | | | P0308 90H | 24H | Misfiring counter at 200 revolution of the eighth cylinder | M | |
| | | | P0300 | 91H | 24H | Misfiring counter at 1000 revolution of the single cylinder | N |
| | | | P0300 92H 24H | 24H | Misfiring counter at 200 revolution of the single cylinder | | |
| | | | P0300 | 93H | 24H | Misfiring counter at 200 revolution of the multiple cylinders | 0 |

Ρ

< ECU DIAGNOSIS INFORMATION >

| | | Self-diagnostic test item | | Test value and Test limit (GST display) | | | |
|---------|------|---------------------------|-------|---|--------------------------|--|--|
| Item | OBD- | | DTC | | | Description | |
| nem | MID | | | TID | Unitand Scaling ID | Description | |
| | A2H | No. 1 cylinder misfire | P0301 | 0BH | 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 | 0BH | 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 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing 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 driv- ing cycles | |
| MISFIRE | | | P0304 | 0CH | 24H | Misfire counts for last/current driving cycles | |
| MISTIRE | A6H | No. 5 cylinder misfire | P0305 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing 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 driv- ing cycles | |
| | | | P0306 | 0CH | 24H | Misfire counts for last/current driving cycles | |
| | A8H | No. 7 cylinder misfire | 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 | |
| | A9H | No. 8 cylinder misfire | P0308 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles | |
| | | | P0308 | 0CH | 24H | Misfire counts for last/current driving cycles | |

< ECU DIAGNOSIS INFORMATION >

VVEL CONTROL MODULE

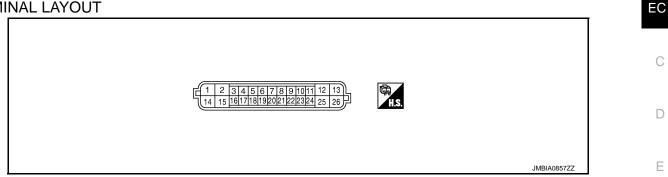
Reference Value

А

F

C

INFOID:000000008156638



PHYSICAL VALUES

NOTE:

- VVEL control module is located behind the IPDM E/R. For this inspection, remove hoodledge cover (RH).
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

| Termi | inal No. | Description | | | Value |
|----------|-------------|---|------------------|---|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 1 (W) | 14 (B/W) | VVEL actuator motor pow- er supply (bank 2) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 2 | 2 14 | VVEL actuator motor (High lift) (bank 2) | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100µSec/div € 5V/div JMBIA0854ZZ |
| | (B/W) | | | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div F SV/div JMBIA0855ZZ |
| 3 | 4 | | | [Engine is running] • Warm-up condition • Idle speed | Approx.0.25 - 1.40 V |
| (G) (W) | | | Input | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | Approx.0.25 - 4.75 V |
| 4 (W) | | Sensor ground [VVEL control shaft posi- tion sensor 1 (bank 1)] | | _ | _ |

< ECU DIAGNOSIS INFORMATION >

| Termi | inal No. | Description | | | Value | |
|-------------|-------------|---|------------------|---|--------------------------------|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 5 | 6 | VVEL control shaft posi- | | [Engine is running]Warm-up conditionIdle speed | Approx.0.25 - 1.40 V | |
| (R) | (B) | tion sensor 1 (bank 2) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | Approx.0.25 - 4.75 V | |
| 6 (B) | _ | Sensor ground [VVEL control shaft posi- tion sensor 1 (bank 2)] | _ | _ | _ | |
| 7 (SB) | 6 (B) | Sensor power supply [VVEL control shaft posi- tion sensor 1 (bank 2)] | _ | [Ignition switch: ON] | 5 V | |
| 8 (BG) | 14 (B/W) | Power supply for VVEL control module | _ | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 9 (LG) | 4 (W) | Sensor power supply [VVEL control shaft posi- tion sensor 1 (bank 1)] | _ | [Ignition switch: ON] | 5 V | |
| 11 (G) | _ | CAN communication line [ECM] | Input/ Output | _ | _ | |
| 12 | 14 (RAM) | | Output | [Engine is running] • Warm-up condition • Idle speed | 0 - 14 V★ 100µSec/div | |
| (G) | (B/W) | | | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div | |
| 13 (W) | 14 (B/W) | VVEL actuator motor pow- er supply (bank 1) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 14 (B/W) | | VVEL control module ground | | _ | _ | |

< ECU DIAGNOSIS INFORMATION >

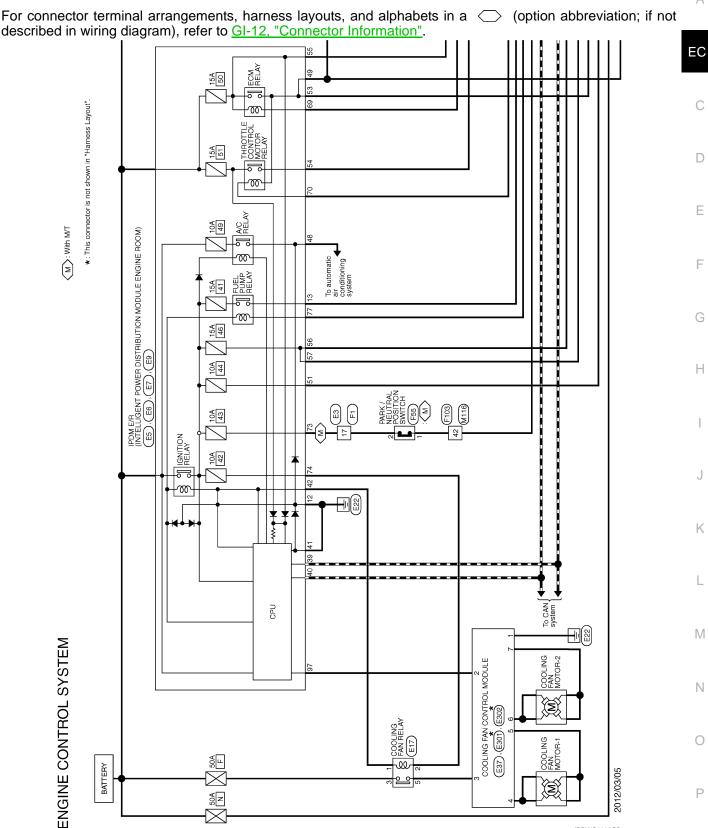
| Terminal No. | | Description | | | Value | | | |
|--------------|-------------|---|--|---|--|--|---|----|
| + | | Signal name | Input/ Output | Condition | (Approx.) | A | | |
| 15 | 14 | | W/EL optuptermeter// | V//EL opticitor materia | Output | [Engine is running] • Warm-up condition • Idle speed | 0 - 14 V★ 100µSec/div ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ | E(|
| (L/Y) | (B/W) | | [Engine is running] • Warm-up condition | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ | E | | |
| 16 (R) | 17 (L) | VVEL control shaft posi- tion sensor 2 (bank 1) | Input | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition When revving engine up to 2,000 rpm quickly | 3.50 - 4.75 ∨ 0.25 - 4.75 ∨ | C H | | |
| 17 (L) | | Sensor ground [VVEL control shaft posi- tion sensor 2 (bank 1)] | _ | — | | | | |
| 18 (G) | 19 (W) | VVEL control shaft posi- tion sensor 2 (bank 2) | Input | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition When revving engine up to 2,000 rpm quickly | 3.50 - 4.75 ∨ 0.25 - 4.75 ∨ | ŀ | | |
| 19 (W) | _ | Sensor ground [VVEL control shaft posi- tion sensor 2 (bank 2)] | | _ | _ | l | | |
| 20 (BR) | 19 (W) | Sensor power supply [VVEL control shaft posi- tion sensor 2 (bank 2)] | | [Ignition switch: ON] | 5 V | Ν | | |
| 21 (V) | 14 (B/W) | VVEL actuator motor relay abort signal | Input | [Engine is running]Warm-up conditionIdle speed | 0 V | 1 | | |
| 22 (P) | 17 (L) | Sensor power supply [VVEL position sensor 2 (bank 1)] | _ | [Ignition switch: ON] | 5 V | (| | |
| 23 (Y) | 14 (B/W) | VVEL control motor relay | Output | [Ignition switch: OFF] [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) 0 - 1.0 V | F | | |
| 24 (L) | | CAN communication line | Input/ Output | | | | | |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| Term | inal No. | Description | | | Value | |
|------|----------|-------------------------|------------------|---|---|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 25 | 14 | VVEL control motor (Low | | [Engine is running] • Warm-up condition • Idle speed | 0 - 14 V★ 100µSec/div 5V/div JMBIA0854ZZ | |
| (BR) | (B/W) | lift) (bank 1) | Output | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div € 5V/div JMBIA0855ZZ | |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)



VVEL CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

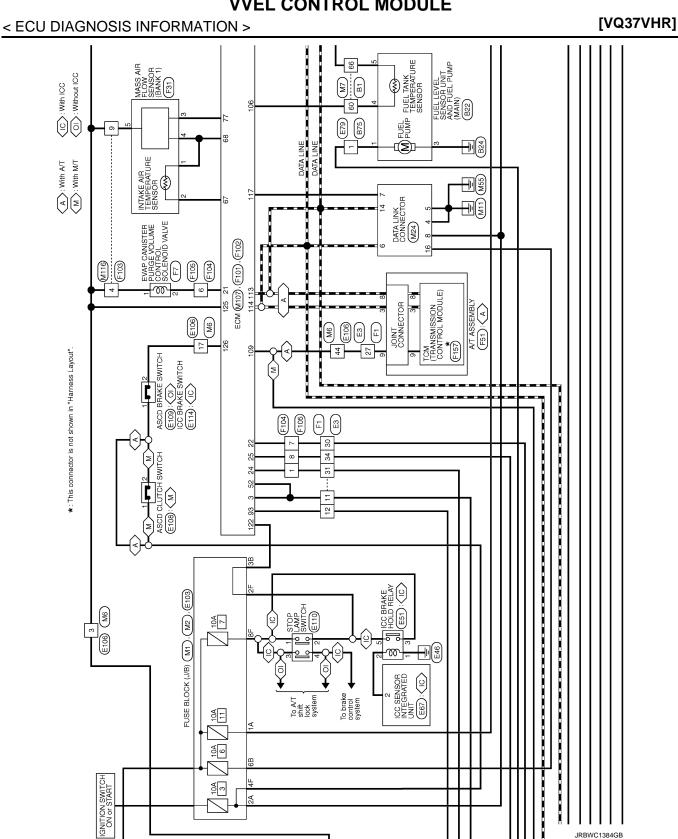
Wiring Diagram - ENGINE CONTROL SYSTEM -

INFOID:000000008496964

[VQ37VHR]

А

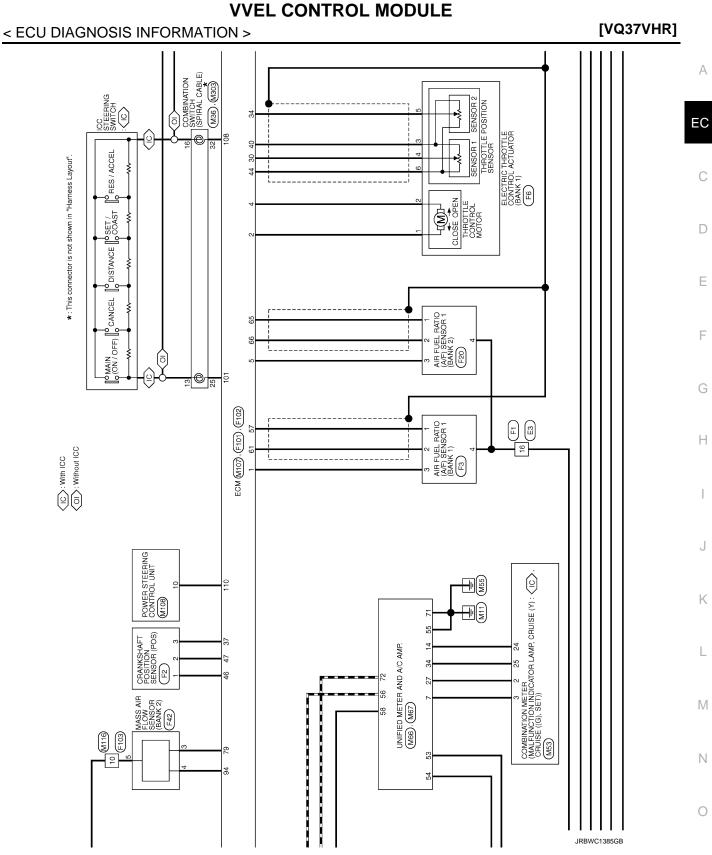
JRBWC1383GB



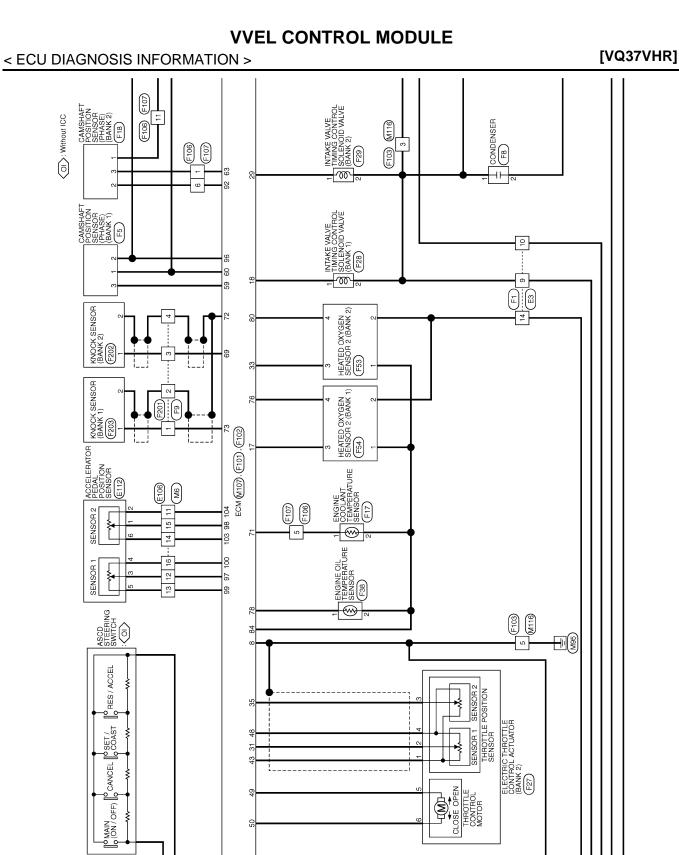
VVEL CONTROL MODULE

Revision: 2012 July

2013 G Convertible



Ρ



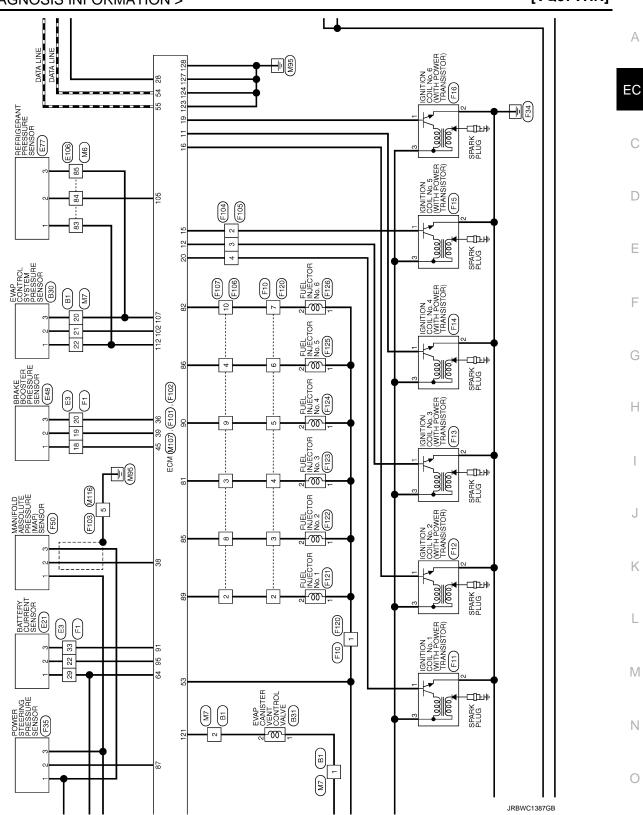
0

JRBWC1386GB

VVEL CONTROL MODULE

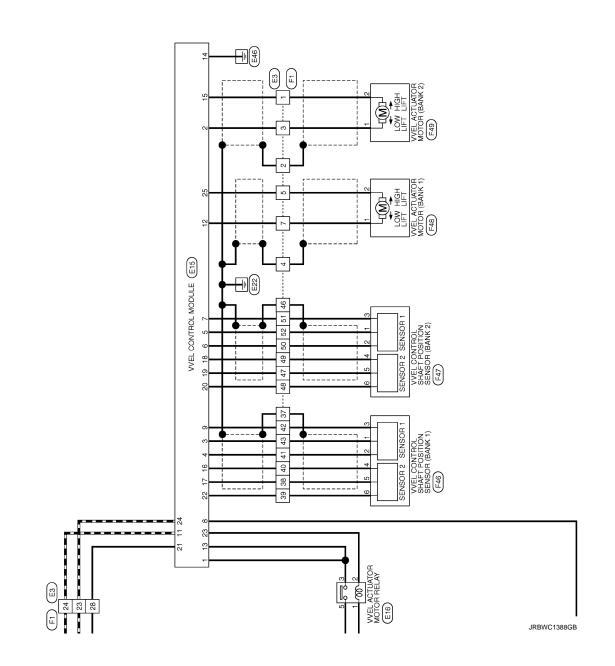
< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]



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< ECU DIAGNOSIS INFORMATION >



< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | | | | | | S` | YMPT | ОМ | | | | | | | С |
|------------|--|---------------|--------------|-------------------------|------------------------|--------------|--------------------|--------------------|------------------|------------------------|-------------------------------|----------------------------|-----------------|-----------------------------|---|---|
| | | | | | | NO | | | | | HIGH | | | | | D |
| | | RT (EXCP. HA) | | -LAT SPOT | TION | ACCELERATION | | | | DLE | OVERHEATS/WATER TEMPERATURE H | SUMPTION | MPTION | R CHARGE) | | E |
| | | START/RESTART | ± | /SURGING/F | CK/DETONA | POWER/POOR | OW IDLE | E/HUNTING | ATION | ETURN TO I | WATER TE | FUEL CONS | OIL CONSUMPTION | EAD (UNDEF | Reference page | F |
| | | HARD/NO ST | ENGINE STALL | HESITATION/SURGING/FLAT | SPARK KNOCK/DETONATION | LACK OF PO | HIGH IDRE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE | BATTERY DEAD (UNDER CHARGE) | | G |
| Warrant | y symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | - | Н |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | <u>EC-510</u> | |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | <u>EC-595</u> | |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | <u>EC-507</u> | |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-92 | |
| Air | Positive crankcase ventilation sys- tem | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | <u>EC-529</u> | J |
| | Incorrect idle speed adjustment | | | | | | 1 | 1 | 1 | 1 | | 1 | | | <u>EC-14</u> | K |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | <u>EC-414,</u> <u>EC-421</u> | |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | <u>EC-14</u> | L |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | <u>EC-518</u> | |
| Main po | wer supply and ground circuit | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | <u>EC-156</u> | |
| Mass ai | r flow sensor circuit | 1 | | | 2 | | | | | | | | | | <u>EC-181,</u> <u>EC-187</u> | N |
| Engine | coolant temperature sensor circuit | | | | | | 3 | | | 3 | | | | | <u>EC-206,</u> <u>EC-213</u> | N |
| Air fuel | ratio (A/F) sensor 1 circuit | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | <u>EC-221,</u> <u>EC-225,</u> <u>EC-228,</u> <u>EC-477</u> | 0 |
| Throttle | position sensor circuit | | | | | | 2 | | | 2 | | | | | EC-209, EC-280, EC-410, EC-412, EC-423 | Ρ |
| Accelera | ator pedal position sensor circuit | | | 3 | 2 | 1 | | | | | | | | | <u>EC-482,</u> <u>EC-486,</u> <u>EC-490</u> | |
| Ka a alu a | ensor circuit | | | 2 | | | | | | | | 3 | | | <u>EC-290</u> | |

[VQ37VHR]

А

EC

INFOID:000000008156640

< SYMPTOM DIAGNOSIS >

[VQ37VHR]

| | | | | | | S١ | MPT | OM | | | | | | |
|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|--|
| | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDTE/TOM IDTE | 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 | HA | |
| Engine oil temperature sensor | | | 4 | | 1 | | | | | | 3 | | | <u>EC-276,</u> <u>EC-277</u> |
| Crankshaft position sensor (POS) circuit | 2 | 2 | | | | | | | | | | | | <u>EC-293</u> |
| Camshaft position sensor (PHASE) circuit | 3 | 2 | | | | | | | | | | | | <u>EC-297</u> |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | <u>EC-354</u> (A/T mod- els) <u>EC-357</u> (M/T mod- els) |
| Power steering pressure sensor circuit | | 2 | | | | | 3 | 3 | | | | | | <u>EC-367</u> |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | <u>EC-375,</u> <u>EC-377</u> |
| Intake valve timing control solenoid valve cir- cuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | <u>EC-178</u> |
| Manifold absolute pressure (MAP) sensor | | | | | | | | | | | 3 | | | <u>EC-193</u> |
| Brake booster pressure sensor | | | | | | | | | | | 3 | | | <u>EC-370</u> |
| VVEL control module | 3 | | 4 | 4 | 3 | | | | | | | | | <u>EC-</u> 467, <u>EC-</u> 469 |
| VVEL actuator motor | 3 | | 4 | 4 | 3 | | | | | | | | | <u>EC-396</u> |
| VVEL actuator motor relay | 3 | | 4 | 4 | 3 | | | | | | | | | <u>EC-400</u> |
| VVEL actuator shaft position sensor | 3 | | 4 | 4 | 3 | | | | | | | | | <u>EC-392</u> |
| PNP signal circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | <u>EC-383</u> |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | <u>EC-531</u> |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | <u>EC-505</u> |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | <u>HAC-4</u> |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | <u>BRC-5</u> |

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

< SYMPTOM DIAGNOSIS >

[VQ37VHR]

| | | SYMPTOM | | | | | | | | | | | А | | | |
|------------|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|-----------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|---|--------------|
| | | 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 | DLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | Reference page | EC C D |
| Warrantv s | ymptom code | AA | AB | AC | AD | AE | AF | AG | = AH | AJ | AK | AL | АM | НА | | F |
| Fuel | Fuel tank Fuel piping Vapor lock | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | - | | <u>FL-13</u> <u>FL-4</u> | G |
| | Valve deposit Poor fuel (Heavy weight gasoline, Low octane) | 5 | . 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | | Н |
| Air | Air duct Air cleaner | | | | | | | | | | - | | | | <u>EM-28</u> <u>EM-28</u> | I |
| | Air leakage from air duct (Mass air flow sensor — electric throttle control actuator) Electric throttle control actuator Air leakage from intake manifold/ Collector/Gasket | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | | 5 | | | EM-28 EM-29 EM-33 | J |
| Cranking | Battery Generator circuit | 1 | 1 | 1 | | 1 | | 1 | 1 | | | | | 1 | PG-116 CHG-24, CHG-25 | K |
| | Starter circuit | 3 | - | | | | | | | | | 1 | | | <u>STR-7,</u> <u>STR-8</u> | |
| | Signal plate PNP signal circuit | 6 4 | - | | | | | | | | | | | | <u>EM-121</u> <u>TM-9, TM-</u> <u>167</u> | Μ |
| Engine | Cylinder head Cylinder head gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | 3 | | <u>EM-107</u> | Ν |
| | Cylinder block Piston Piston ring Connecting rod | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | 4 | | <u>EM-121</u> | O P |
| | Bearing Crankshaft | | | | | | | | | | | | | | | |

< SYMPTOM DIAGNOSIS >

[VQ37VHR]

| | | | | | | | S١ | /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 | |
| Valve | Timing chain | 5 | | | | | | | | | | | | | <u>EM-64</u> |
| mecha- nism | Camshaft | | | | | | | | | | | 5 | | | <u>EM-94</u> |
| | Intake valve timing control | | 5 | 5 | 5 | 5 | | 5 | 5 | | | | | | <u>EM-64</u> |
| | Intake valve | | | | | | | | | | | | 3 | | <u>EM-107</u> |
| | Exhaust valve | | | | | | | | | | | | Ŭ | | |
| Exhaust | Exhaust manifold/Tube/Muffler/ Gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | <u>EX-4, EX-6</u> |
| | Three way catalyst | | | | | | | | | | | | | | |
| Lubrica- tion | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | <u>LU-10, LU-</u> <u>11, LU-12</u> |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | <u>LU-7</u> |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | <u>CO-11,</u> <u>CO-11</u> |
| | Thermostat | | | | | | | | | 5 | | | | | <u>CO-22</u> |
| | Water pump | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | <u>CO-21</u> |
| | Water gallery | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | <u>CO-25</u> |
| | Cooling fan | | | | | | | | | | | | | | <u>CO-18</u> |
| | Coolant level (Low)/Contaminat- ed coolant | | | | | | | | | 5 | | | | | <u>CO-7</u> |
| IVIS (INFII NATS) | NITI Vehicle Immobilizer System — | 1 | 1 | | | | | | | | | | | | SEC-5 |

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS >

NORMAL OPERATING CONDITION

Description

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 1,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 1,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. However, if the engine speed is above 4,000 rpm, fuel will be cut off in a few seconds. Fuel cut will be operated until the engine speed reaches 1,000 rpm, then fuel cut will be cancelled. **NOTE:**

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, <u>EC-47.</u> <u>"System Description"</u>.

TORQUE CUT CONTROL (AT HIGH ENGINE OIL TEMPERATURE)

ECM receives engine oil temperature signal from engine oil temperature sensor.

To avoid VVEL performance, ECM performs the engine torque cut control at high engine oil temperature. If engine oil temperature is too high, engine oil viscosity will change. As a result, engine oil pressure is decreased. This control is to control the VVEL operating angle by operating the VVEL actuator sub assembly. If this control is operated, engine performance will decrease, then maximum engine speed is reduced a little, for example.

NOTE:

If the engine oil temperature sensor is deteriorated, its characteristic will change.

In this case, the operating temperature for engine torque cut control might be decrease.

Perform Component Inspection of the engine oil temperature sensor to check for the deterioration. Refer to <u>EC-276, "Component Inspection"</u>.

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< PRECAUTION > 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 "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see "SRS AIR BAG".
- Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

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Precaution for Battery Service

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

Precaution for Procedure without Cowl Top Cover

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When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.

Precautions For Xenon Headlamp Service

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WARNING:

Comply with the following warnings to prevent any serious accident.

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- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon EC headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)

CAUTION:

- Comply with the following cautions to prevent any error and malfunction.
- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.
- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

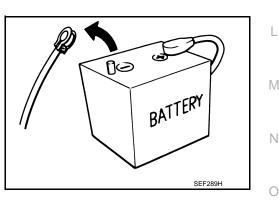
On Board Diagnostic (OBD) System of Engine and A/T

The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration. CAUTION:

- · Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will Н cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-105, "Description".
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

General Precautions

- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then dis-٠ connect negative battery cable.



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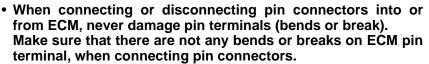
Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

< PRECAUTION >

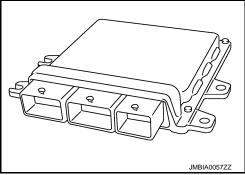
- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.

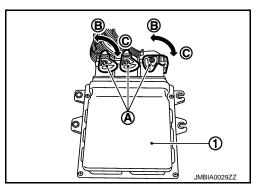
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.

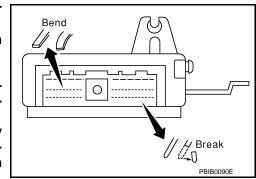
- If the battery is disconnected, the following emission-related diagnostic information will be cleared within 24 hours.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.
- 1 : ECM
- C : Loosen

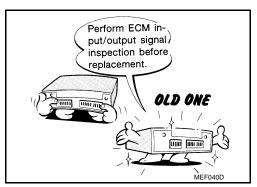


- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions 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 <u>EC-533</u>, "Reference Value".
- Handle mass air flow sensor carefully to avoid damage.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).









< PRECAUTION >

the two tester probes to contact.

damage the ECM power transistor.

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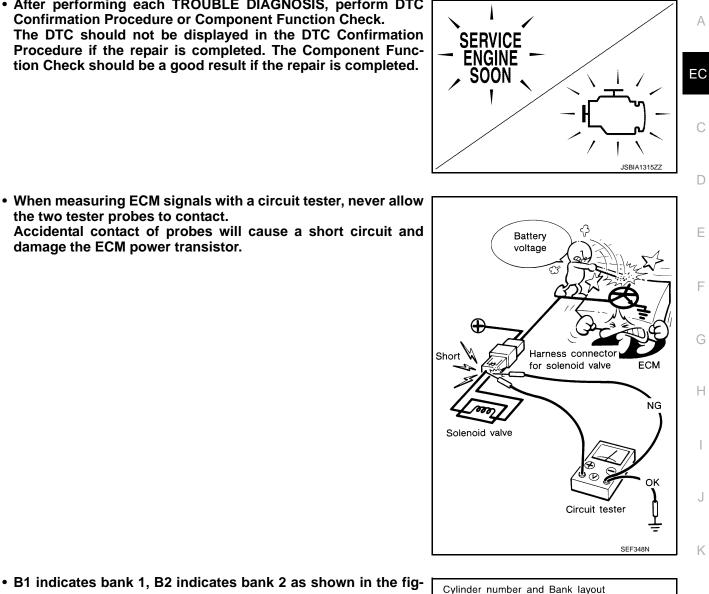
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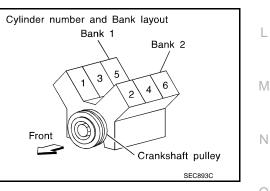
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• After performing each TROUBLE DIAGNOSIS, perform DTC **Confirmation Procedure or Component Function Check.** The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.



- B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.
- Never operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



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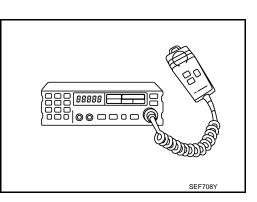
< PRECAUTION >

- Never depress accelerator pedal when starting.
- Immediately after starting, never rev up engine unnecessarily.
- Never rev up engine just prior to shutdown.

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- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
- Keep the antenna as far as possible from the electronic control units.
- Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.
- Never let them run parallel for a long distance.
- Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
- Be sure to ground the radio to vehicle body.



PREPARATION

< PREPARATION > PREPARATION PREPARATION

Special Service Tools

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 | | Checks fuel pressure |
| ommercial Service | e Tools | INFOID:00000008156649 |
| Tool name (Kent-Moore No.) | | Description |
| Leak detector i.e.: (J-41416) | | Locates the EVAP leak |
| | S-NT703 | |
| EVAP service port adapter i.e.: (J-41413-OBD) | CALLER AND | Applies positive pressure through EVAP service port |
| Fuel filler cap adapter | S-NT704 | Checks fuel tank vacuum relief valve opening |
| i.e.: (MLR-8382) | | pressure |
| Socket wrench | S-NT815 19 mm (0.75 in) 10 re than 12 mm 12 mm 12 mm 12 mm 12 mm 12 mm | Removes and installs engine coolant temperature sensor |

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PREPARATION

< PREPARATION >

| Tool name (Kent-Moore No.) | | Description |
|---|---|--|
| Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12) | a Mating surface shave cylinder | Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti- seize lubricant shown below. a: 18 mm diameter with pitch 1.5 mm for Zirco- nia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Tita- nia Oxygen Sensor |
| Anti-seize lubricant i.e.: (Permatex TM 133AR or equivalent meeting MIL specifica- tion MIL-A-907) | S-NT779 | Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads. |

< PERIODIC MAINTENANCE > PERIODIC MAINTENANCE FUEL PRESSURE

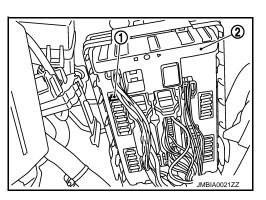
FUEL PRESSURE RELEASE

(P) With CONSULT

- 1. Turn ignition switch ON.
- 2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.

Without CONSULT

- 1. Remove fuel pump fuse (1) located in IPDM E/R (2).
- 2. Start engine.
- 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 HV36 models do not have fuel return system.
- Use Fuel Pressure Gauge Kit (J-44321) to check fuel pressure.
- 1. Release fuel pressure to zero.
- 2. Install the inline fuel quick disconnected fitting (A) between fuel damper (1) and injector tube.
- 3. Connect the fuel pressure test gauge (quick connector adapter hose) (B) to the inline fuel quick disconnected fitting.
- 4. Turn ignition switch ON and check for fuel leakage.
- 5. Start engine and check for fuel leakage.
- 6. Read the indication of fuel pressure gauge.

At idling : Approximately 350 kPa (3.57 kg/cm², 51 psi)

If result is unsatisfactory, check fuel hoses and fuel tubes for ^L clogging.

If OK, Replace "fuel filter and fuel pump assembly". Refer to <u>FL-6, "Removal and Installation"</u>. If NG, Repair or replace.

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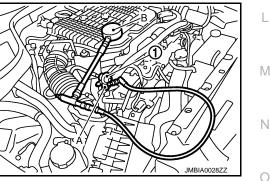
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< PERIODIC MAINTENANCE >

EVAP LEAK CHECK

Inspection

CAUTION:

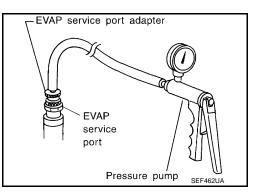
- Do not use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

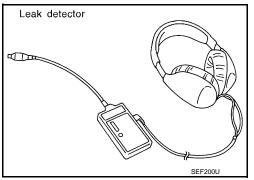
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

B WITH CONSULT

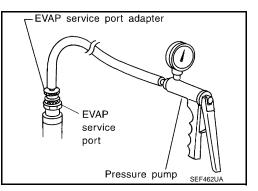
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- 3. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
- 4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
- 6. Remove EVAP service port adapter and hose with pressure pump.
- 7. Locate the leak using a leak detector. Refer to <u>EC-92, "System</u> <u>Diagram"</u>.





WITHOUT CONSULT

- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
- 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/cm², 0.2 to 0.4 psi).
- 4. Remove EVAP service port adapter and hose with pressure pump.

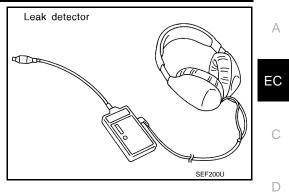


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EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

5. Locate the leak using a leak detector. Refer to <u>EC-92, "System</u> <u>Diagram"</u>.



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SERVICE DATA AND SPECIFICATIONS (SDS)

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SERVICE DATA AND SPECIFICATIONS (SDS) SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

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[VQ37VHR]

| Transmission | Condition | Specification |
|--------------|--------------------------------|----------------|
| A/T | No load* (in P or N position) | 650 ± 50 rpm |
| M/T | No load* (in Neutral position) | 650 ± 50 rpm |

*: Under the following conditions

• A/C switch: OFF

• Electric load: OFF (Lights, heater fan & rear window defogger)

• Steering wheel: Kept in straight-ahead position

Ignition Timing

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| Transmission | Condition | Specification |
|--------------|--------------------------------|---------------------|
| A/T | No load* (in P or N position) | $10\pm5^\circ$ BTDC |
| M/T | No load* (in Neutral position) | $10\pm5^\circ$ BTDC |

*: Under the following conditions

• A/C switch: OFF

• Electric load: OFF (Lights, heater fan & rear window defogger)

• Steering wheel: Kept in straight-ahead position

Calculated Load Value

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| Condition | Specification (Using CONSULT or GST) |
|--------------|--------------------------------------|
| At idle | 5 – 35 % |
| At 2,500 rpm | 5 – 35 % |

Mass Air Flow Sensor

| Supply voltage | Battery voltage (11 – 14 V) |
|--------------------------------------|--|
| Output voltage at idle | 0.7 – 1.2 V* |
| Mass air flow (Using CONSULT or GST) | 2.0 – 6.0 g/sec at idle* 7.0 – 20.0 g/sec at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no load.