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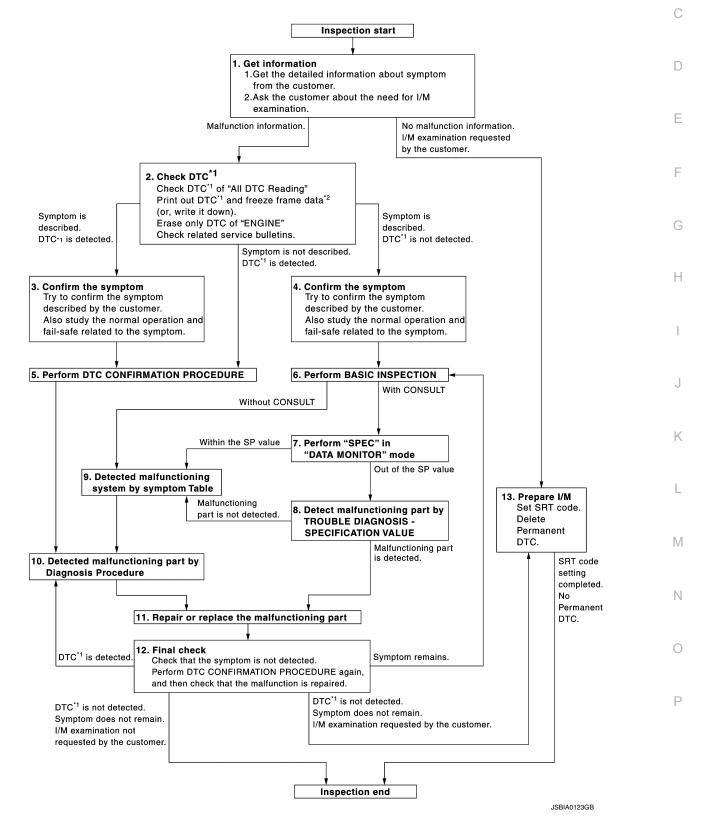
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| SERVICE DATA AND SPECIFICATIONS (SDS) |

BASIC INSPECTION DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

OVERALL SEQUENCE



INFOID:000000010596652

А

EC

*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-143. "On Board Diagnosis Function" or EC-146. "CONSULT Function".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to <u>EC-616</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-620</u>, "<u>Description</u>" and <u>EC-572</u>, "<u>Fail safe</u>".

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-620</u>, "<u>Description</u>" and <u>EC-572</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-574, "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 | CINSPECTION > | [VQ37VHR] |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| YES NO | >> GO TO 10. > Check according to <u>GI-45, "Intermittent Incident</u> ". | |
| 6.PERF | FORM BASIC INSPECTION | |
| Perform | EC-14, "BASIC INSPECTION : Special Repair Requirement". | E |
| <u>Do you h</u> | have CONSULT? | |
| YES NO | >> GO TO 7. >> GO TO 9. | (|
| 7.PERF | FORM SPEC IN DATA MONITOR MODE | |
| Make su B2" are v | CONSULT are that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA-B1" and within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode. Refer to <u>EC-</u> action Check". | |
| | easurement value within the SP value? | E |
| YES NO | >> GO TO 9. >> GO TO 8. | |
| 8.DETE | ECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE | F |
| | nalfunctioning part according to EC-157, "Diagnosis Procedure". | |
| <u>Is a malf</u> YES NO | f <u>unctioning part detected?</u> >> GO TO 11. >> GO TO 9. | (|
| - | ECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE | ł |
| Detect n | nalfunctioning system according to <u>EC-616, "Symptom Table"</u> based on the confirme and determine the trouble diagnosis order based on possible causes and symptoms. | |
| | | |
| 10 | >> GO TO 10. | |
| | TECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE | |
| Inspect a | according to Diagnosis Procedure of the system. | |
| The Diag | gnosis Procedure in EC section described based on open circuit inspection. A short cir equired for the circuit check in the Diagnosis Procedure. For details, refer to <u>GI-48.</u> | |
| <u>Is a malf</u> | functioning part detected? | |
| YES NO | >> GO TO 11. >> Monitor input data from related sensors or check voltage of related ECM termina SULT. Refer to <u>EC-534</u> , "Reference Value". | 0 |
| 11. REI | PAIR OR REPLACE THE MALFUNCTIONING PART | ſ |
| | air or replace the malfunctioning part. onnect parts or connectors disconnected during Diagnosis Procedure again after repa | ir and replace- |
| 3. Che | ck DTC. If DTC is displayed, erase it. Refer to <u>EC-143, "On Board Diagnosis Function"</u> . <u>NSULT Function"</u> . | on" or <u>EC-146.</u> |
| | >> CO TO 12 | |
| 12 | >> GO TO 12. IAL CHECK | |
| | | ward Free stiers |
| Check as When sy that the s | TC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Compo gain, and then make sure that the malfunction have been completely repaired. (mptom was described from the customer, refer to confirmed symptom in step 3 or 4, a symptom is not detected. | |
| | detected and does symptom remain? | |
| | >> DTC is detected: GO TO 10. >> 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-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function".
- NO-2 >> I/M examination, requested from the customer: GO TO 13.

13.PREPARE FOR I/M EXAMINATION

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

>> INSPECTION END.

Diagnostic Work Sheet

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.



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

[VQ37VHR]

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

WORKSHEET SAMPLE

| Customer name MR/MS | | Model & Year | VIN | | |
|----------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--|--|
| Engine # | | Trans. | Mileage | | |
| Incident Date | 9 | 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 screwed on. | | | |
| | ☐ Startability | Impossible to start | nrottle position d by throttle position | | |
| Symptoms | Idling | □ No fast idle □ Unstable □ H □ Others [| High idle 🔲 Low idle | | |
| - , | Driveability | Stumble Surge Knock Intake backfire Exhaust backfi Others [| Intake backfire | | |
| | Engine stall | At the time of start While idling While accelerating While decelerating Just after stopping While loading | | | |
| Incident occurrence | | ☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night [| ☐ In the daytime | | |
| Frequency | | All the time Under certain conditions Sometimes | | | |
| Weather con | ditions | □ 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 0 2,000 | | | |
| Road conditions | | 🗌 In town 🗌 In suburbs 🗌 Hig | Jhway 🛛 Off road (up/down) | | |
| Driving conditions | | Not affected At starting While idling While accelerating While cruis While decelerating While turning Vehicle speed | 5 | | |
| | | 0 10 20 | 30 40 50 60 MPH | | |
| Malfunction indicator lamp | | ☐ Turned on ☐ Not turned on | | | |

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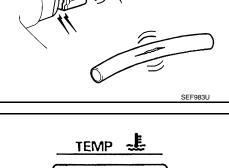
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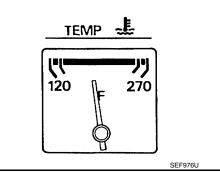
INSPECTION AND ADJUSTMENT BASIC INSPECTION

BASIC INSPECTION : Special Repair Requirement

1.INSPECTION START

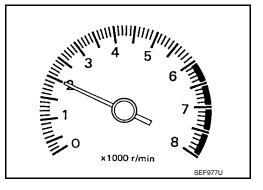
- 1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
- 2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses 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.
- Start engine and warm it up until engine coolant temperature indicator points the middle of gauge. Ensure engine stays below 1,000 rpm.





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

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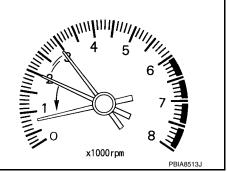
EC

С

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

Is the inspection result normal?

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



| PBIA6513J | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 4.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING | D |
| Stop engine. Perform <u>EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description"</u>. | E |
| >> GO TO 5. | |
| 5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING | F |
| Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description". | |
| >> GO TO 6. | G |
| 6.PERFORM IDLE AIR VOLUME LEARNING | |
| Perform <u>EC-21, "IDLE AIR VOLUME LEARNING : Description"</u> . Is Idle Air Volume Learning carried out successfully? | Η |
| YES >> GO TO 7. NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4. | |
| 7.CHECK IDLE SPEED AGAIN | |
| Start engine and warm it up to normal operating temperature. Check idle speed. For procedure, refer to <u>EC-19</u>, "IDLE SPEED : <u>Description</u>". | J |
| For specification, refer to <u>EC-631, "Idle Speed"</u> . | K |
| Is the inspection result normal? | |
| YES >> GO TO 10. NO >> GO TO 8. | |
| 8. DETECT MALFUNCTIONING PART | L |
| Check the Following. Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-304, "Component Inspection"</u>. Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-300, "Component Inspection"</u>. | M |
| Is the inspection result normal? | NI |
| YES >> GO TO 9. NO >> Repair or replace. Then GO TO 4. | Ν |
| 9. CHECK ECM FUNCTION | |
| 1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.) | 0 |
| Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to EC-17. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description". | Ρ |
| >> GO TO 4. | |

10.CHECK IGNITION TIMING

1. Run engine at idle.

< BASIC INSPECTION >

[VQ37VHR]

2. Check ignition timing with a timing light.

A :Timing indicator

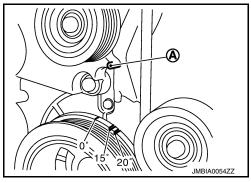
For procedure, refer to EC-19, "IGNITION TIMING : Descripti<u>on"</u>.

For specification, refer to EC-631, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 19.

NO >> GO TO 11.



11.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.

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

>> GO TO 12.

12.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 13.

13.PERFORM IDLE AIR VOLUME LEARNING

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

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 14.

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

14.CHECK IDLE SPEED AGAIN

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

2. Check idle speed. For procedure, refer to EC-19, "IDLE SPEED : Description". For specification, refer to EC-631, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.

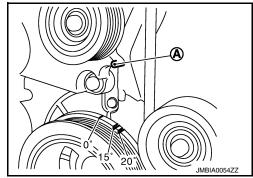
Check ignition timing with a timing light. 2.

A :Timing indicator

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

Is the inspection result normal?

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



16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-52, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 17.

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

< BASIC INSPECTION >

[VQ37VHR]

| 17. DETECT MALFUNCTIONING PART | А |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Check the following. Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-304, "Component Inspection"</u>. Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-300, "Component Inspection"</u>. | EC |
| Is the inspection result normal? | LU |
| YES >> GO TO 18. NO >> Repair or replace. Then GO TO 4. | |
| 18. CHECK ECM FUNCTION | С |
| 1. 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 EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description". | _ |
| >> GO TO 4. | E |
| 19.INSPECTION END | |
| If ECM is replaced during this BASIC INSPECTION procedure, go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description". | F |
| >> INSPECTION END | G |
| ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) | |
| ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description | Η |
| When replacing ECM, the following procedure must be performed. (For details, refer to <u>EC-17, "ADDITIONAL</u> <u>SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement"</u> .) | I |
| PROGRAMMING OPERATION | |
| NOTE: After replacing with a blank ECM, programming is required to write ECM information. Be sure to follow the procedure to perform the programming. | J |
| ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair | K |
| Requirement | |
| 1.CHECK ECM PART NUMBER | I |
| Check ECM part number to see whether it is blank ECM or not. | |
| NOTE: | |
| Part number of blank ECM is 23703 - xxxxx. Check the part number when ordering ECM or with the one included in the label on the container box. | Μ |
| Is the ECM a blank ECM? | |
| YES >> GO TO 2. | Ν |
| NO >> GO TO 4. 2.SAVE ECM PART NUMBER | |
| | 0 |
| Read out the part number from the old ECM and save the number, following the programming instructions. Refer to "CONSULT Operation Manual". NOTE: | D |
| The ECM part number is saved in CONSULT. Even when ECM part number is not saved in CONSULT, go to 3. | Ρ |
| >> GO TO 3. | |
| 3.PERFORM ECM PROGRAMMING | |
| | |

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

< BASIC INSPECTION >

NOTE:

During programming, maintain the following conditions:

Ignition switch: ON

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

>> GO TO 5.

4.REPLACE ECM

Replace ECM.

>> GO TO 5.

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

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

>> GO TO 6.

6.PERFORM VIN REGISTRATION

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

>> GO TO 7.

7. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

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

>> GO TO 8.

8. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 9.

9.PERFORM IDLE AIR VOLUME LEARNING

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

>> END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE)

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

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

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL

| BASIC INSPECTION > | [VQ37VHR] |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| MODULE) : Special Repair Requirement | INFOID:000000010596658 |
| PERFORM IDLE AIR VOLUME LEARNING | |
| Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description". | |
| >> END DLE SPEED | |
| DLE SPEED : Description | INFOID:000000010596659 |
| This describes how to check the idle speed. For the actual procedure, follow the NSPECTION". Refer to <u>EC-19, "IDLE SPEED : Special Repair Requirement"</u> . | instructions in "BASIC |
| DLE SPEED : Special Repair Requirement | INFOID:000000010596660 |
| .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 GNITION TIMING | |
| GNITION TIMING : Description | INFOID:000000010596661 |
| This describes how to check the ignition timing. For the actual procedure, follow the NSPECTION". Refer to EC-19, "IGNITION TIMING : Special Repair Requirement". | instructions in "BASIC |
| GNITION TIMING : Special Repair Requirement | INFOID:000000010596662 |
| CHECK IGNITION TIMING | |
| . Attach timing light to loop wire as shown. | |
| | a |
| | |
| | JMBIA0846ZZ |
| 1. Loop wire | |
| A. Timing light B. Timing indicator 2. Check ignition timing. | |
| | |
| >> INSPECTION END /IN REGISTRATION | |
| | |

Revision: February 2015 EC-19

NOTE:

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

VIN REGISTRATION : Special Repair Requirement

INFOID:000000010596664

1.CHECK VIN

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

>> GO TO 2.

2. PERFORM VIN REGISTRATION

With CONSULT

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

>> END ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description INFOLD:00000010596665

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

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement

1.START

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

>> END THROTTLE VALVE CLOSED POSITION LEARNING

THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:000000010596667

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

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:000000010596668

1.START

WITH CONSULT

- 1. Turn ignition switch ON.
- 2. Select "CLSD THL POS LEARN" in "WORK SUPPORT" mode.
- 3. Follow the instructions on the CONSULT display.
- 4. Turn ignition switch OFF and wait at least 10 seconds.

Check that throttle valve moves during the above 10 seconds by confirming the operating sound. (R) WITHOUT CONSULT

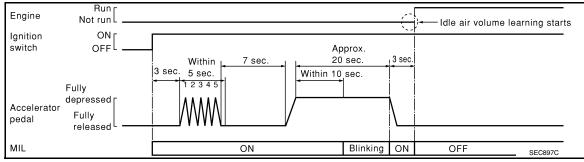


| < BASIC INSPECTION > | [VQ37VHR] |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Start the engine. NOTE: Engine coolant temperature is 25°C (77°F) or less before engine starts. | A |
| Warm up the engine. NOTE: | |
| Raise engine coolant temperature until it reaches 65°C (149°F) or more. 3. Turn ignition switch OFF and wait at least 10 seconds. | EC |
| Check that throttle valve moves during the above 10 seconds by confirming the operating so | ound. C |
| >> END IDLE AIR VOLUME LEARNING | D |
| IDLE AIR VOLUME LEARNING : Description | INFOID:000000010596669 |
| Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle the specific range. Refer to <u>EC-21</u> , "IDLE AIR VOLUME LEARNING : Special Repair Requirement 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. | F |
| IDLE AIR VOLUME LEARNING : Special Repair Requirement | INFOID:000000010596670 G |
| 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) | Н |
| Engine coolant temperature: 70 - 105°C (158 - 221°F) Selector lever: P or N Electric load switch: OFF | I |
| (Air conditioner, headlamp, rear window defogger) On vehicles equipped with daytime light systems, if the parking brake is applied before started the headlamp will not be illuminated. Steering wheel: Neutral (Straight-ahead position) | the engine is J |
| Vehicle speed: Stopped Transmission: Warmed-up | K |
| - With CONSULT: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" sys less than 0.9V. | item indicates |
| - Without CONSULT: Drive vehicle for 10 minutes. <u>Do you have CONSULT?</u> | L |
| YES >> GO TO 2. NO >> GO TO 3. | M |
| 2.PERFORM IDLE AIR VOLUME LEARNING | |
| With CONSULT Perform Accelerator Pedal Released Position Learning. Refer to <u>EC-20, "ACCELERA</u> <u>RELEASED POSITION LEARNING : Description"</u>. | TOR PEDAL |
| 2. Perform Throttle Valve Closed Position Learning. <u>EC-20. "THROTTLE VALVE CLOSE LEARNING : Description"</u> . | D POSITION O |
| Start engine and warm it up to normal operating temperature. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode. Touch "START" and wait 20 seconds. | P |
| Is "CMPLT" displayed on CONSULT screen? | I |
| YES >> GO TO 4. NO >> GO TO 5. | |
| 3.PERFORM IDLE AIR VOLUME LEARNING | |

Without CONSULT NOTE:

< BASIC INSPECTION >

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



>> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

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

Is the inspection result normal?

YES >> INSPECTION END

5. DETECT MALFUNCTIONING PART-I

Check the following

Check that throttle valve is fully closed.

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace malfunctioning part.

6.DETECT MALFUNCTIONING PART-II

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

It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to <u>EC-156</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

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

3.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Without CONSULT

- Disconnect VVEL control shaft position sensor harness connector. 1.
- **Revision: February 2015**

< BASIC INSPECTION > VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description

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

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

It must be performed only on the replaced bank side.

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

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement INFOID:000000010596672

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

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

Voltage : 500 ± 48 mV

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

: 7.0 N•m (0.71 kg-m, 62 in-lb) U)

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

11. Start engine and warm it up to normal operating temperature. 12. Turn ignition switch OFF and wait at least 10 seconds.

Voltage : 500 ± 48 mV

NOTE:

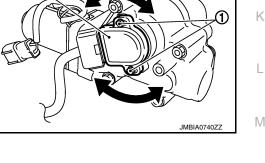
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- If it varies from the standard value after the bolt is tightened, perform steps 6 to 8 again. 10. Turn ignition switch OFF and wait at least 10 seconds.

EC-23



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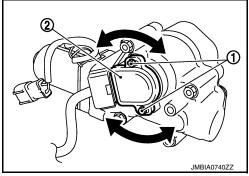
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IVQ37VHR1

INFOID:0000000010596671

< BASIC INSPECTION >

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



| | | VVEL control module | | |
|-------|-----------|---------------------|----------|---------------|
| Bank | Connector | + | - | Voltage |
| Dalik | Connector | Terminal | Terminal | |
| 1 | E14 | 3 | 4 | 500 ± 48 mV |
| 2 | C 14 | 5 | 6 | 500 ± 46 IIIV |

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

C : 7.0 N•m (0.71 kg-m, 62 in-lb)

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

| | | VVEL control module | | Voltage |
|----------------|-----------|---------------------|----------|-----------------|
| Bank Connector | | + | _ | |
| Dalik | Connector | Terminal | Terminal | |
| 1 | E14 | 3 | 4 | 500 ± 48 mV |
| 2 | 2 | 5 | 6 | 500 ± 48 mV |

NOTE:

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

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

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

>> INSPECTION END MIXTURE RATIO SELF-LEARNING VALUE CLEAR

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:000000010596673

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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:000000010596674

1.START

With CONSULT

< BASIC INSPECTION >

| 1. 2. 3. | Start engine and warm it up to normal operating temperature. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT. Clear mixture ratio self-learning value by touching "CLEAR". | А |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| | Vith GST | |
| 1. 2. | Start engine and warm it up to normal operating temperature. Turn ignition switch OFF. | EC |
| 3. 4. 5. 6. | Disconnect mass air flow sensor (bank 1) harness connector. Restart engine and let it idle for at least 5 seconds. Stop engine and reconnect mass air flow sensor (bank 1) harness connector. Select Service \$03 with GST. Make sure DTC P0102 is detected. | С |
| 7. | Select Service \$04 with GST to erase the DTC P0102. | |
| | >> END | D |
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HOW TO SET SRT CODE

< BASIC INSPECTION >

HOW TO SET SRT CODE

Description

INFOID:000000010596675

[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. |
|------------------------------------------------|---------------------------------------|----------------------------------------------------------|--------------------------------------------------------------|
| CATALYST | 1 | Three way catalyst function | P0420, P0430 |
| EVAP SYSTEM | 1 | EVAP control system purge flow monitoring | P0441 |
| | 1 | EVAP control system | P0456 |
| HO2S | 1 | Air fuel ratio (A/F) sensor 1 | P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D |
| | | Heated oxygen sensor 2 | P0137, P0157 |
| | | Heated oxygen sensor 2 | P0138, P0158 |
| | | Heated oxygen sensor 2 | P0139, P0159 |
| EGR/VVT SYSTEM | 2 | Intake value timing control function | P0011, P0021 |

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

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

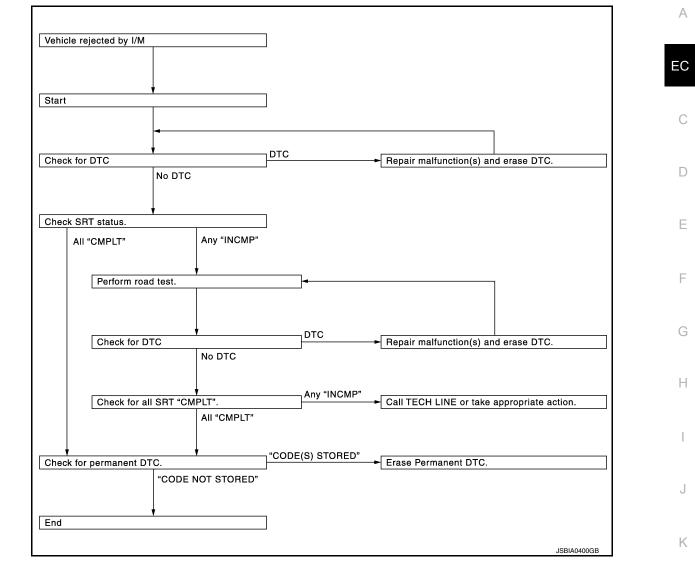
SRT SERVICE PROCEDURE

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

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ37VHR]



SRT Set Driving Pattern

CAUTION:

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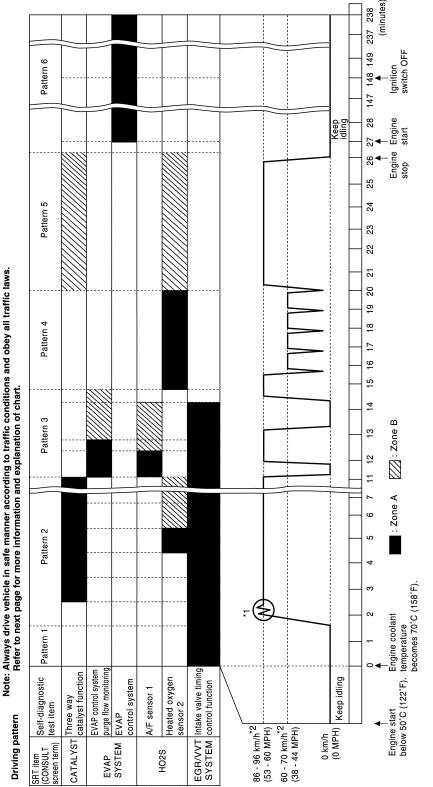
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Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.



*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".

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HOW TO SET SRT CODE

| HOW TO SET SRT CODE | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| < BASIC INSPECTION > | [VQ37VHR] |
| *: Normal conditions - Sea level - Flat road - Ambient air temperature: 20 – 30°C (68 – 86°F) | А |
| NOTE: Diagnosis is performed as quickly as possible under normal conditions. However, under othe diagnosis may also be performed. [For example: ambient air temperature other than 20 – 30°C (| |
| Work Procedure | NFOID:0000000010596677 |
| 1.снеск отс | |
| Check DTC. <u>Is any DTC detected?</u> | D |
| YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-576, "DTC Index"</u> . NO >> GO TO 2. | E |
| 2.CHECK SRT STATUS | |
| With CONSULT Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT. Without CONSULT | F |
| Perform "SRT status" mode with <u>EC-143, "On Board Diagnosis Function"</u> . | G |
| Is SRT code(s) set? | |
| YES >> GO TO 12. NO-1 >> With CONSULT: GO TO 3. NO-2 >> Without CONSULT: GO TO 4. | Н |
| 3. DTC CONFIRMATION PROCEDURE | I |
| Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT. For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-26, "Description"</u>. Check DTC. | ' according to J |
| Is any DTC detected? | К |
| YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-576, "DTC Index"</u>. NO >> GO TO 11. | i x |
| 4.PERFORM ROAD TEST | L |
| Check the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-26, "Description"</u>. Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to <u>EC-27, "SR</u> Pattern". | - |
| In order to set all SRTs, the SRT set driving pattern must be performed at least once. | Μ |
| >> GO TO 5. | N |
| 5.PATTERN 1 | Ν |
| 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). | 0 |
| 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 | Ρ |
| Fuel tank temperature: Less than 1.4 V Refer to <u>EC-534, "Reference Value"</u>. | |

< BASIC INSPECTION >

>> GO TO 6.

6.PATTERN 2

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

NOTE:

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

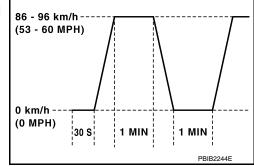
>> GO TO 7.

7.PATTERN 3

• Operate vehicle following the driving pattern shown in the figure.

 Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).
 86 - 96 km (53 - 60 M)

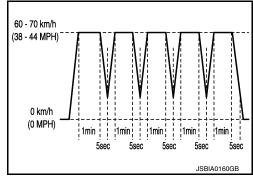
>> GO TO 8.



8.PATTERN 4

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

>> GO TO 9.



9. PATTERN 5

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

>> GO TO 10.

10.PATTERN 6

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

>> GO TO 11.

11.CHECK SRT STATUS

With CONSULT
 Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.
 Without CONSULT
 Perform "SRT status" mode with <u>EC-143</u>, "On Board Diagnosis Function".
 With GST

HOW TO SET SRT CODE

| HOW TO SET SKI CODE | | |
|------------------------------------------------------------------------|----------|--|
| | /Q37VHR] | |
| Select Service \$01 with GST. | 0 | |
| <u>Is SRT(s) set?</u> | A | |
| YES >> GO TO 12. NO >> Call TECH LINE or take appropriate action. | | |
| 12. CHECK PERMANENT DTC | EC | |
| NOTE: | | |
| Permanent DTC cannot be checked with a tool other than CONSULT or GST. | С | |
| | C | |
| Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT. | | |
| Select Service \$0A with GST. | D | |
| Is permanent DTC(s) detected? | | |
| YES >> Go to <u>EC-26, "Description"</u> . | E | |
| NO >> END | _ | |
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< BASIC INSPECTION >

HOW TO ERASE PERMANENT DTC

Description

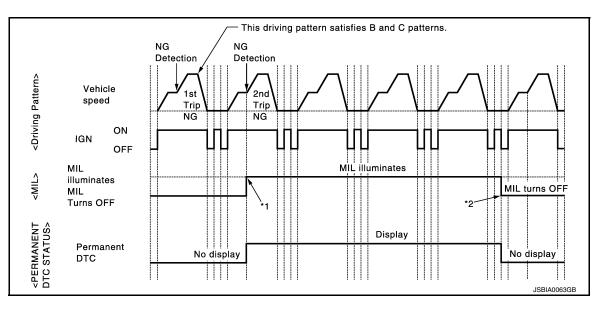
INFOID:000000010596678

[VQ37VHR]

OUTLINE

When a DTC is stored in ECM

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



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate. *2: MIL will turn off after vehicle is driven 3 times (driving pattern B) without any malfunctions.

When a DTC is not stored in ECM

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

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

 $\times:$ Applicable —: Not applicable

| Group [*] | Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs. | Driving pattern | |
|--------------------|-----------------------------------------------------------|-----------------|---|
| | | В | D |
| A | × | — | — |
| В | _ | × | × |

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

PERMANENT DTC ITEM

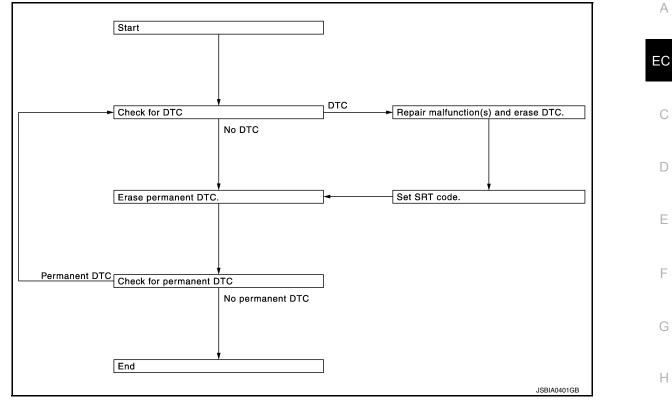
For permanent DTC items, MIL turns ON. Refer to EC-576. "DTC Index".

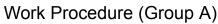
HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

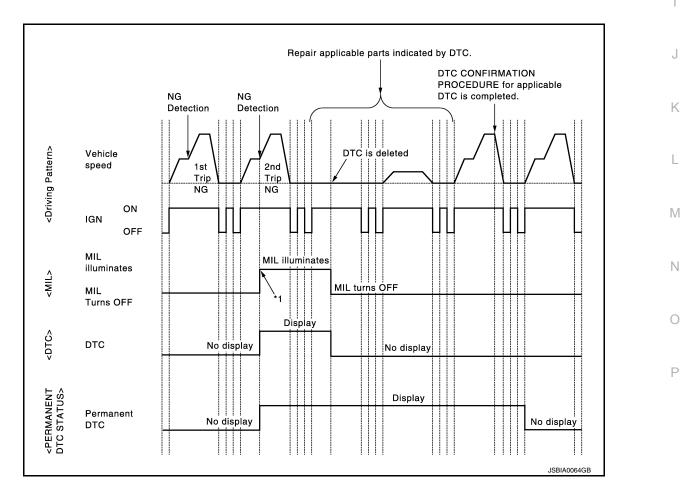
[VQ37VHR]

PERMANENT DTC SERVICE PROCEDURE









< BASIC INSPECTION >

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

1. СНЕСК DTC

Check DTC.

Is any DTC detected?

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

NO >> GO TO 2.

2. CHECK PERMANENT DTC

() With CONSULT

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

With GST

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

Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

3. PERFORM DTC CONFIRMATION PROCEDURE

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

>> GO TO 4.

4.CHECK PERMANENT DTC

With CONSULT

- Turn ignition 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

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

HOW TO ERASE PERMANENT DTC

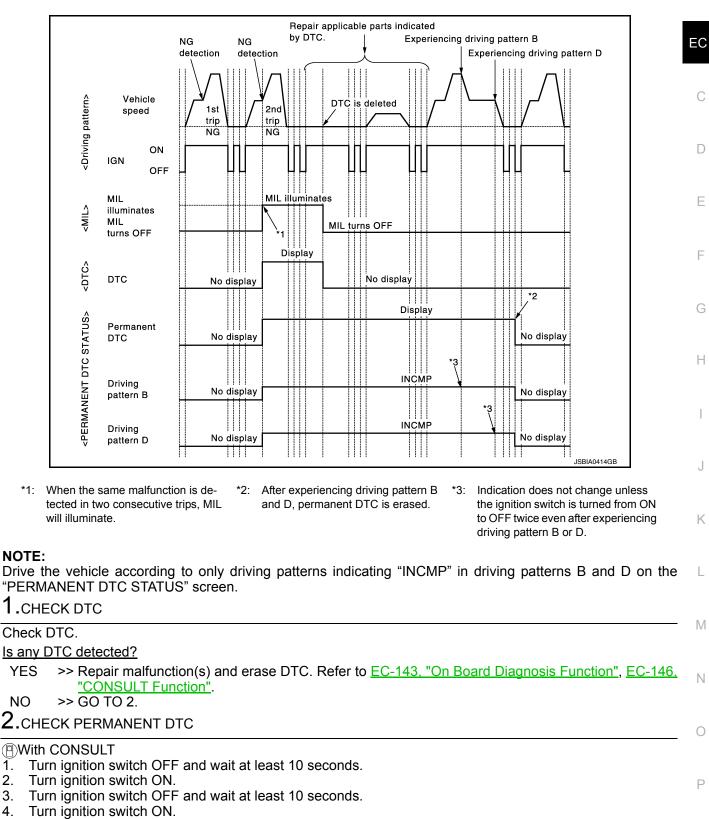
< BASIC INSPECTION >

Work Procedure (Group B)



[VQ37VHR]





Select "PERMANENT DTC STATUS" mode with CONSULT. 5.

Gerein GST

NO

1. 2.

3. 4.

- 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.

HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

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

Is any permanent DTC detected?

YES >> GO TO 3. NO >> END

3. DRIVE DRIVING PATTERN B

CAUTION:

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

With CONSULT

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

With GST

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

>> GO TO 4.

4.CHECK PERMANENT DTC

() With CONSULT

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

With GST

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

Is any permanent DTC detected?

YES >> GO TO 5. NO >> END

5.DRIVE DRIVING PATTERN D

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.
- 1. Drive the vehicle according to driving pattern D. Refer to <u>EC-140, "DIAGNOSIS DESCRIPTION : Driving</u> <u>Pattern"</u>.

>> GO TO 6.

6.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.

HOW TO ERASE PERMANENT DTC

| < BASIC INSPECTION > | [VQ37VHR] | |
|--------------------------------------------------------------------------------------------------------------|-----------|--------------|
| Select "PERMANENT DTC STATUS" mode with CONSULT. With GST | | А |
| 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. | | EC |
| Turn ignition switch ON. Select Service \$0A with GST. | ļ | |
| Is any permanent DTC detected? | | С |
| YES >> GO TO 1. NO >> END | | - |
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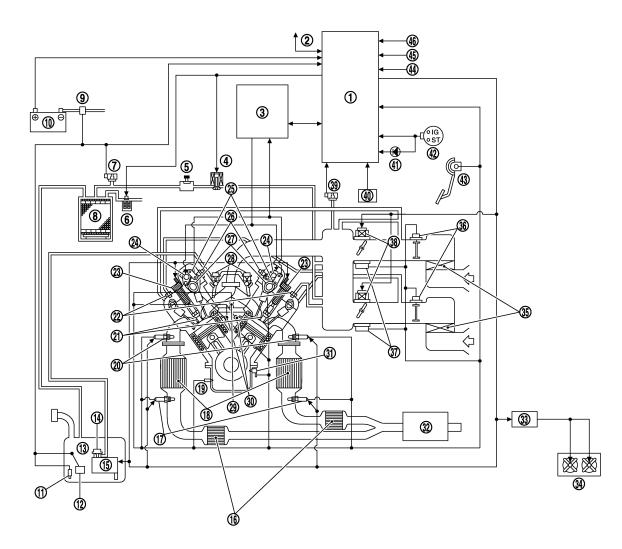
< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION ENGINE CONTROL SYSTEM

System Diagram

INFOID:000000010596681

[VQ37VHR]



- 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)

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- 3. VVEL control module
- 6. EVAP canister vent control valve
- 9. Battery current sensor
- 12. Fuel level sensor
- 15. Fuel pump
- 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 valve | 27. | Camshaft position sensor (PHASE) | А |
|-----|------------------------------------|-----|--------------------------------------------|-----|-----------------------------------------------------------|----|
| 28. | Fuel damper | 29. | Engine coolant temperature sensor | 30. | Knock sensor | |
| 31. | Crankshaft position sensor (POS) | 32. | Muffler | 33. | Cooling fan control module | |
| 34. | Cooling fan | 35. | Air cleaner | 36. | Mass air flow sensor (with intake air temperature sensor) | EC |
| 37. | Electric throttle control actuator | 38. | Throttle position sensor | 39. | Manifold absolute pressure (MAP) sensor | С |
| 40. | Brake booster pressure sensor | 41. | MIL | 42. | Ignition switch | 0 |
| 43. | Accelerator pedal position sensor | 44. | Power steering pressure sensor | 45. | Refrigerant pressure sensor | |
| 46. | PNP signal | | | | | D |
| | | | | | | |

System Description

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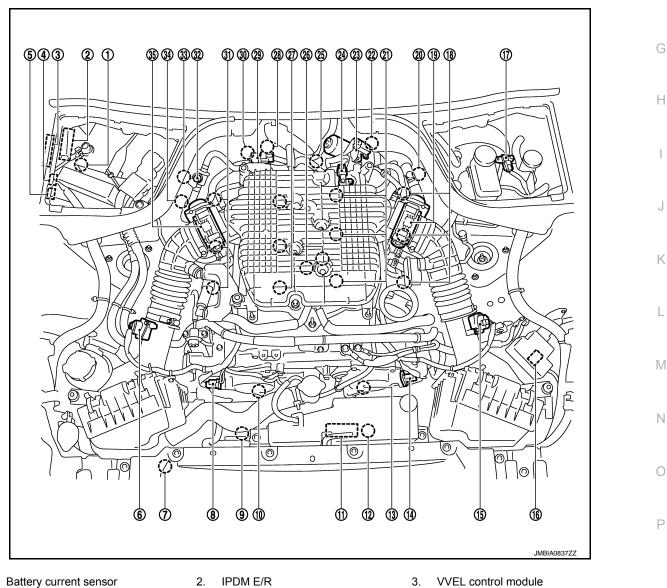
ECM performs various controls such as fuel injection control and ignition timing control.

Component Parts Location

INFOID:000000010596683

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Cooling fan relay 4.

1.

- 2.
- 5. VVEL actuator motor relay
- VVEL control module
- 6. 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)
- 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)
- 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) 15. Mass air flow sensor (bank 2) (bank 2)
- 17. Brake booster pressure sensor

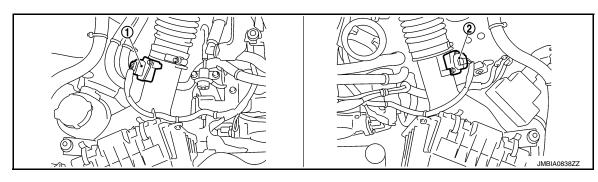
11. Cooling fan control module

- 20. A/F sensor 1 (bank 2)
- VVEL actuator motor (bank 2) 23.
- 26. Knock sensor
- 29. EVAP canister purge volume control solenoid valve
- 32. EVAP service port
- 35. Electric throttle control actuator (bank 1)

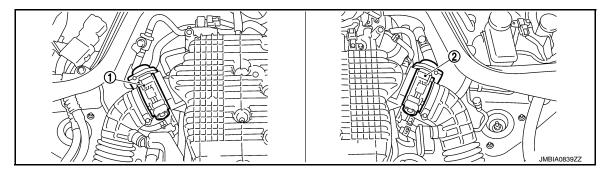
Cooling fan motor-2

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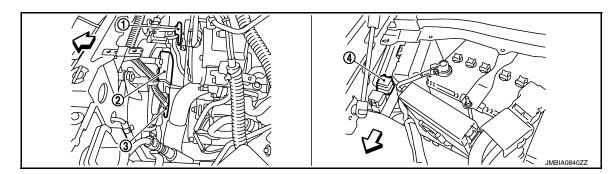
- 12. Cooling fan motor-1
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP) sensor
- 27. Fuel injector (bank 1)
- 30. VVEL control shaft position sensor (bank 1)
- 33. A/F sensor 1 (bank 1)



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)



Revision: February 2015

2015 QX50

[VQ37VHR]

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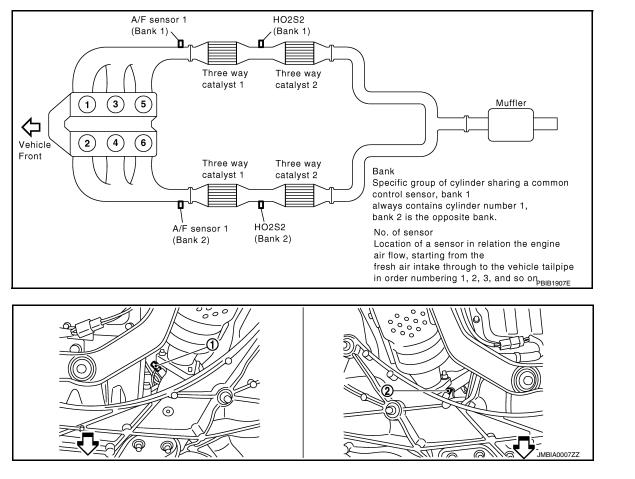
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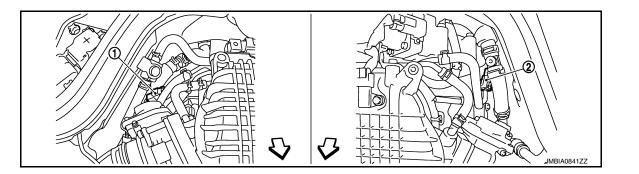
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- C: Vehicle front
- 1. Cooling fan motor-2
- 2. Cooling fan control module
- 3. Cooling fan motor-1

4. Cooling fan relay



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



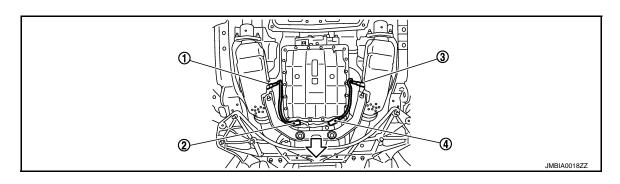
C : Vehicle front

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

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

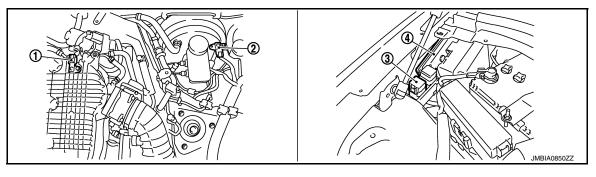
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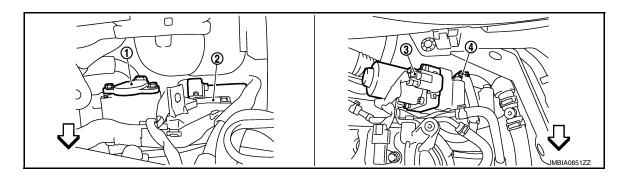


- C : Vehicle front
- Heated oxygen sensor 2 (bank 2) 1.
- Heated oxygen sensor 2 (bank 2) 2. harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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



C : Vehicle front

(bank 2)

4.

1. VVEL control shaft position sensor (bank 1)

VVEL control shaft position sensor

- 2. VVEL actuator motor (bank 1)
- 3. VVEL actuator motor (bank 2)

< SYSTEM DESCRIPTION >

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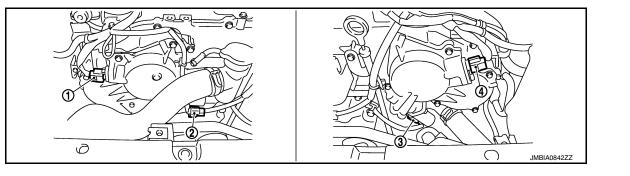
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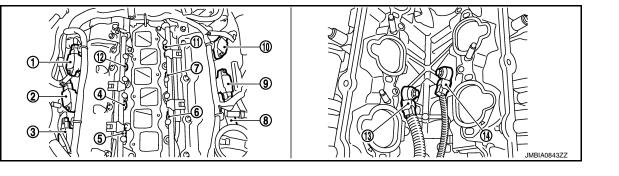
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- Camshaft position sensor (PHASE) 2. 1. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid 3. valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector



- 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. tor)
- 13. Knock sensor (bank 1)

- Ignition coil No.3 (with power transis- 3. tor)
- 5. Fuel injector No.1
- Ignition coil No.2 (with power transis- 9. 8. tor)
 - Fuel injector No.6
- 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

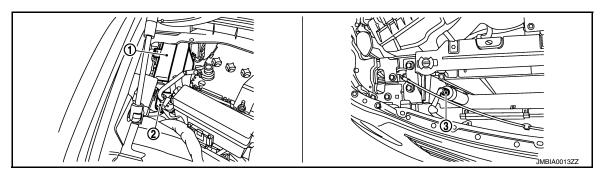
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C: Vehicle front

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

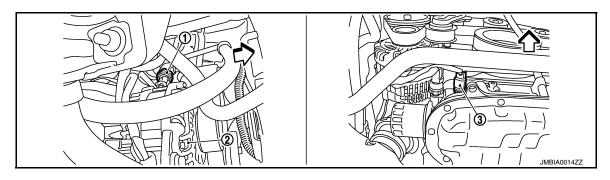
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< SYSTEM DESCRIPTION >



1. IPDM E/R

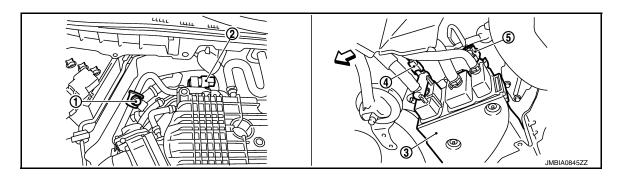
- 2. Battery current sensor
- 3. Refrigerant pressure sensor



C : Vehicle front

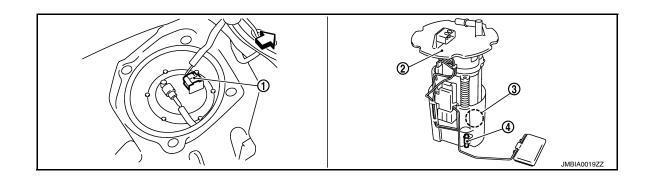
1. Power steering pressure sensor 2. Alternator

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
- solenoid valve
 EVAP control system pressure sen-



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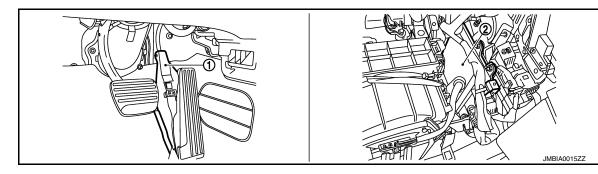
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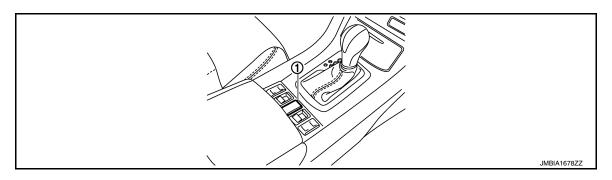
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C: Vehicle front

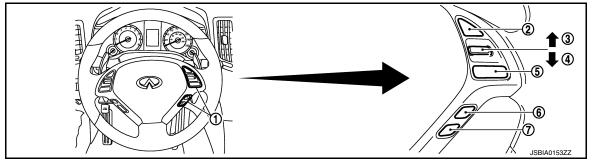
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- Fuel tank temperature sensor 4.



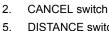
1. Accelerator pedal position sensor 2. ECM



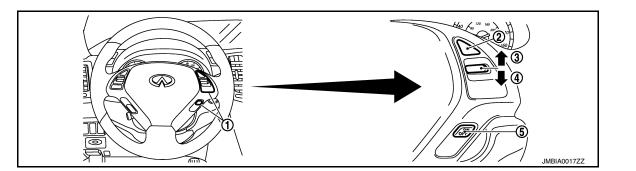
Snow mode switch 1.



- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch



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



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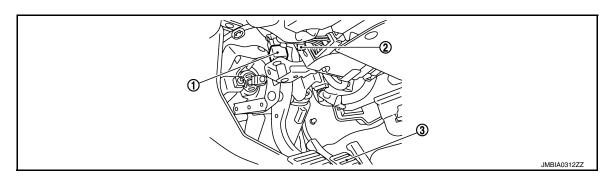
< SYSTEM DESCRIPTION >

[VQ37VHR]

- 1. ASCD steering switch
- SET/COAST switch 4.
- 2. CANCEL switch MAIN switch

5.

3. **RESUME/ACCELERATE** switch



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

Component Description

INFOID:000000010596684

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

< SYSTEM DESCRIPTION >

[VQ37VHR]

| Reference | |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EC-294, "Description" | A |
| EC-188, "Description" | |
| EC-527, "Description" | EC |
| EC-370. "Description" | |
| EC-529, "Description" | |
| EC-468, "Description" | С |
| EC-415. "Description" | |
| EC-423, "Description" | D |
| EC-212, "Description" | |
| EC-393. "Description" | |
| EC-397, "Description" | E |
| EC-461, "Description" | |
| EC-389, "Description" | |
| | EC-294, "Description" EC-188. "Description" EC-527. "Description" EC-370. "Description" EC-529, "Description" EC-468. "Description" EC-415. "Description" EC-423. "Description" EC-212. "Description" EC-393. "Description" EC-393. "Description" EC-397. "Description" EC-393. "Description" |

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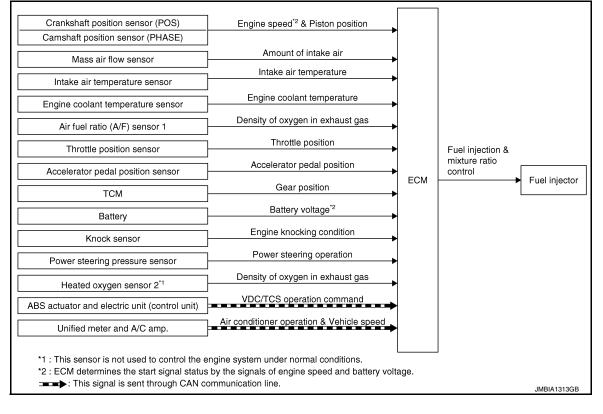
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< SYSTEM DESCRIPTION >

MULTIPORT FUEL INJECTION SYSTEM

System Diagram



System Description

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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 | | Fuel injector |
| Mass air flow sensor | Amount of intake air | | |
| Intake air temperature sensor | Intake air temperature | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | Fuel injection | |
| ТСМ | Gear position | & mixture ratio | |
| Battery | Battery voltage*3 | control | |
| Knock sensor | Engine knocking condition | | |
| Power steering pressure sensor | Power steering operation | | |
| Heated oxygen sensor 2*1 | Density of oxygen in exhaust gas | _ | |
| ABS actuator and electric unit (control unit)*2 | VDC/TCS operation command | | |
| Unified meter and A/C amp. | Air conditioner operation* ² | | |
| | Vehicle speed* ² | - | |

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

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

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< SYSTEM DESCRIPTION >

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

SYSTEM DESCRIPTION

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

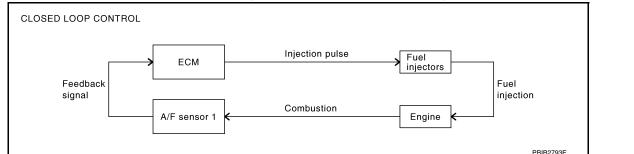
<Fuel increase>

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

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 1 can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to <u>EC-224</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
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

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

Revision: February 2015

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< SYSTEM DESCRIPTION >

[VQ37VHR]

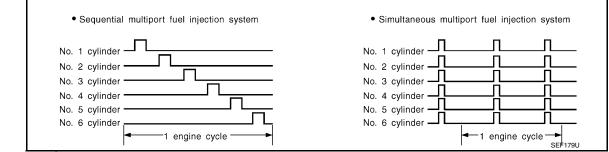
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

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

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

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

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of
the same width are simultaneously transmitted from the ECM.
The six injectors will then receive the signals two times for each engine cycle.

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

FUEL SHUT-OFF

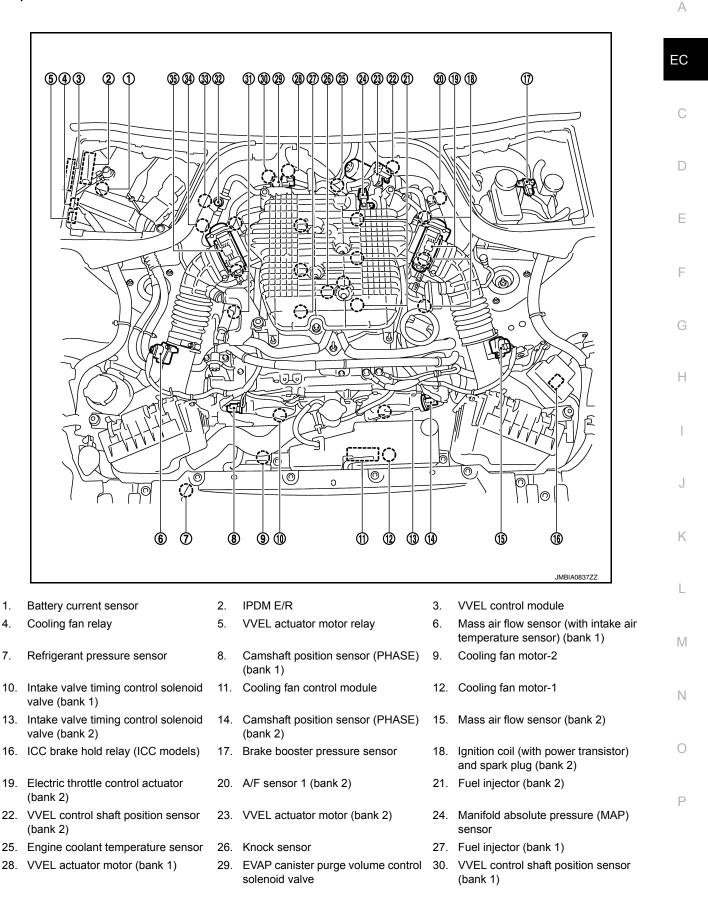
Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]

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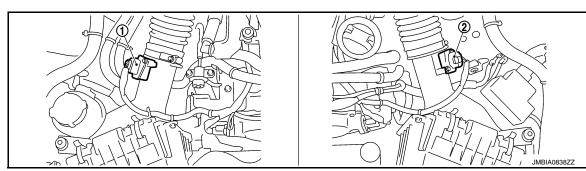
< SYSTEM DESCRIPTION >

 Ignition coil (with power transistor) 32. EVA and spark plug (bank 1)

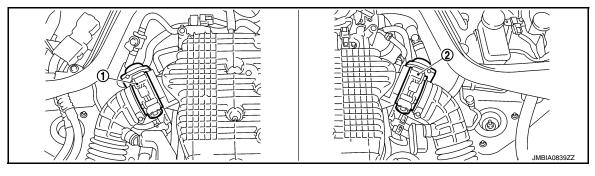
32. EVAP service port

33. A/F sensor 1 (bank 1)

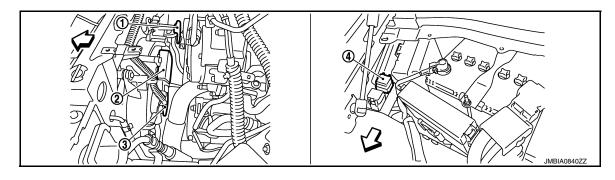
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



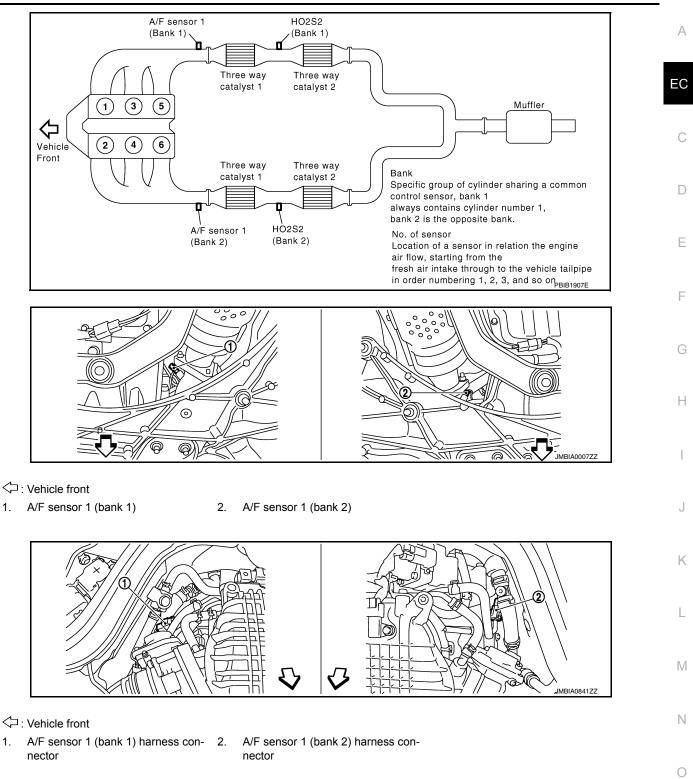
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)

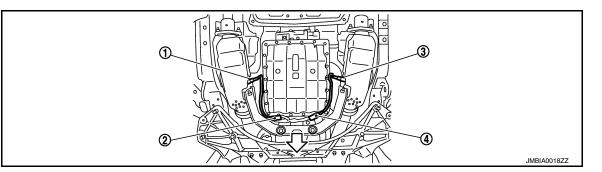


C : Vehicle front

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

< SYSTEM DESCRIPTION >





1.

EC-53

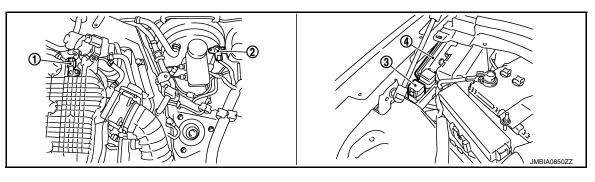
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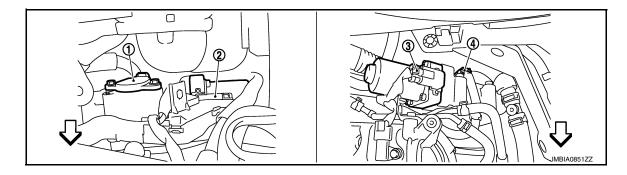
C : Vehicle front

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

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



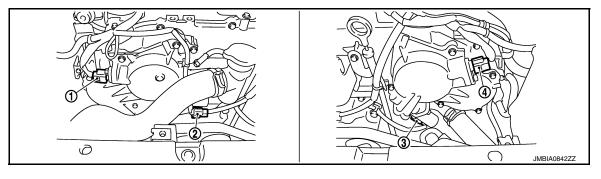
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



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)



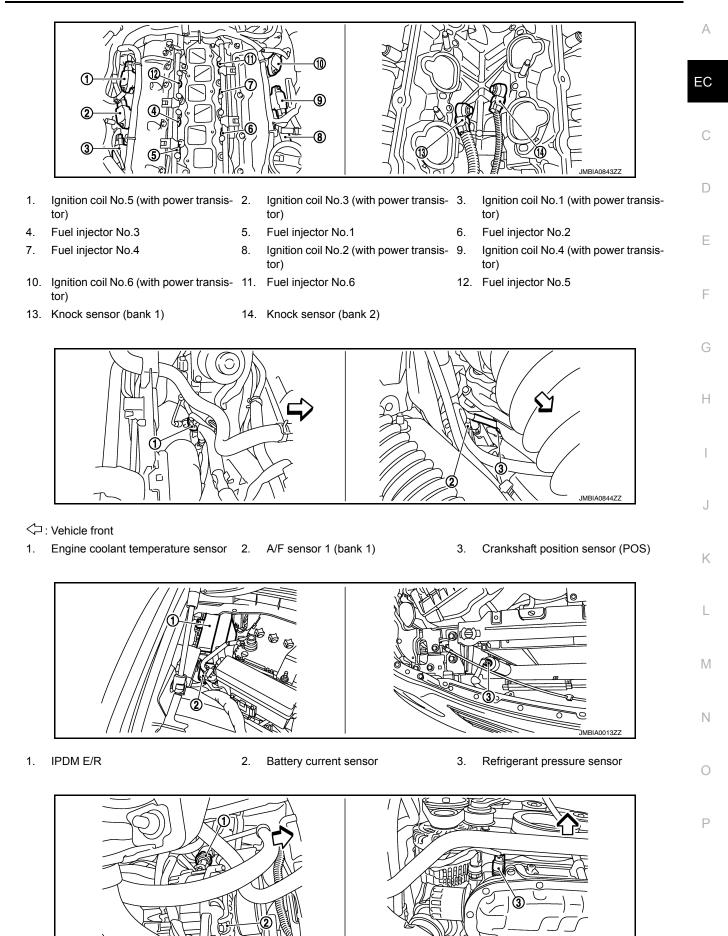
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

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

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



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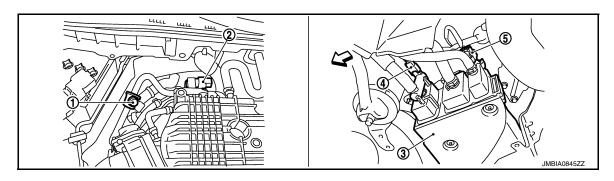
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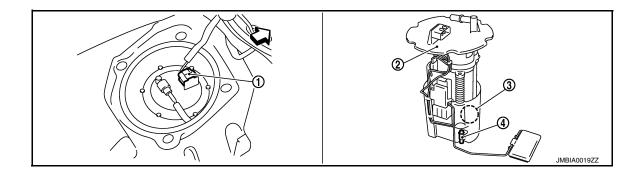
C: Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

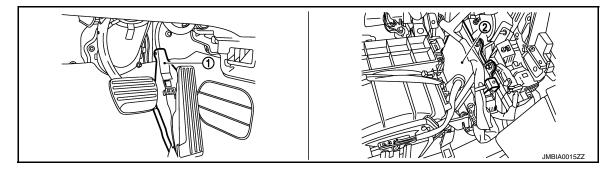


- C: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C: Vehicle front

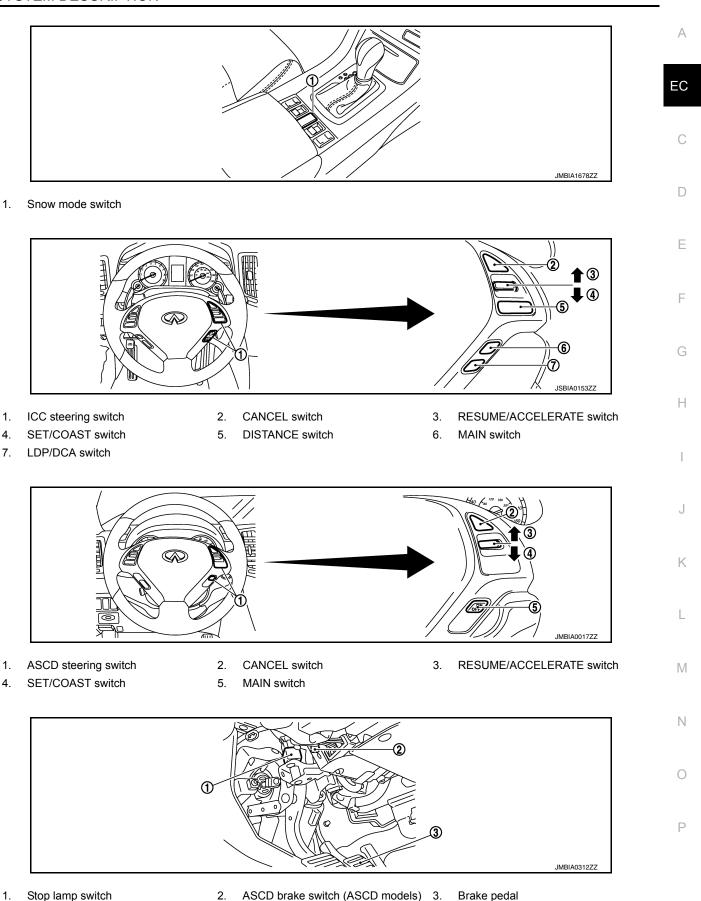
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



1. Stop lamp switch

ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)

< SYSTEM DESCRIPTION >

Component Description

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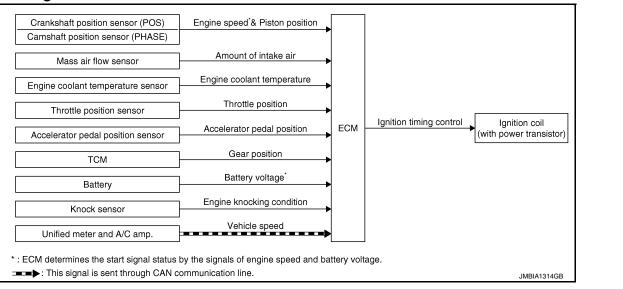
[VQ37VHR]

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

< SYSTEM DESCRIPTION >

ELECTRIC IGNITION SYSTEM

System Diagram



System Description

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator |
|-----------------------------------|-----------------------------|-----------------|---------------------------|
| Crankshaft position sensor (POS) | Engine speed* ² | | |
| Camshaft position sensor (PHASE) | Piston position | | |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position | Ignition timing | Ignition coil (with power |
| Accelerator pedal position sensor | Accelerator pedal position | control | transistor) |
| ТСМ | Gear position | | |
| Battery | Battery voltage*2 | | |
| Knock sensor | Engine knocking | | |
| Unified meter and A/C amp. | Vehicle speed* ¹ | | |

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

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

SYSTEM DESCRIPTION

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

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

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

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

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

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



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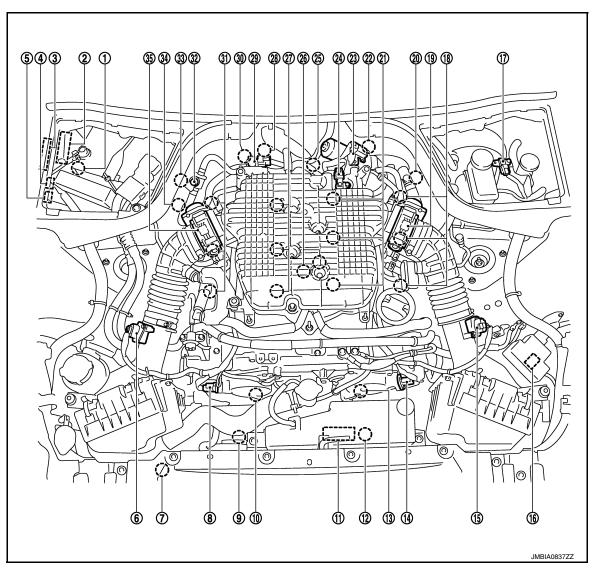
< SYSTEM DESCRIPTION >

[VQ37VHR]

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:000000010596691



- 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)
- 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 >

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

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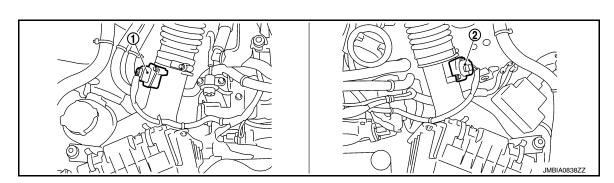
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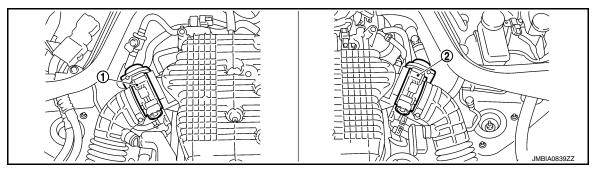
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[VQ37VHR]

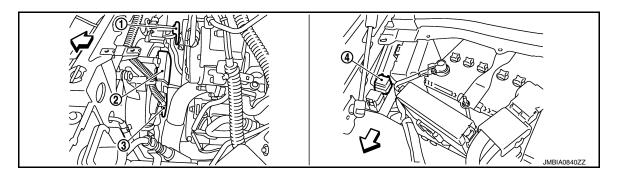
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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)



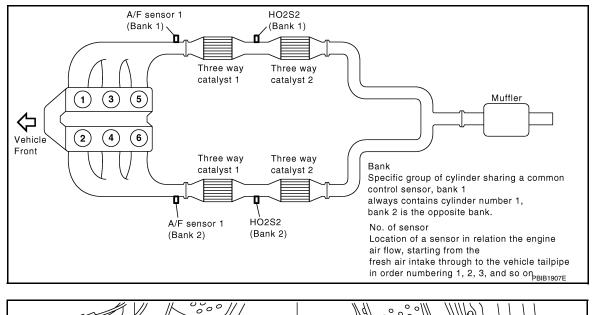
- C: Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- 3. Cooling fan motor-1

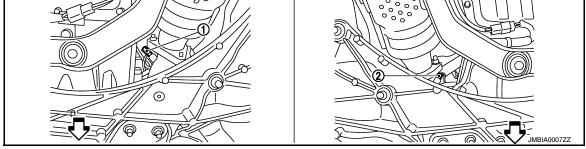
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< SYSTEM DESCRIPTION >

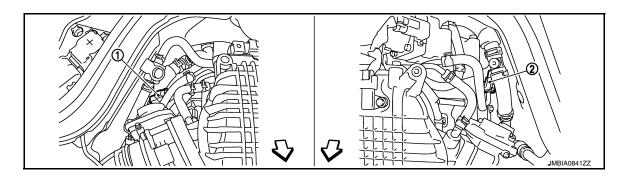






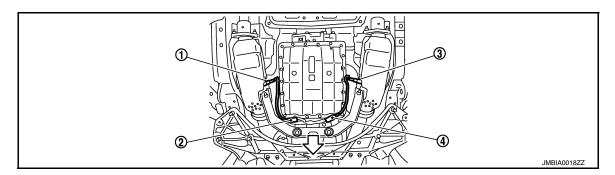
└□ : Vehicle front

- 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



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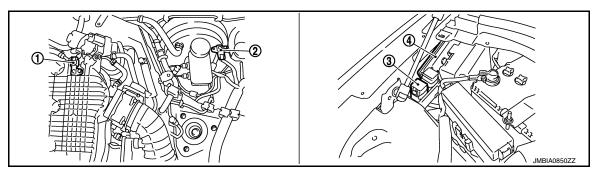
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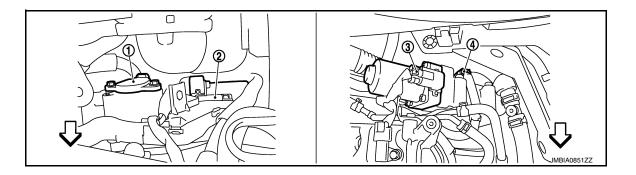
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Heated oxygen sensor 2 (bank 1) 4. harness connector



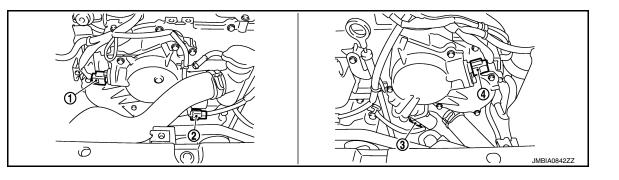
- 3. VVEL actuator motor relay 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor sensor
- VVEL control module 4.



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)



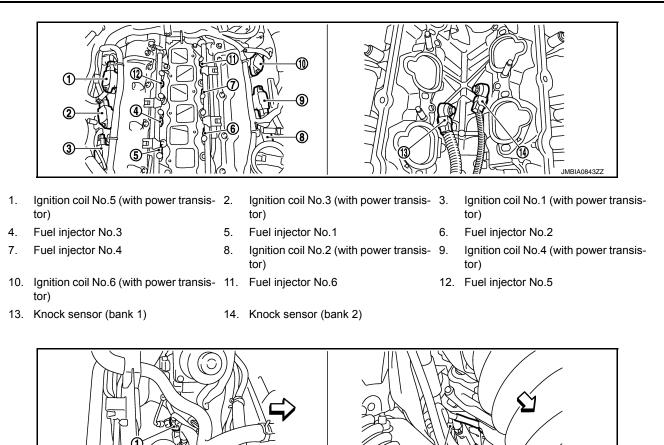
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

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

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

< SYSTEM DESCRIPTION >

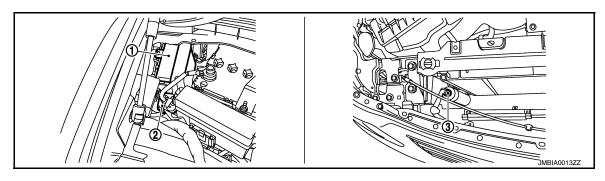
[VQ37VHR]



C : Vehicle front

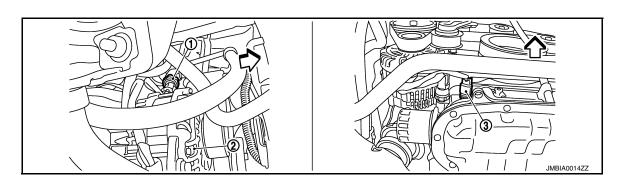
- 1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- 3. Crankshaft position sensor (POS)

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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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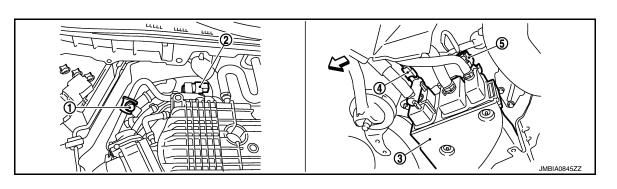
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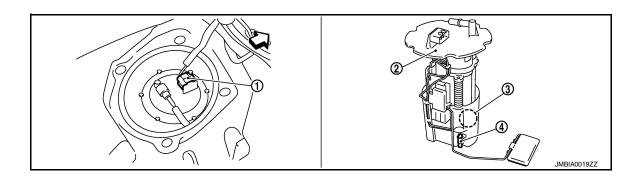
\Box : Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

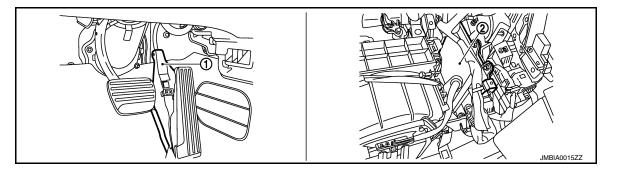


- C: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



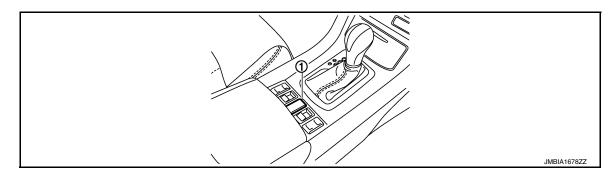
C: Vehicle front

- 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

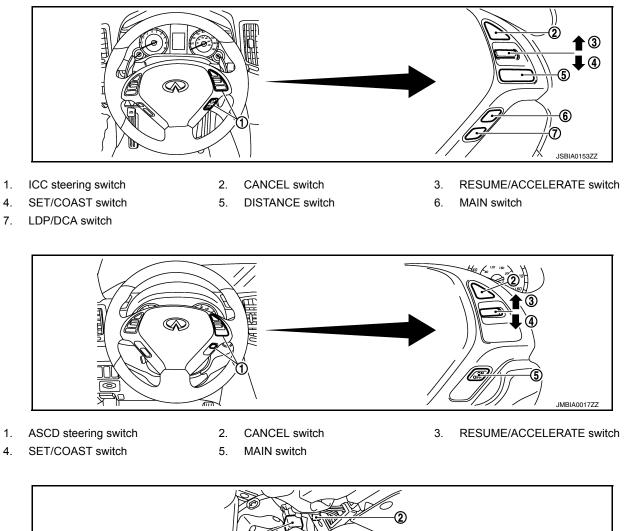


1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >



1. Snow mode switch



1. Stop lamp switch

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

< SYSTEM DESCRIPTION >

Component Description

INFOID:000000010596692

[VQ37VHR]

| Component | Reference | |
|-----------------------------------|-----------------------|----|
| Accelerator pedal position sensor | EC-476. "Description" | EC |
| Camshaft position sensor (PHASE) | EC-301, "Description" | |
| Crankshaft position sensor (POS) | EC-297. "Description" | 0 |
| Engine coolant temperature sensor | EC-209. "Description" | C |
| Ignition signal | EC-516, "Description" | |
| Knock sensor | EC-294, "Description" | D |
| Mass air flow sensor | EC-188. "Description" | |
| Throttle position sensor | EC-212. "Description" | _ |
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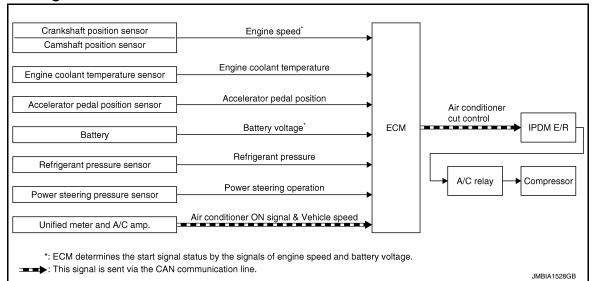
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< SYSTEM DESCRIPTION >

AIR CONDITIONING CUT CONTROL

System Diagram



System Description

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INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator | | |
|----------------------------------------------------------------------|-----------------------------|-----------------|-----------------------------------------------|--|--|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*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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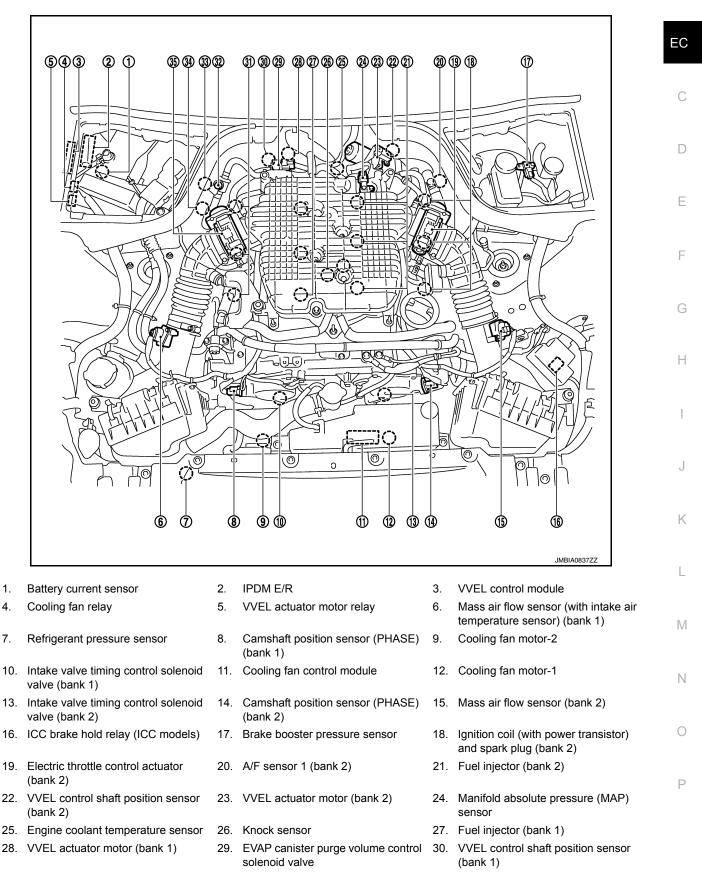
< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]

INFOID:000000010596695







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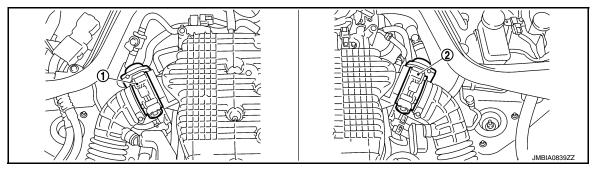
 Ignition coil (with power transistor) 32. EVAF and spark plug (bank 1)

32. EVAP service port

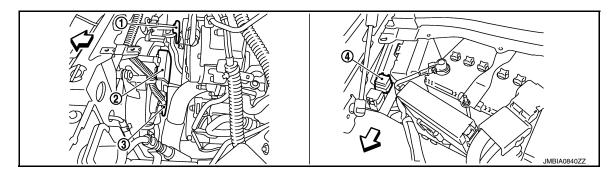
33. A/F sensor 1 (bank 1)

- 34. Crankshaft position sensor (POS)
- 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)

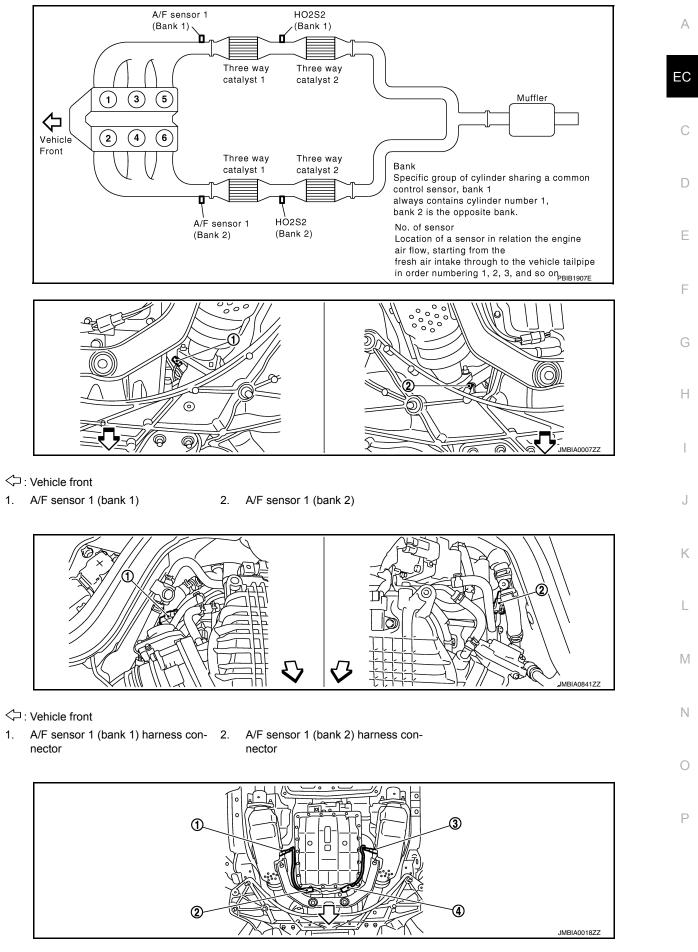


C : Vehicle front

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

< SYSTEM DESCRIPTION >





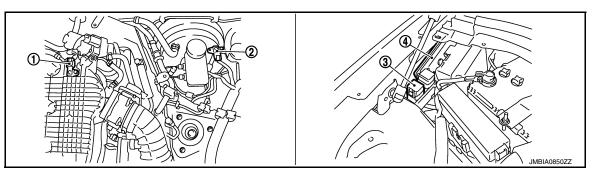


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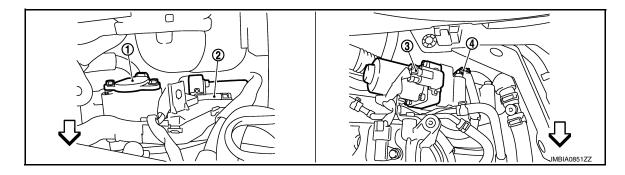
C : Vehicle front

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

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



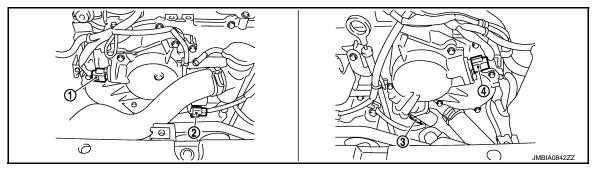
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



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)



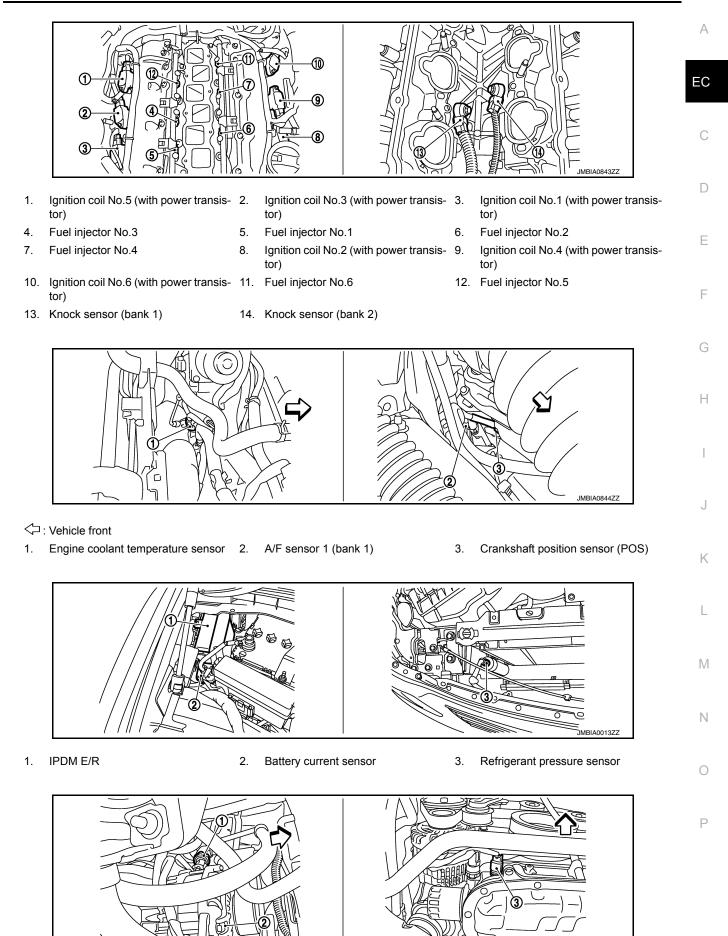
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

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

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



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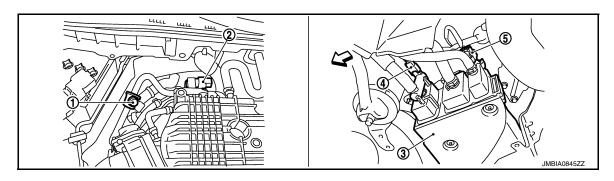
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< SYSTEM DESCRIPTION >

C: Vehicle front

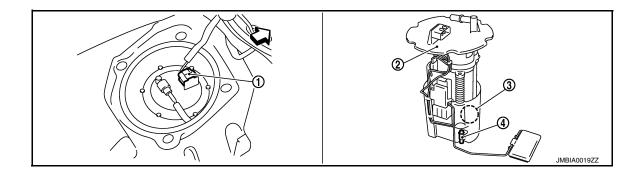
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



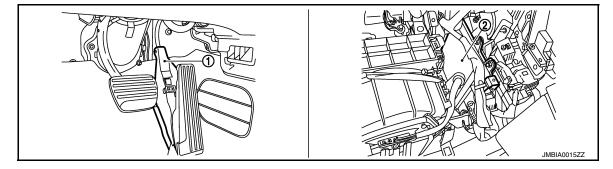
└□ : Vehicle front

- 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

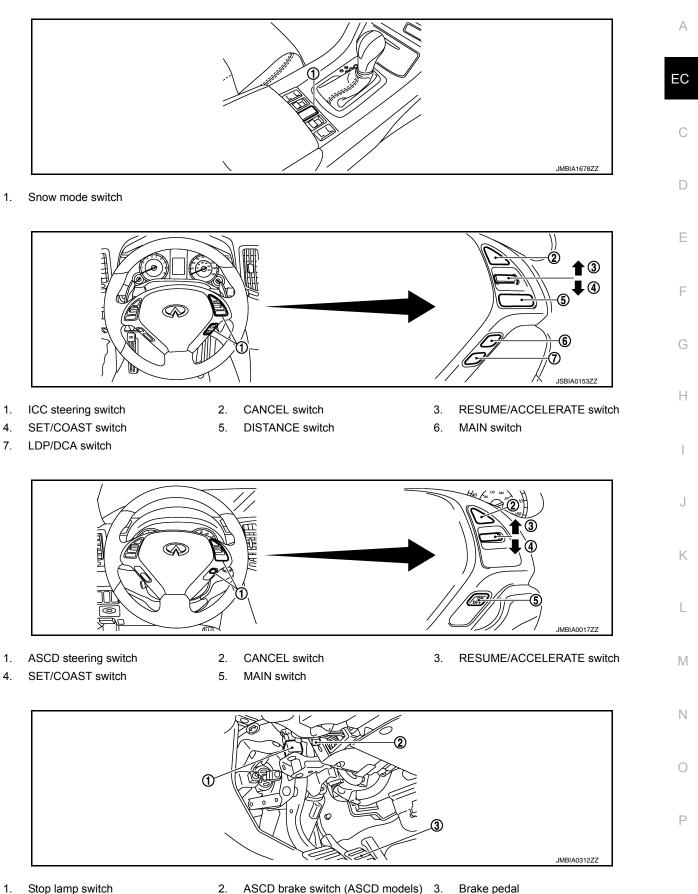
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



1. Stop lamp switch

ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)

< SYSTEM DESCRIPTION >

Component Description

INFOID:000000010596696

[VQ37VHR]

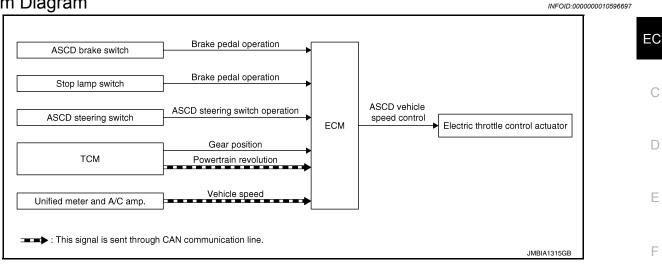
| Component | Reference |
|-----------------------------------|-----------------------|
| Accelerator pedal position sensor | EC-476. "Description" |
| Camshaft position sensor (PHASE) | EC-301, "Description" |
| Crankshaft position sensor (POS) | EC-297, "Description" |
| Engine coolant temperature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

Revision: February 2015

< SYSTEM DESCRIPTION >

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram



System Description

INFOID:000000010596698

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | Н |
|----------------------------|--------------------------------|----------------------------|---------------------------|---|
| ASCD brake switch | Brake pedal operation | | | _ |
| Stop lamp switch | Brake pedal operation | | | 1 |
| ASCD steering switch | ASCD steering switch operation | ASCD vehicle speed control | Electric throttle control | 1 |
| Unified meter and A/C amp. | Vehicle speed* | ASCD vehicle speed control | actuator | |
| ТСМ | Gear position | | | J |
| | 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 Μ 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

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

CANCEL OPERATION

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

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

Revision: February 2015

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< SYSTEM DESCRIPTION >

- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- · TCS system is operated

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

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

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

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

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

COAST OPERATION

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

RESUME OPERATION

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

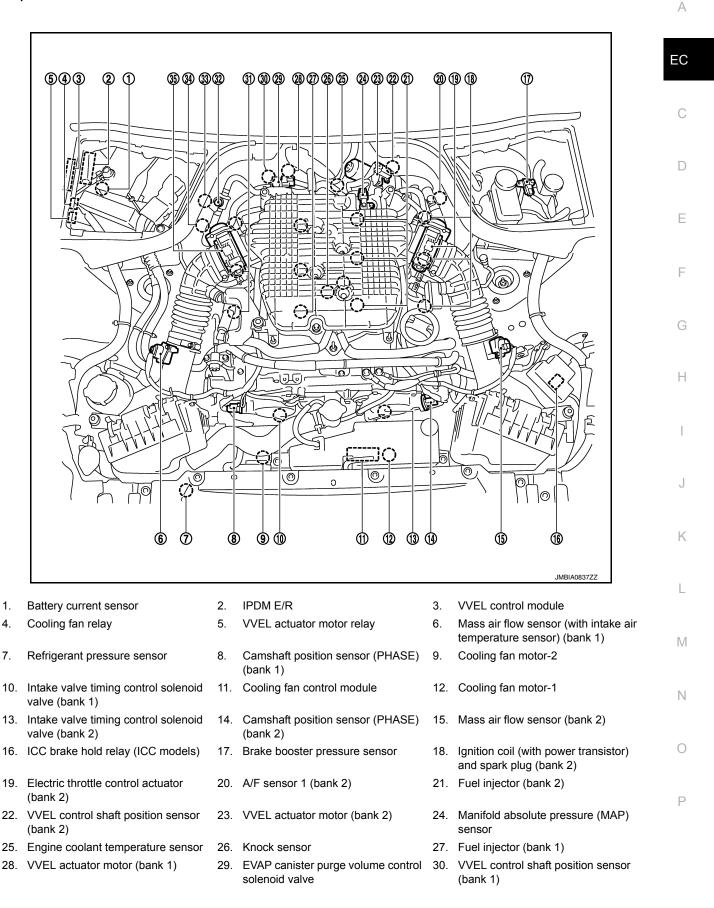
- Brake pedal is released
- A/T selector lever is in the P and N positions
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]

INFOID:000000010596699



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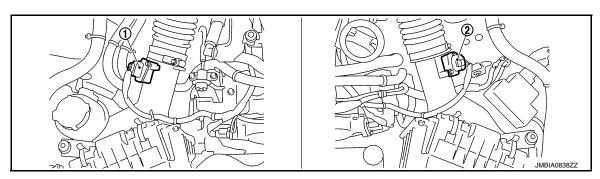
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< SYSTEM DESCRIPTION >

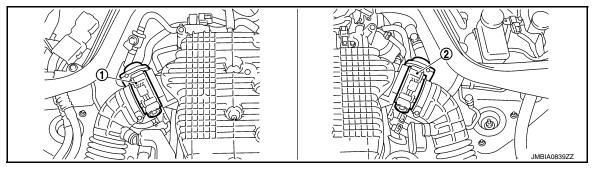
- Ignition coil (with power transistor) 32. EVA and spark plug (bank 1)
- 32. EVAP service port

33. A/F sensor 1 (bank 1)

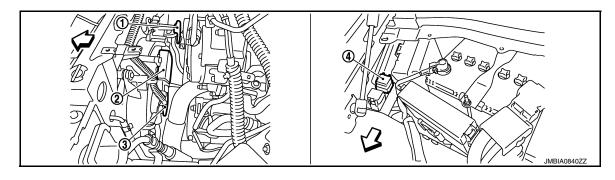
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



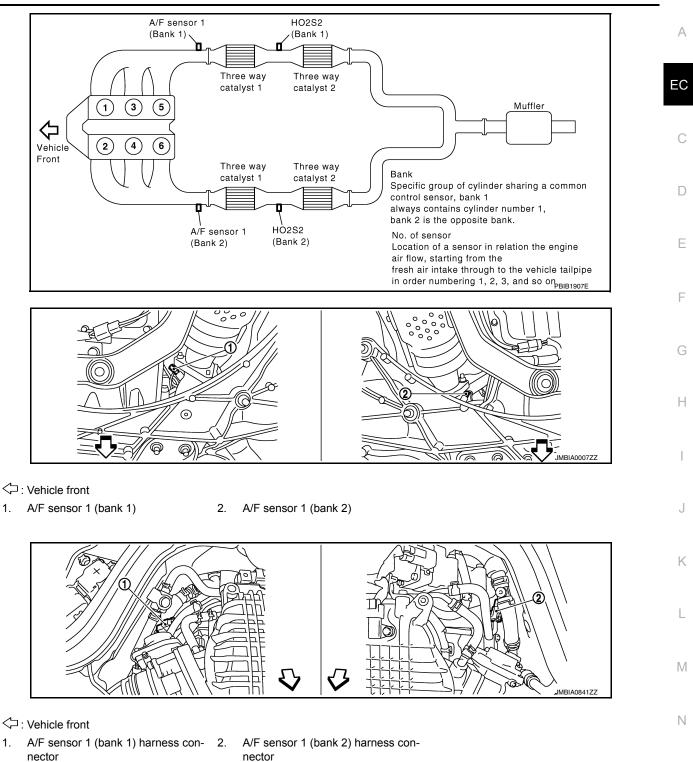
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)

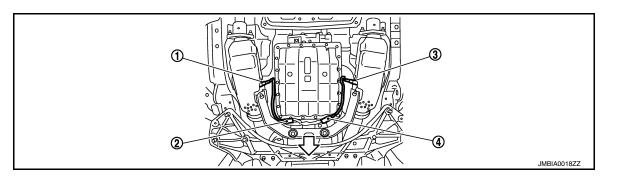


C : Vehicle front

- 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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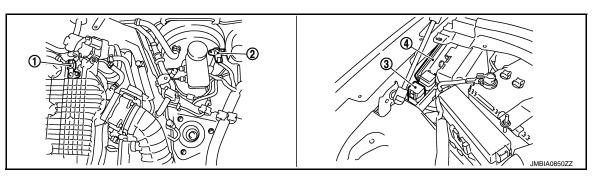
[VQ37VHR]

< SYSTEM DESCRIPTION >

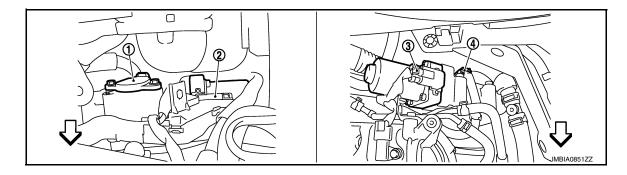
C: Vehicle front

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

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



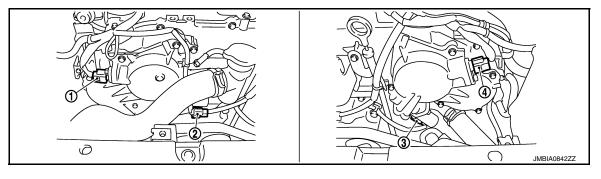
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



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)



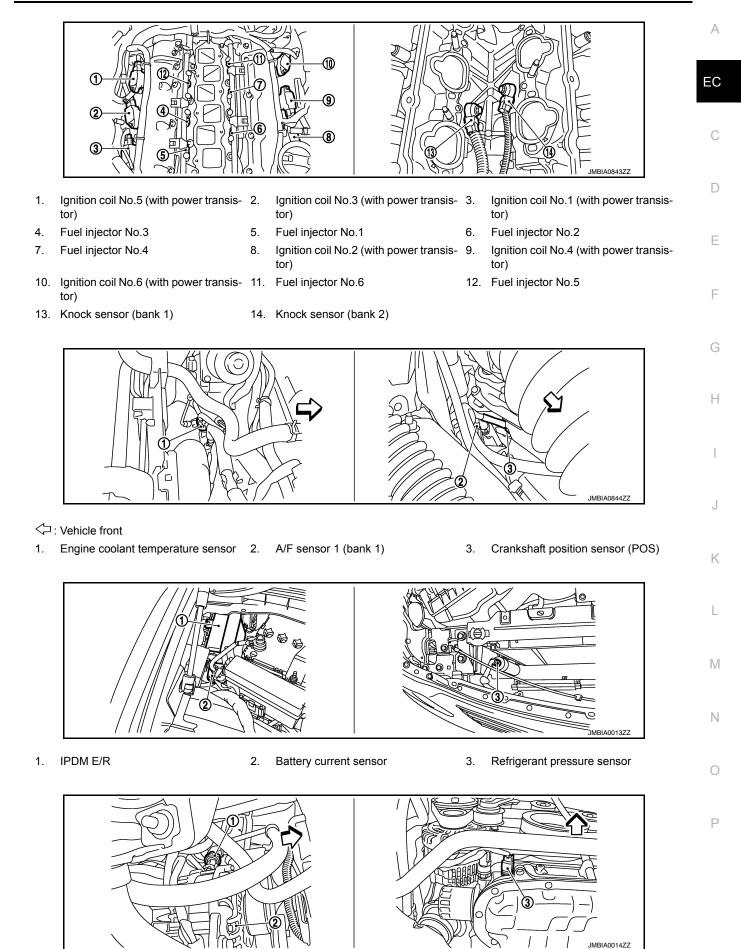
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

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

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



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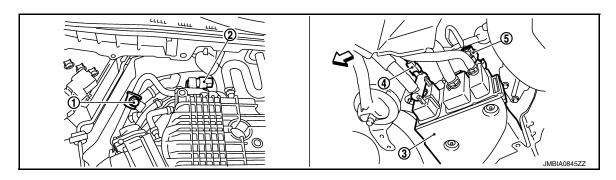
2015 QX50

< SYSTEM DESCRIPTION >

C: Vehicle front

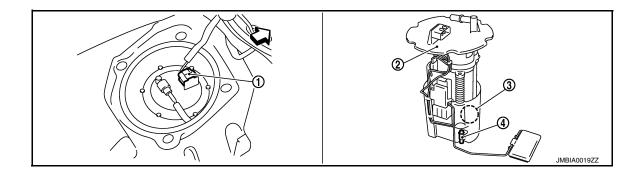
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



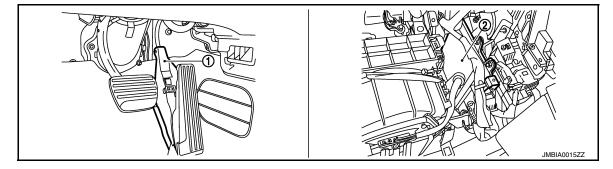
└□ : Vehicle front

- 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

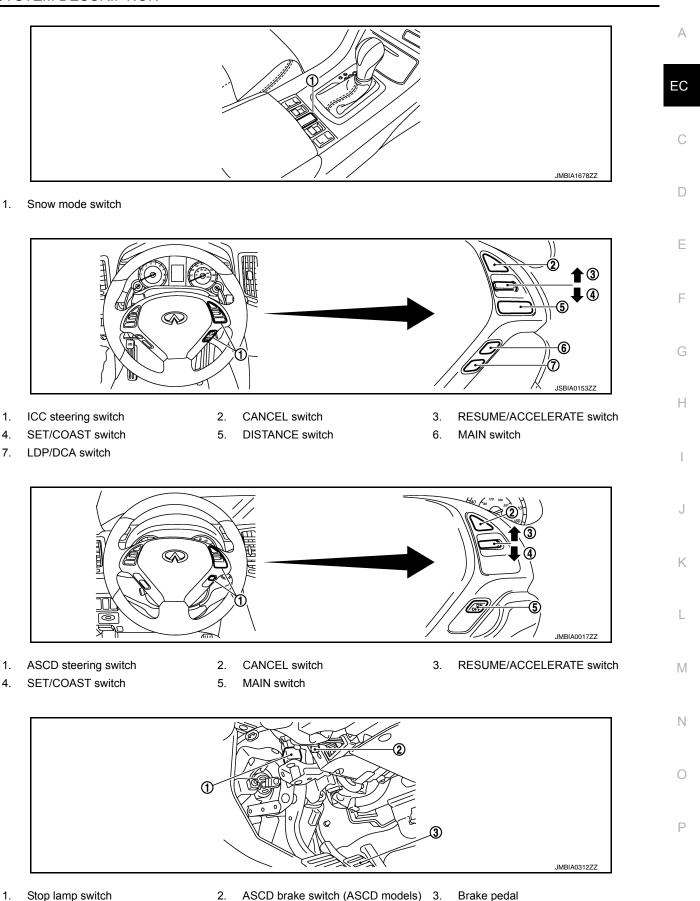
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



1. Stop lamp switch

ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)

< SYSTEM DESCRIPTION >

Component Description

INFOID:000000010596700

[VQ37VHR]

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

CAN COMMUNICATION

System Description

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only. Refer to LAN-8, "CAN Communication Control Circuit", about CAN communication for detail.

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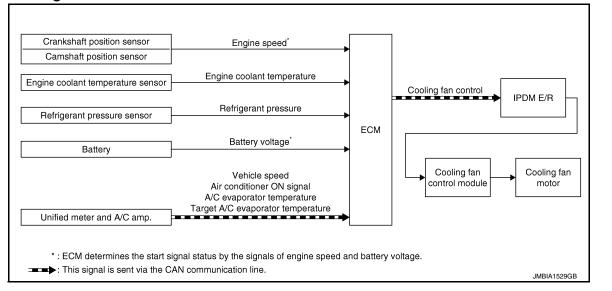
[VQ37VHR]

INFOID:000000010596701

< SYSTEM DESCRIPTION >

COOLING FAN CONTROL

System Diagram



System Description

INFOID:000000010596703

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 | Cooling fan control | IPDM E/R ↓ Cooling fan control module ↓ | |
| Battery | Battery voltage*1 | | | |
| Unified meter and A/C amp. | Vehicle speed*2 | | | |
| | Air conditioner ON signal* ² | | Cooling fan motor | |
| | 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.

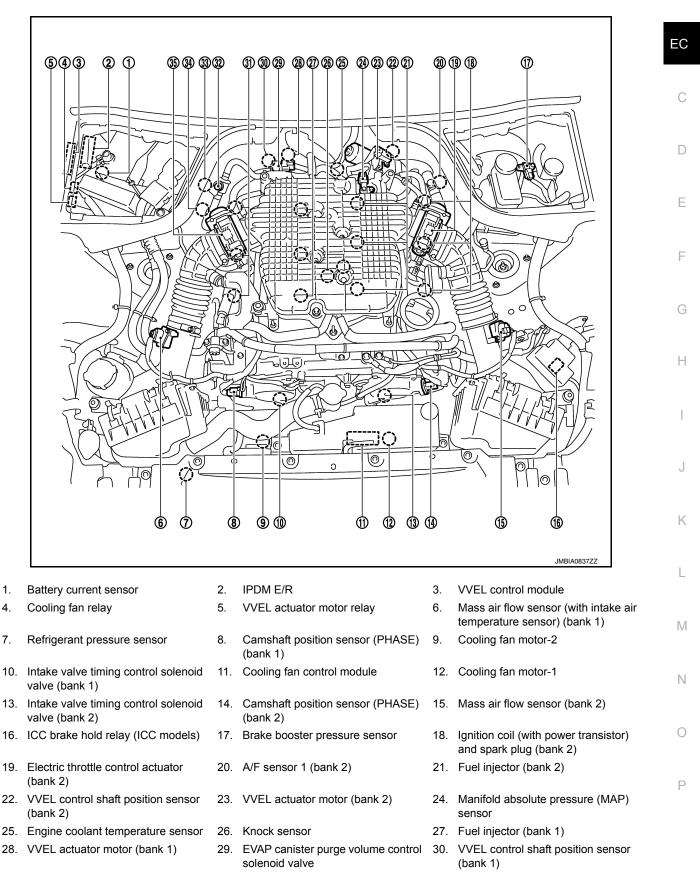
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< SYSTEM DESCRIPTION >

Component Parts Location

[VQ37VHR]







< SYSTEM DESCRIPTION >

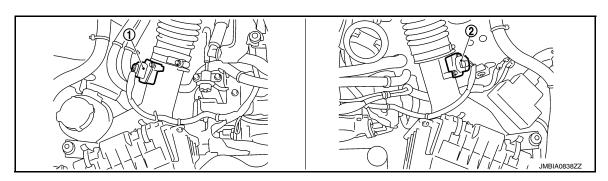
[VQ37VHR]

 Ignition coil (with power transistor) 3 and spark plug (bank 1)

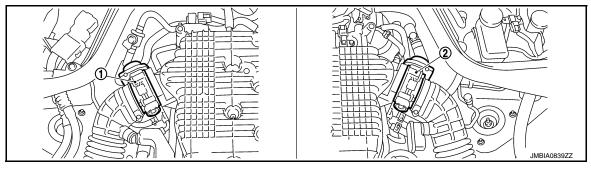
32. EVAP service port

33. A/F sensor 1 (bank 1)

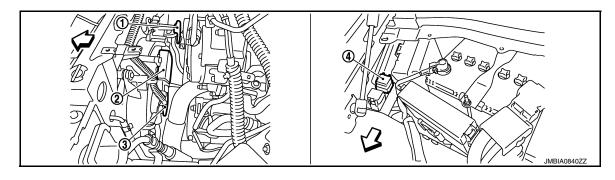
- 34. Crankshaft position sensor (POS)
- Electric throttle control actuator (bank 1)



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)

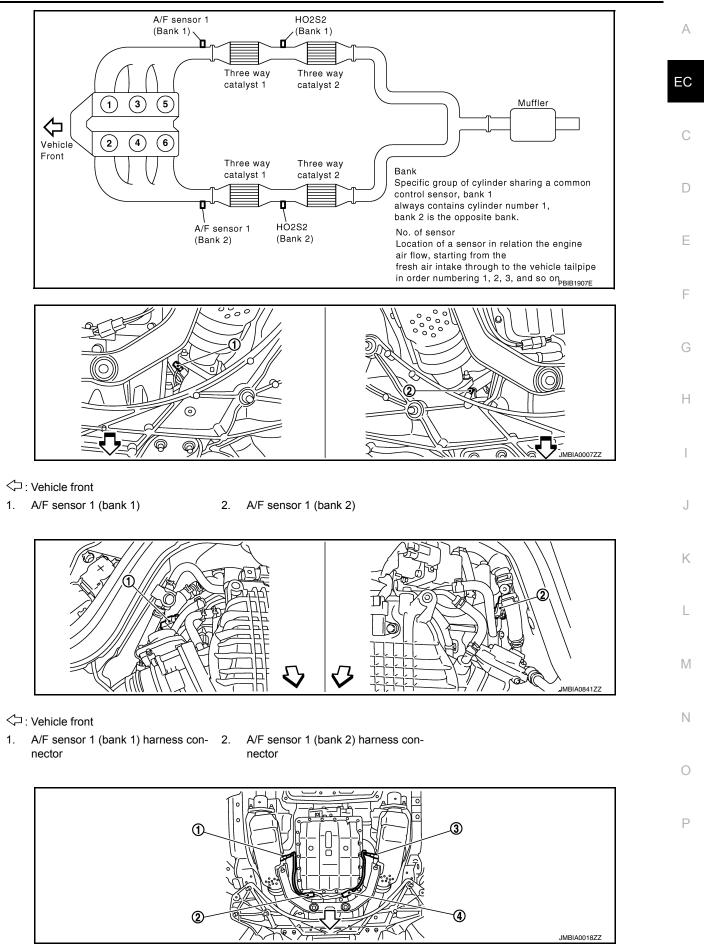


C : Vehicle front

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

< SYSTEM DESCRIPTION >





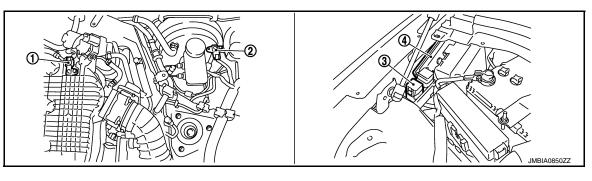
EC-91

< SYSTEM DESCRIPTION >

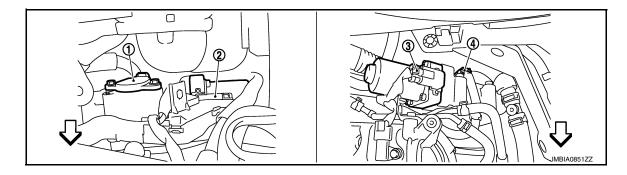
: Vehicle front

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

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



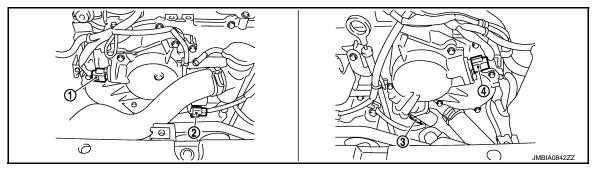
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



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)



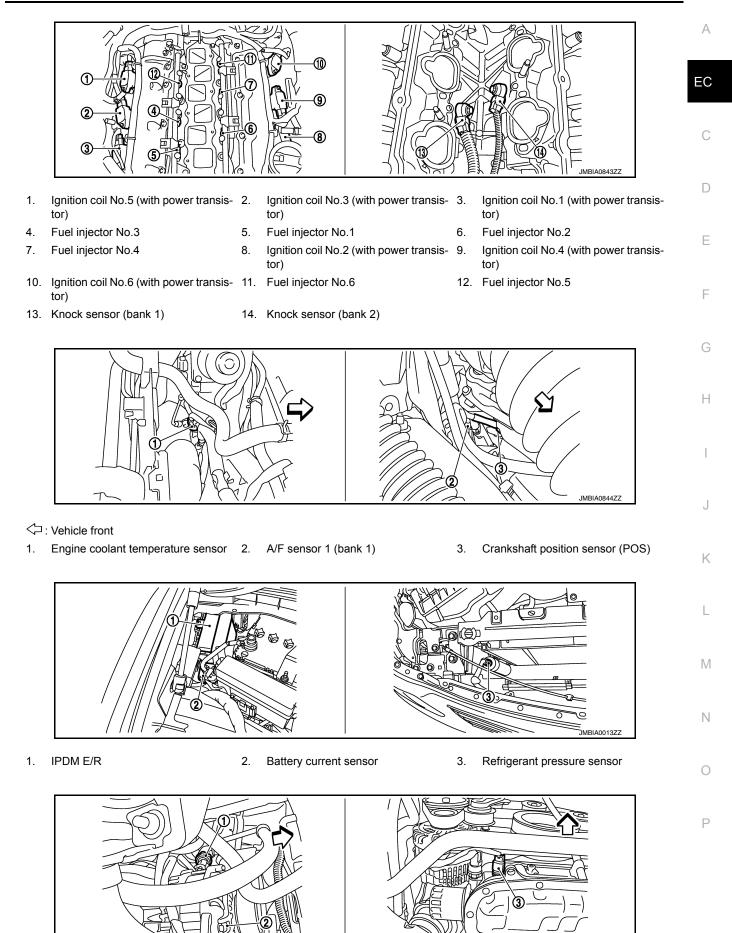
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

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

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



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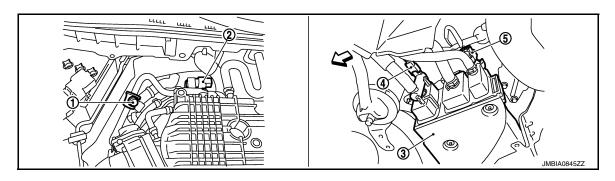
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< SYSTEM DESCRIPTION >

C: Vehicle front

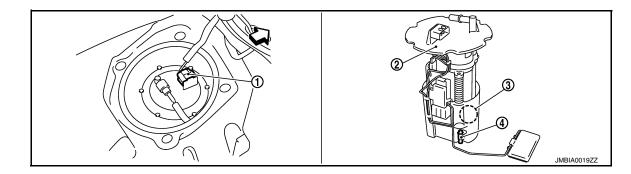
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



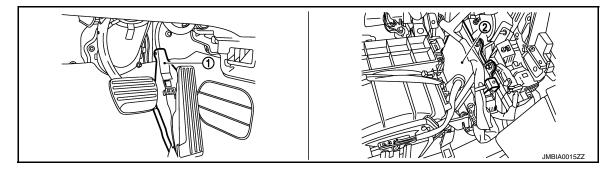
└□ : Vehicle front

- 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

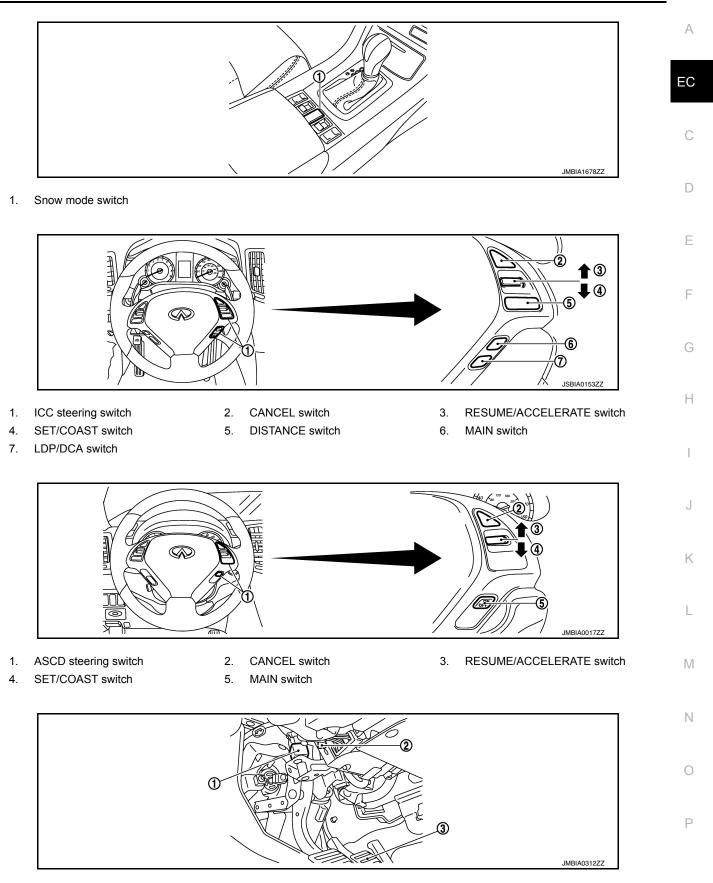
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



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

< SYSTEM DESCRIPTION >

Component Description

INFOID:000000010596705

[VQ37VHR]

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

< SYSTEM DESCRIPTION >

EVAPORATIVE EMISSION SYSTEM

System Diagram

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

System Description

INPUT/OUTPUT SIGNAL CHART

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

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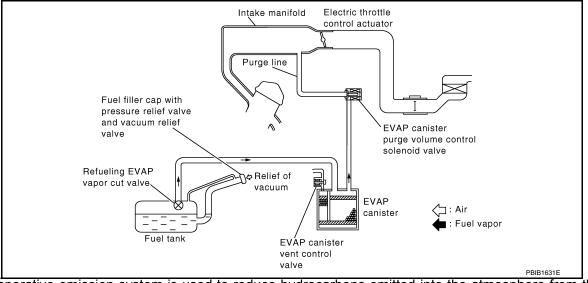
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< SYSTEM DESCRIPTION >

[VQ37VHR]

SYSTEM DESCRIPTION



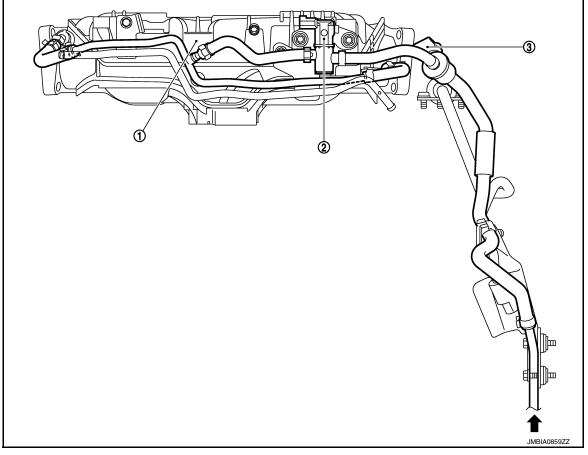
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

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 proportionally regulated as the air flow increases.

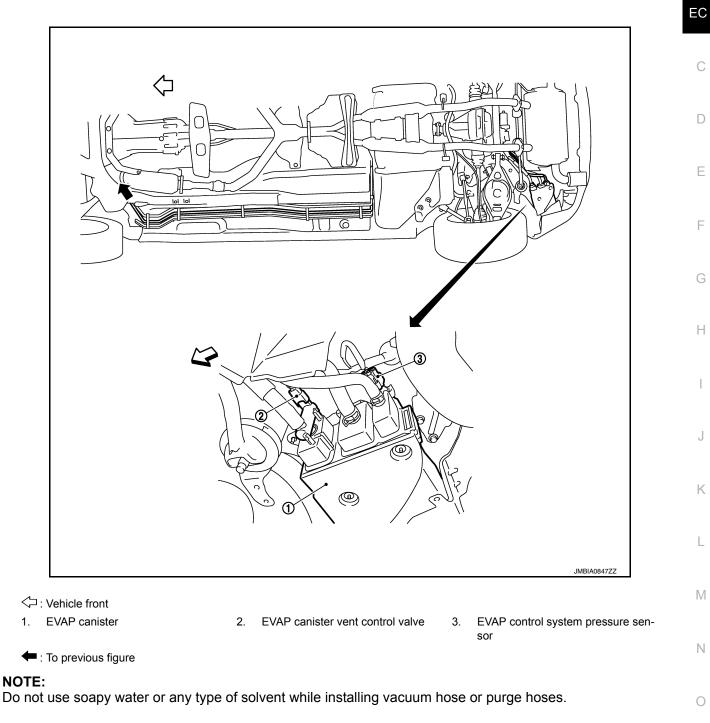
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

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



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[VQ37VHR]

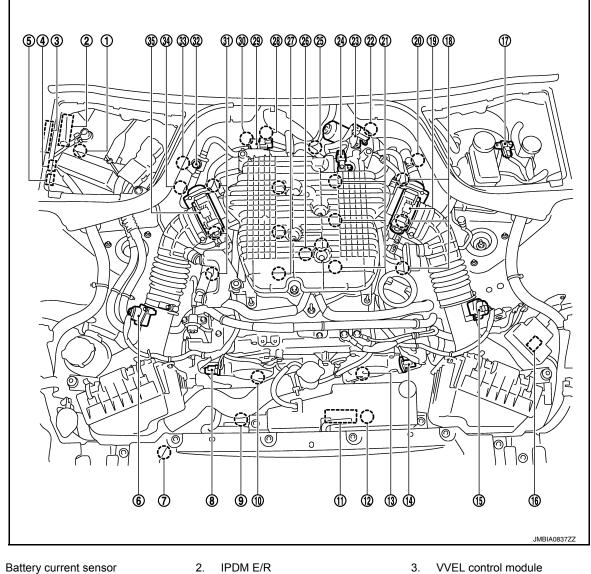
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< SYSTEM DESCRIPTION >

Component Parts Location

INFOID:000000010596708

[VQ37VHR]



4. Cooling fan relay

1.

- 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)

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

- 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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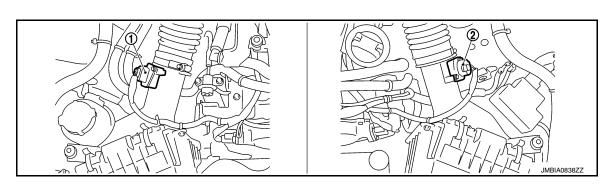
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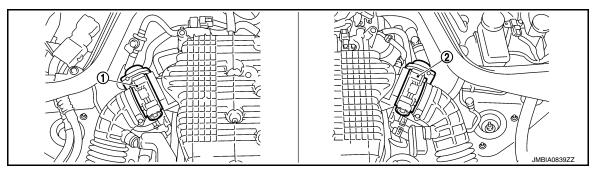
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[VQ37VHR]

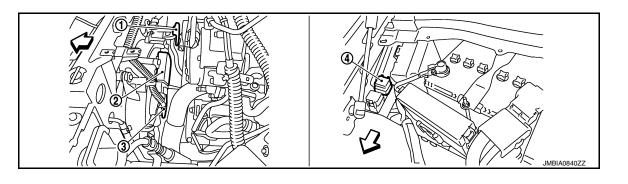
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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)



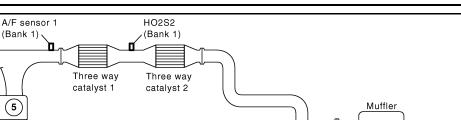
- C: Vehicle front
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- 3. Cooling fan motor-1

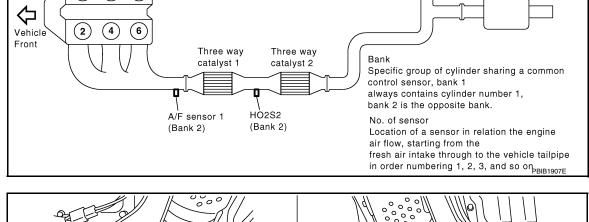
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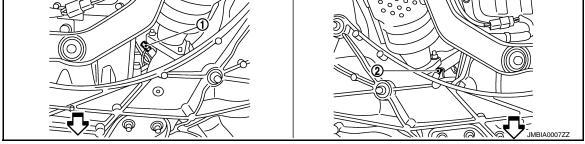
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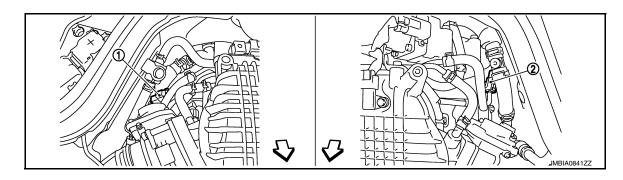
(3)





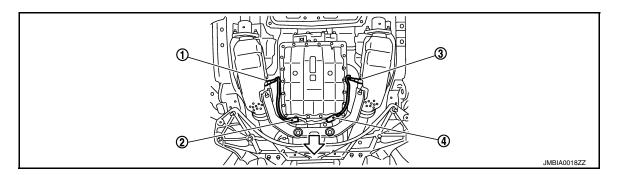


- └□ : Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



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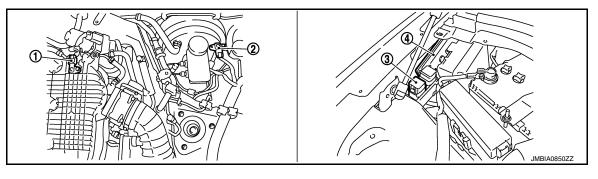
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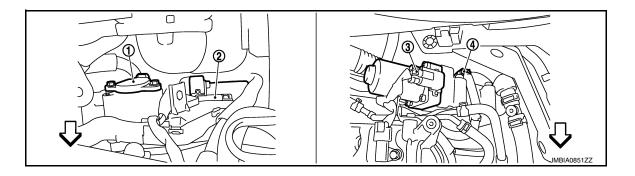
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Heated oxygen sensor 2 (bank 1) 4. harness connector



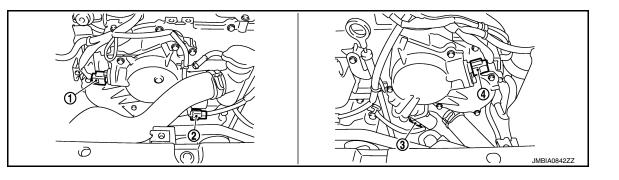
- 3. VVEL actuator motor relay 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor sensor
- VVEL control module 4.



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)



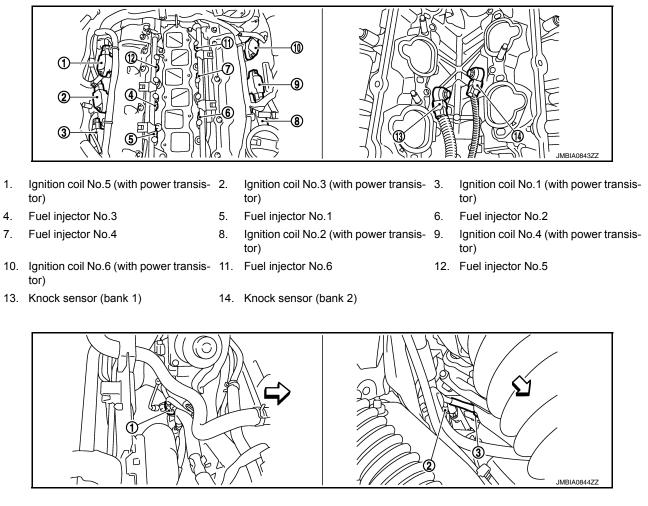
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

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

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

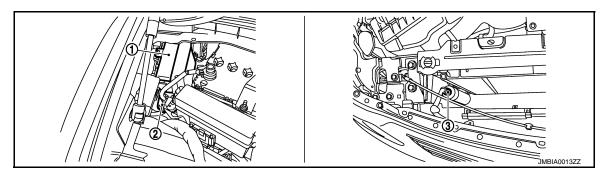
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[VQ37VHR]



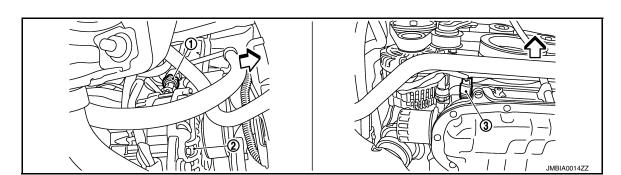
: Vehicle front

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



1. IPDM E/R

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



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< SYSTEM DESCRIPTION >

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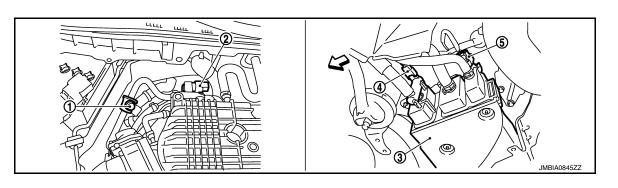
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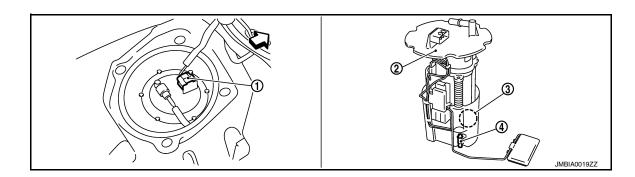
\Box : Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

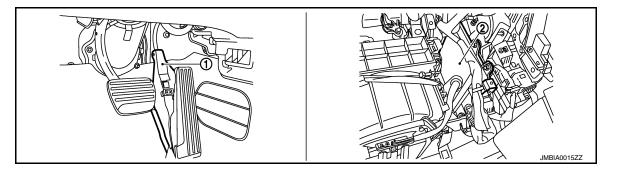


- └□: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



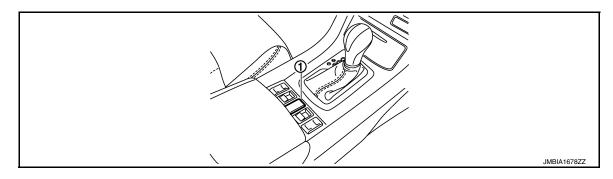
C: Vehicle front

- 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 >



1. Snow mode switch

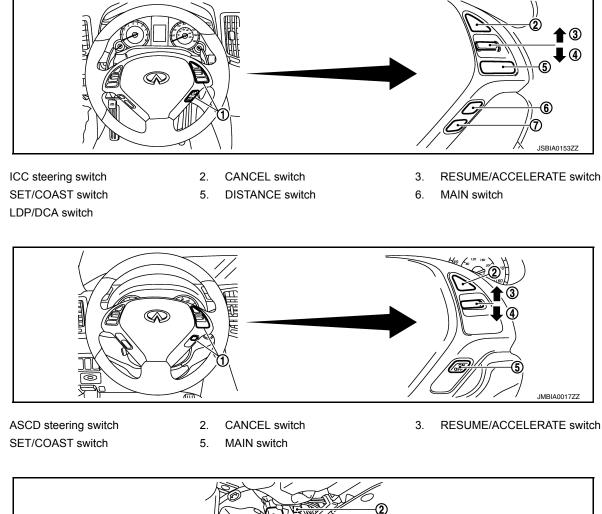
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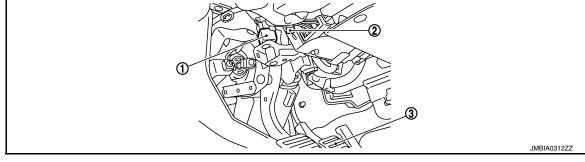
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- 1. Stop lamp switch
- 2. ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)

< SYSTEM DESCRIPTION >

Component Description

INFOID:000000010596709

[VQ37VHR]

| Component | Reference | |
|---------------------------------------------------|-----------------------|----|
| A/F sensor 1 | EC-224, "Description" | EC |
| Accelerator pedal position sensor | EC-476, "Description" | |
| Camshaft position sensor (PHASE) | EC-301, "Description" | 0 |
| Crankshaft position sensor (POS) | EC-297, "Description" | 0 |
| Engine coolant temperature sensor | EC-209, "Description" | |
| EVAP canister purge volume control solenoid valve | EC-315, "Description" | D |
| EVAP control system pressure sensor | EC-331, "Description" | |
| Fuel tank temperature sensor | EC-270, "Description" | |
| Mass air flow sensor | EC-188, "Description" | E |
| Throttle position sensor | EC-212, "Description" | |

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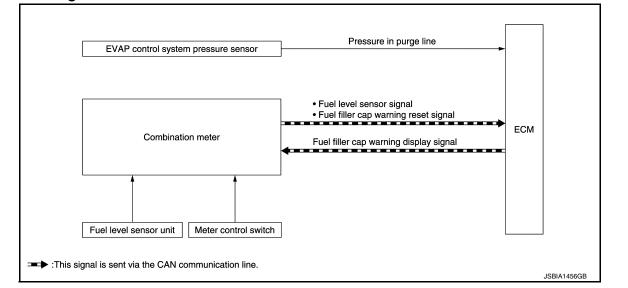
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FUEL FILLER CAP WARNING SYSTEM

< SYSTEM DESCRIPTION >

FUEL FILLER CAP WARNING SYSTEM

System Diagram



System Description

INFOID:000000010596711

INPUT/OUTPUT SIGNAL CHART

Input

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

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

Output

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

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

SYSTEM DESCRIPTION

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

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

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

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

CAUTION:

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

Reset Operation

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

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

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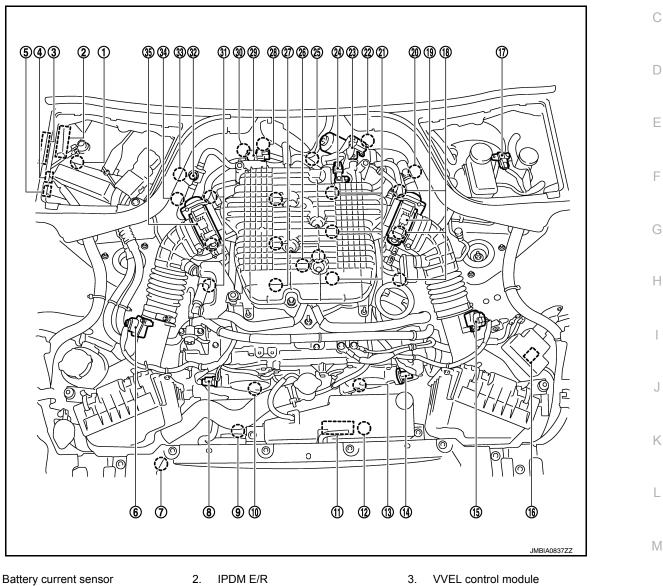
< SYSTEM DESCRIPTION >

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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



- Battery current sens
 Cooling fan relay
- 7. Refrigerant pressure sensor
- 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)
- VVEL control shaft position sensor (bank 2)

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25. Engine coolant temperature sensor 2

- 5. VVEL actuator motor relay
- 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

- 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)
- 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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< SYSTEM DESCRIPTION >

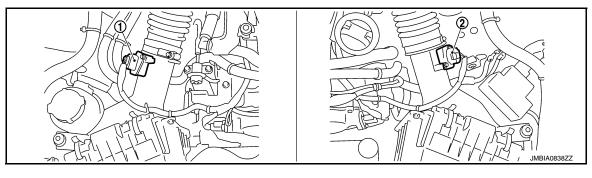
- 28. VVEL actuator motor (bank 1)
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor solenoid valve
 - (bank 1)

[VQ37VHR]

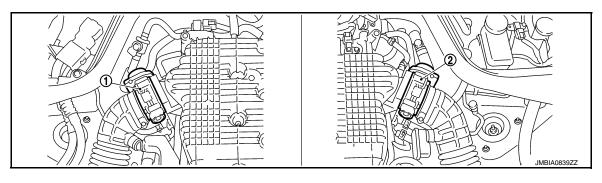
33. A/F sensor 1 (bank 1)

- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)

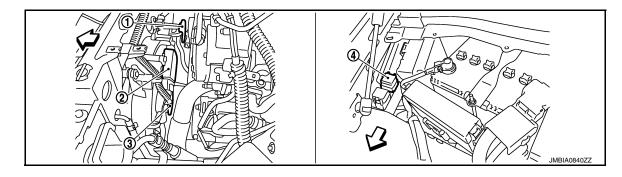
32. EVAP service port



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



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

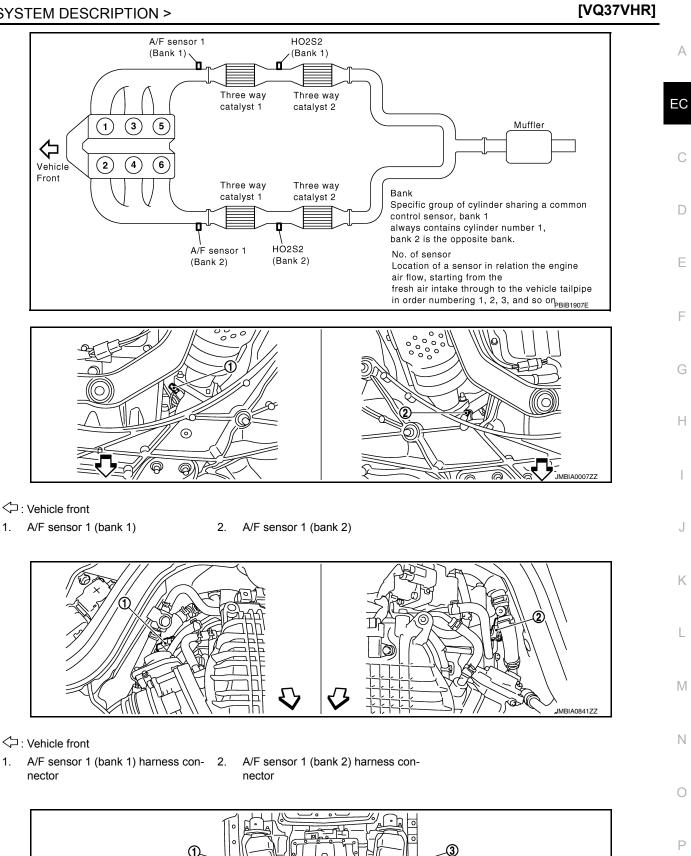


C: Vehicle front

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

< SYSTEM DESCRIPTION >

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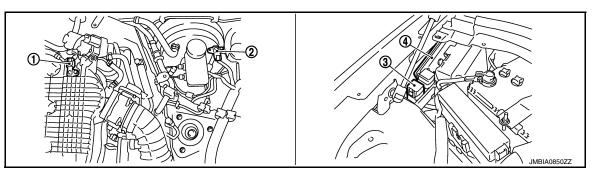
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< SYSTEM DESCRIPTION >

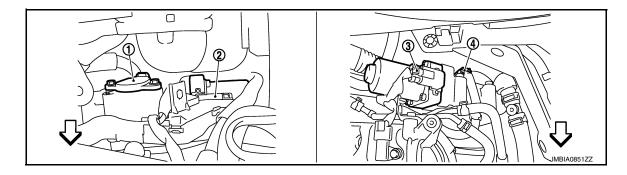
C: Vehicle front

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

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



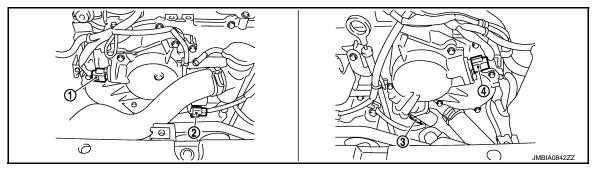
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



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)



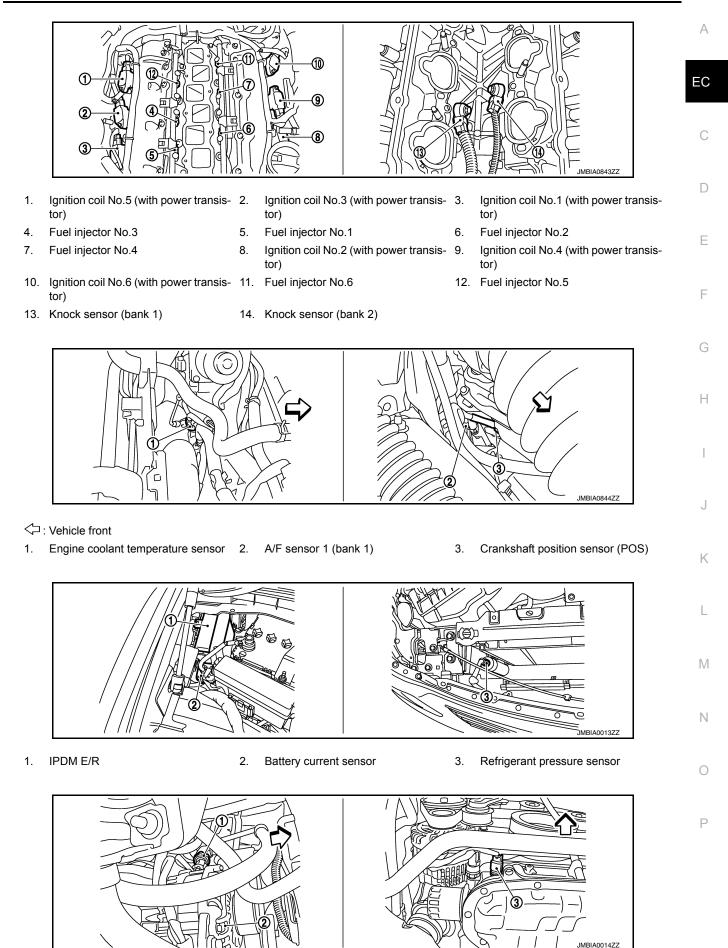
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

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

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



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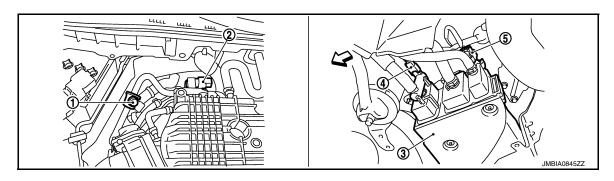
2015 QX50

< SYSTEM DESCRIPTION >

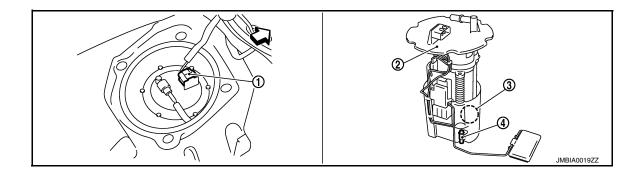
C: Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

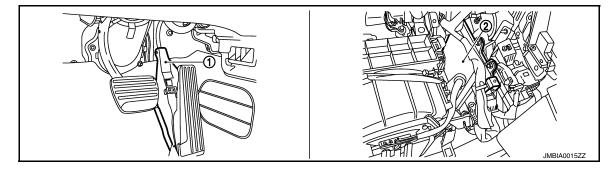


- C: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



C : Vehicle front

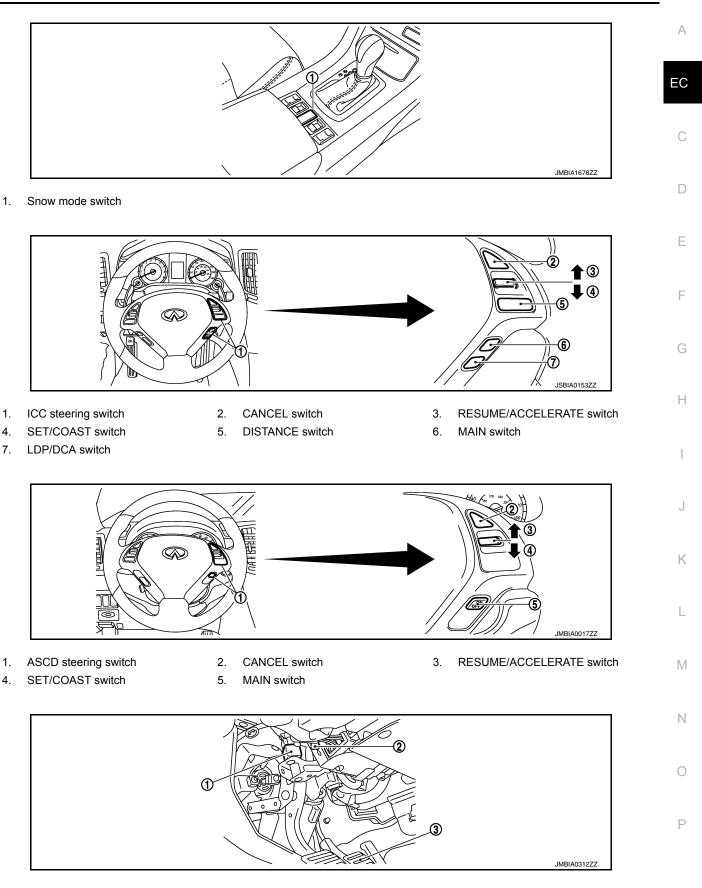
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



1. Stop lamp switch

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

< SYSTEM DESCRIPTION >

Component Description

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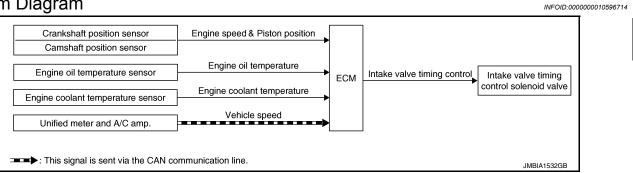
[VQ37VHR]

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

< SYSTEM DESCRIPTION >

INTAKE VALVE TIMING CONTROL

System Diagram



System Description

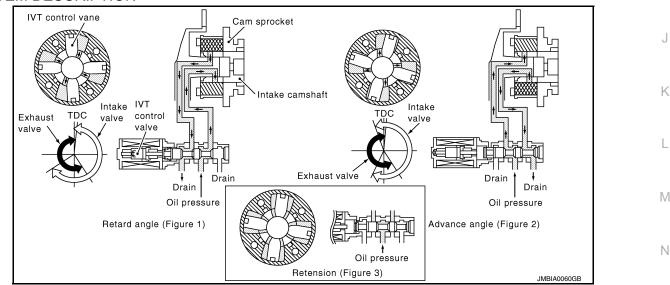
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INPUT/OUTPUT SIGNAL CHART

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

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

SYSTEM DESCRIPTION



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

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

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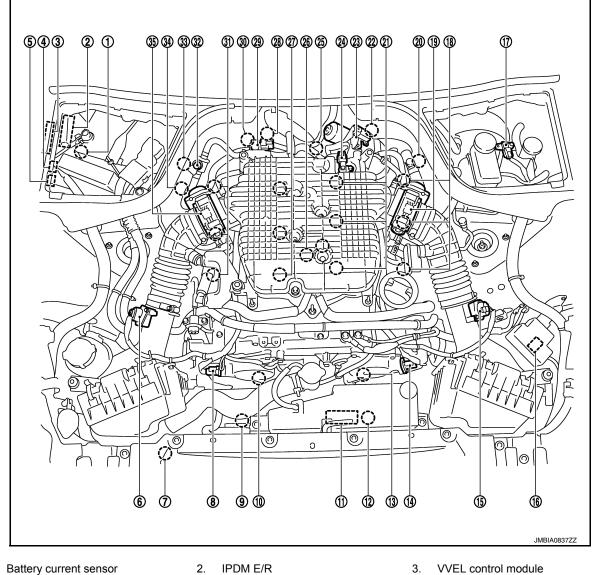
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< SYSTEM DESCRIPTION >

Component Parts Location

INFOID:000000010596716

[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)

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

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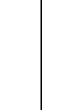
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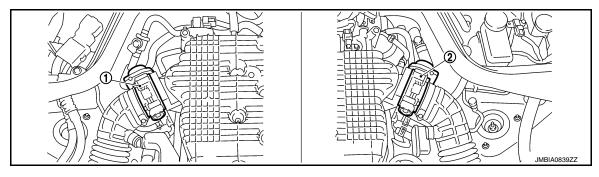
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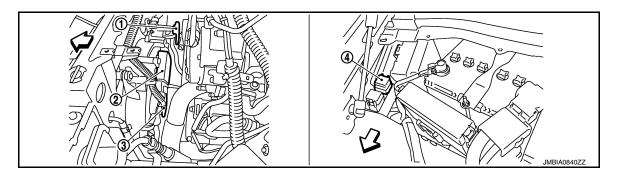


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1. Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)



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



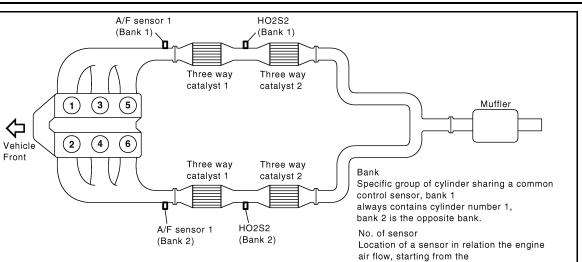
C: Vehicle front

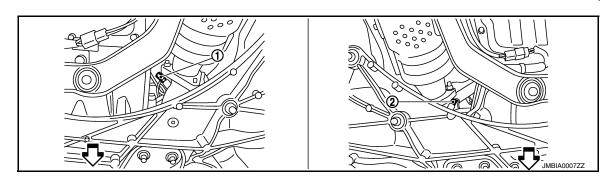
- 1. Cooling fan motor-2
- 4. Cooling fan relay
- 2. Cooling fan control module
- 3. Cooling fan motor-1

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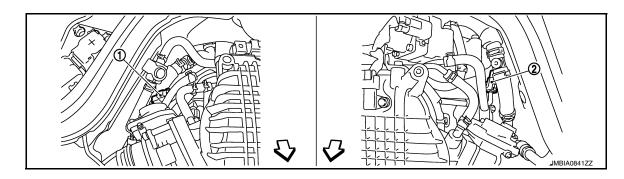
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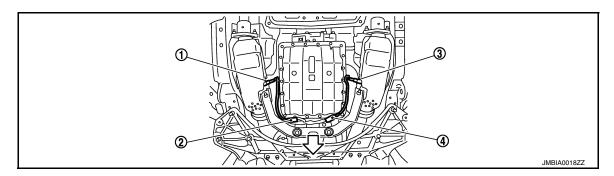


- └□ : Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



C : Vehicle front

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



[VQ37VHR]

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

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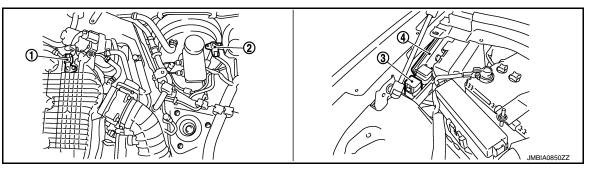
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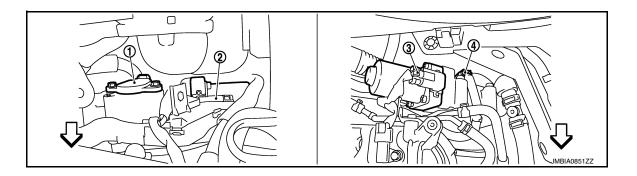
C: Vehicle front

- 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



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



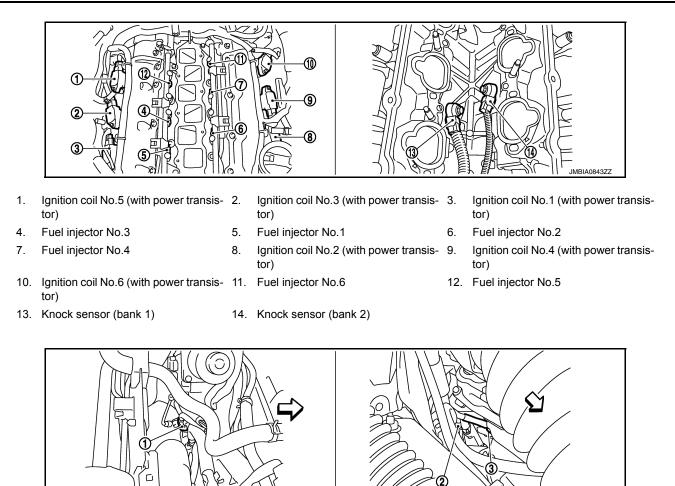
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

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

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

< SYSTEM DESCRIPTION >

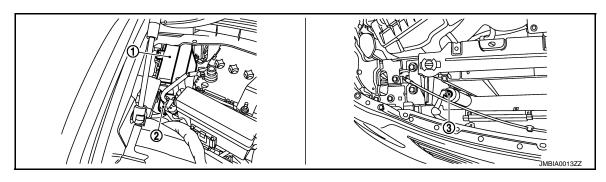
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C: Vehicle front

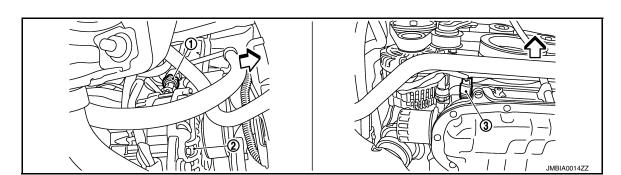
- 1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- 3. Crankshaft position sensor (POS)

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1. IPDM E/R

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



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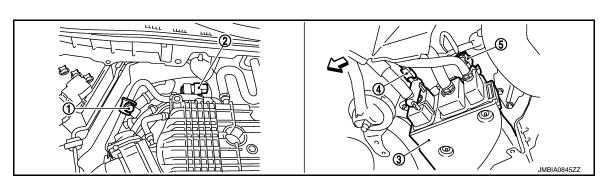
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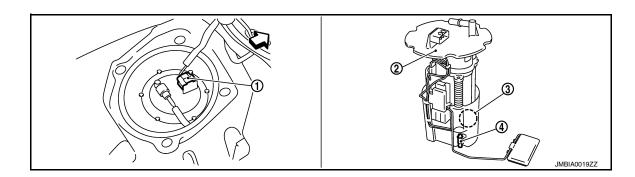
\triangleleft : Vehicle front

1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor

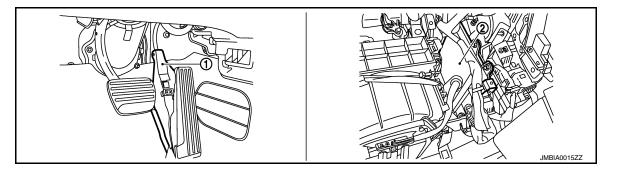


- └□: Vehicle front
- 1. EVAP service port
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 4. EVAP canister vent control valve
- 5. EVAP control system pressure sensor



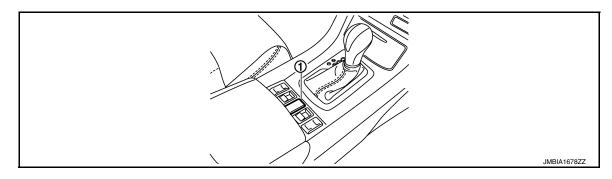
C: Vehicle front

- 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

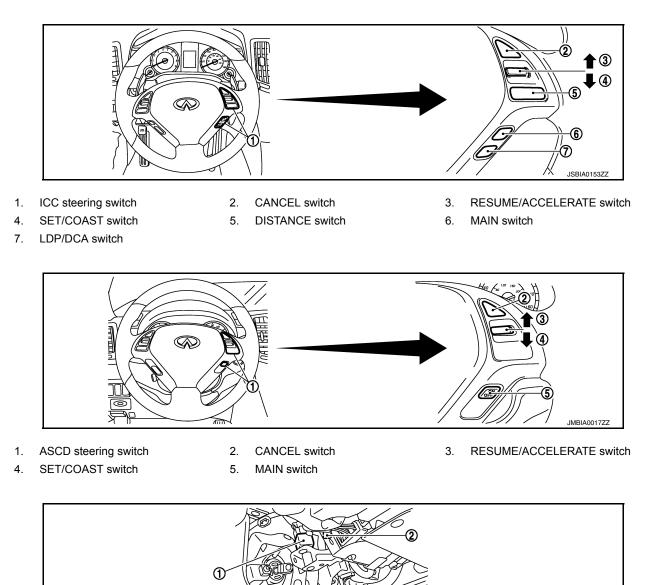


1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >



1. Snow mode switch



 ASCD brake switch (ASCD models) 3. Brake pedal ICC brake switch (ICC models)

Stop lamp switch

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Component Description

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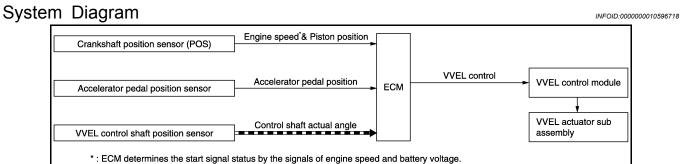
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| Component | Reference | |
|--------------------------------------------|-----------------------|----|
| Camshaft position sensor (PHASE) | EC-301, "Description" | EC |
| Crankshaft position sensor (POS) | EC-297, "Description" | |
| Engine coolant temperature sensor | EC-209, "Description" | 0 |
| Engine oil temperature sensor | EC-277, "Description" | |
| Intake valve timing control solenoid valve | EC-185, "Description" | |

< SYSTEM DESCRIPTION >

VVEL SYSTEM



System Description

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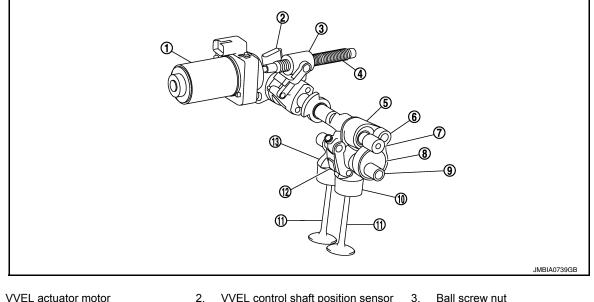
[VQ37VHR]

INPUT/OUTPUT SIGNAL CHART

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

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

SYSTEM DESCRIPTION



- VVEL actuator motor 1.
- 4. Ball screw shaft
- Control shaft 7
- 10. Valve lifter
- 13. Output cam

- VVEL control shaft position sensor
- 5. Rocker arm
- 8. Eccentric cam
- 11. Intake valve

- Ball screw nut
- 6. Link A
- Drive shaft 9
- 12. Link B

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

Revision: February 2015

< SYSTEM DESCRIPTION >

Component Parts Location

INFOID:000000010596720

[VQ37VHR]

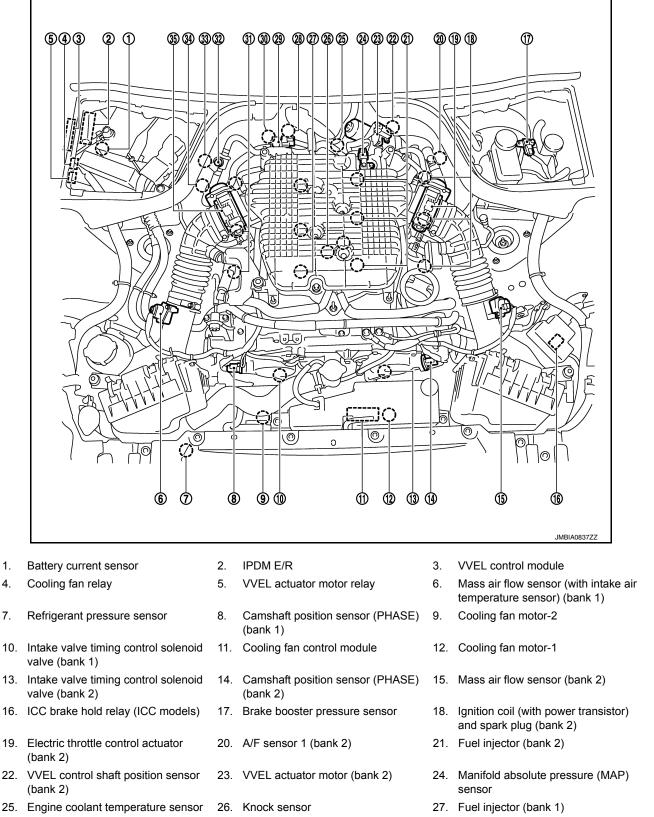
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- 28. VVEL actuator motor (bank 1)
- 29. EVAP canister purge volume control
 - solenoid valve

- 30. VVEL control shaft position sensor (bank 1)

1. 4.

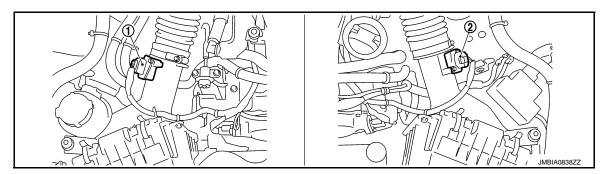
7.



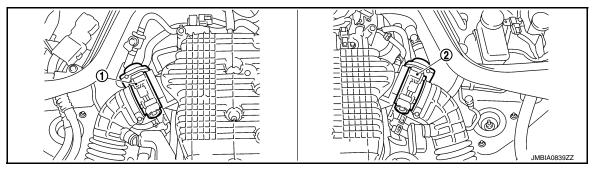
< SYSTEM DESCRIPTION >

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

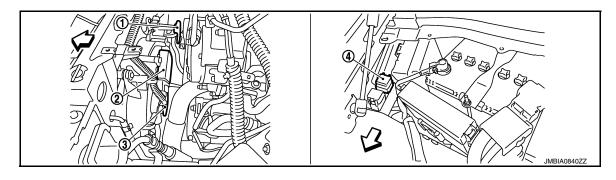
- 34. Crankshaft position sensor (POS)
 - Electric throttle control actuator (bank 1)



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



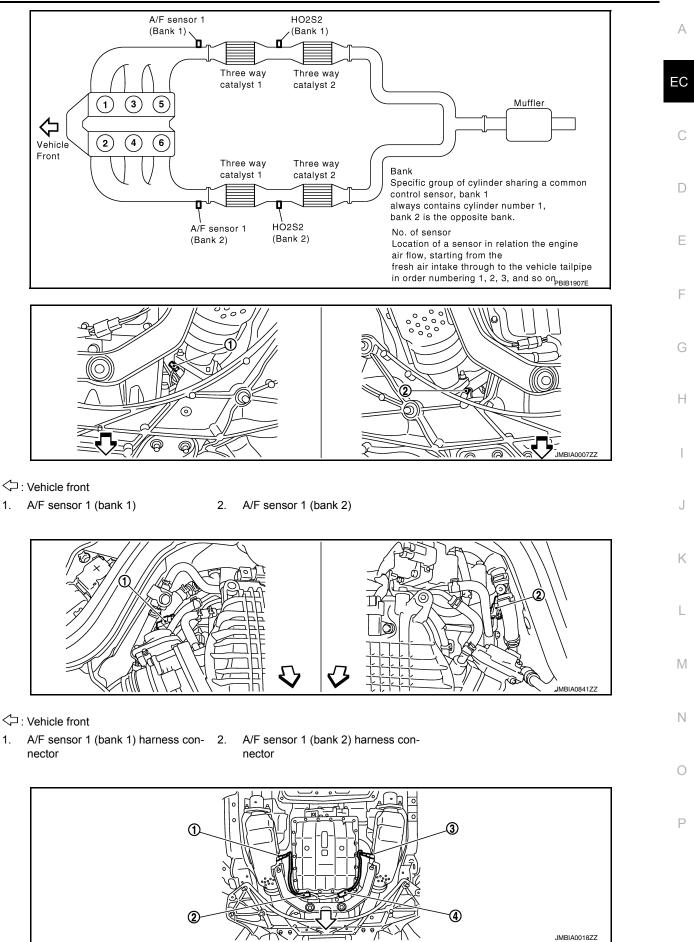
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



- 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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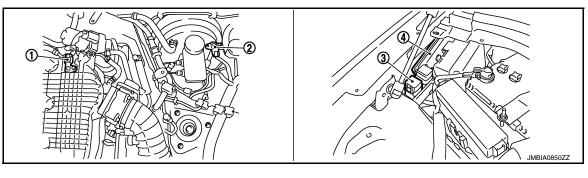
EC-129

< SYSTEM DESCRIPTION >

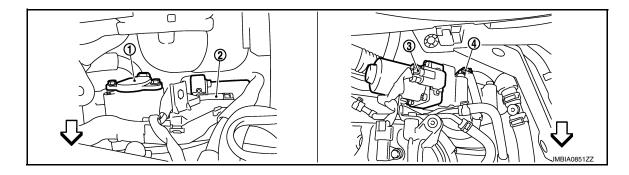
C : Vehicle front

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

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



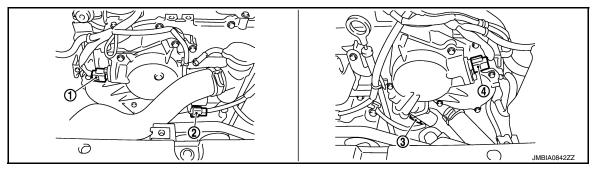
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



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)



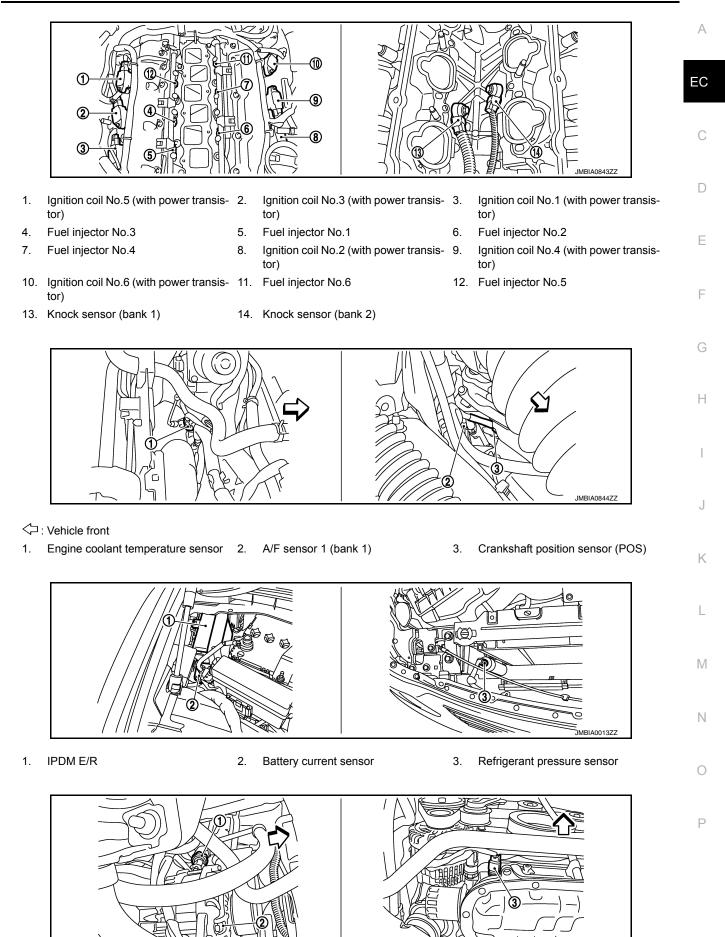
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)

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

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

< SYSTEM DESCRIPTION >

[VQ37VHR]



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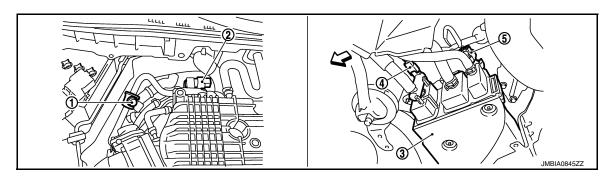
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< SYSTEM DESCRIPTION >

C: Vehicle front

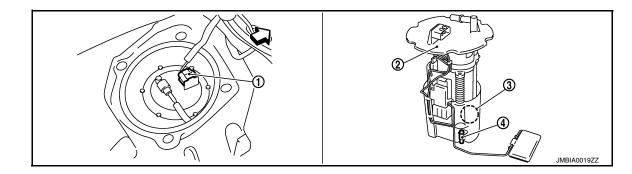
1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



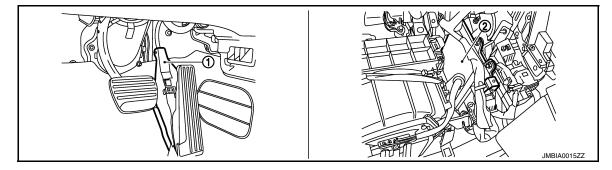
└□ : Vehicle front

- 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

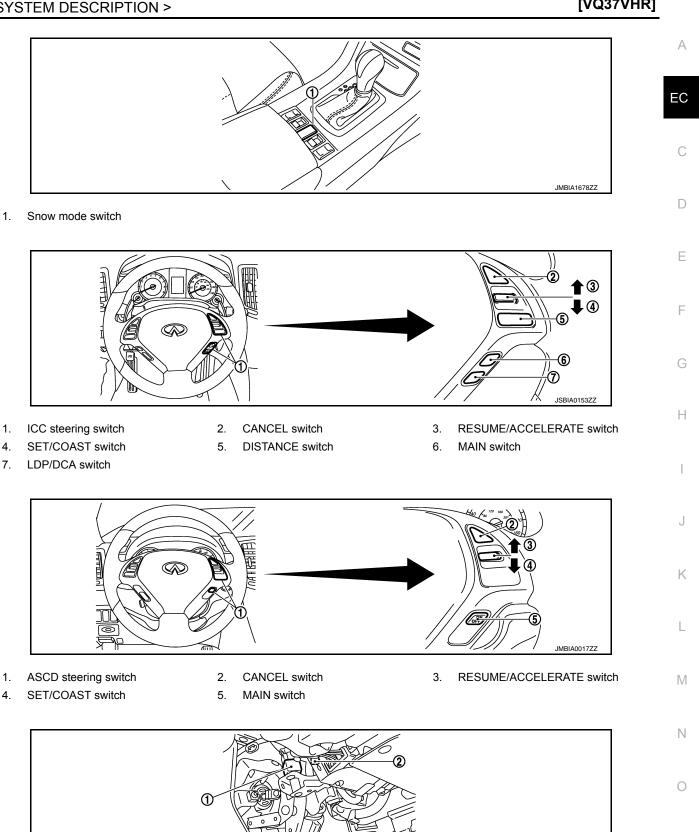
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- 4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

< SYSTEM DESCRIPTION >

[VQ37VHR]



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

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< SYSTEM DESCRIPTION >

Component Description

INFOID:000000010596721

[VQ37VHR]

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

ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

This system is an on board diagnostic system that records exhaust emission-related diagnostic information EC 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 D control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to EC-135, "Diagnosis Description".

NOTE:

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

[VQ37VHR]

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< SYSTEM DESCRIPTION >

DIAGNOSIS SYSTEM (ECM) DIAGNOSIS DESCRIPTION

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

INFOID:000000010596724

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-576, "DTC Index".) | | × | _ | _ | × | — | _ | _ |
| Except above | | | | × | _ | × | × | _ |

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:000000010596725

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-576</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 of | lata | |

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

| | | | | 111 |
|-------------------------------------|-----------------------|-------------------|----------------|-----|
| 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-

• *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"

EC-137

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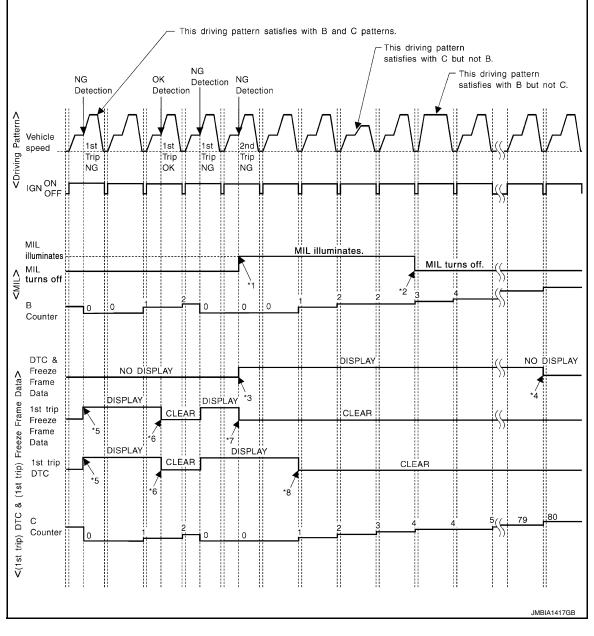
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< SYSTEM DESCRIPTION >



- *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-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

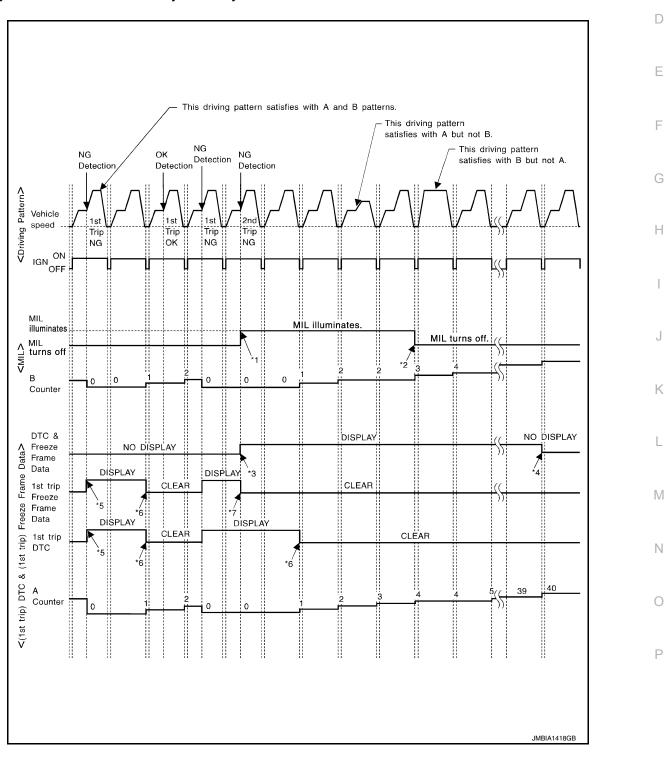
< SYSTEM DESCRIPTION >

Driving Pattern C Refer to <u>EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern"</u>. Example: If the stored freeze frame data is as per the following:

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"



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EC

С

< 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-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern B Refer to EC-140, "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.

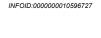
NOTE:

- Drive the vehicle at a constant velocity.
- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern R
- 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

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< SYSTEM DESCRIPTION >

[VQ37VHR]

| Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%] Engine coolant temperature condition: | А |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 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: | EC |
| When the same malfunction is detected regardless of the above vehicle conditions, reset the counter of driving pattern C. | С |
| When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern C. | 0 |
| • The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM. | D |
| DRIVING PATTERN D | |
| Driving pattern D means a trip satisfying the following conditions. The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total. Idle speed lasts 30 seconds or more. | E |
| A lapse of 600 seconds or more after engine start. | F |
| NOTE: When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern | |
| D. When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern D. | G |
| DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code | Н |
| 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 com- ponents. 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 | I |
| 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 | J |
| "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: | К |
| The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM mem- ory power supply is interrupted for several hours. | L |
| If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will con- tinue 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. | Μ |
| NOTE: If permanent DTC is stored or MIL illuminates during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT"), DTC (No DTCs) and permanent DTC (NO permanent DTCs) before the inspection. | Ν |
| 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. | 0 |
| | Ρ |
| | |
| | |

< SYSTEM DESCRIPTION >

| | | | | Example | | |
|------------|-------------|-------------------|-----------------------------|---------|-------------------------------------------------|-----------------------------|
| Self-diagn | osis result | Diagnosis | $\leftarrow ON \rightarrow$ | | on cycle $OFF \leftarrow ON \rightarrow OFF$ | $\leftarrow ON \rightarrow$ |
| 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" |
| NG exists | Case 3 | P0400 | OK | OK | — | _ |
| | | P0402 | — | | — | _ |
| | | P1402 | NG | _ | NG | NG (Consecutive NG) |
| | | (1st trip) DTC | 1st trip DTC | _ | 1st trip DTC | DTC (= MIL ON) |
| | | SRT of EGR | "INCMP" | "INCMP" | "INCMP" | "CMPLT" |

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

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

-: Self-diagnosis is not carried out.

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

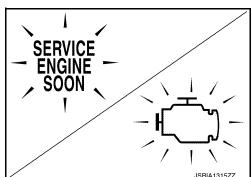
INFOID:000000010596729

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-521, "Component Function Check"</u>.

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



< SYSTEM DESCRIPTION >

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. |
| Malfunction warning | If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected. |
| Self-diagnostic results | DTCs or 1st trip DTCs stored in ECM can be read. |
| Accelerator pedal released position learning | ECM can learn the accelerator pedal released position. Refer to <u>EC-20</u> , "ACCELER- ATOR PEDAL RELEASED POSITION LEARNING : Description". |
| Throttle valve closed position learning | ECM can learn the throttle valve closed position. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description". |
| Idle air volume learning | ECM can learn the idle air volume. Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description". |
| Mixture ratio self-learning value clear | Mixture ratio self-learning value can be erased. Refer to <u>EC-24. "MIXTURE RATIO</u> <u>SELF-LEARNING VALUE CLEAR : Description"</u> . |

BULB CHECK MODE

Description

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

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

 SRT STATUS MODE

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

Operation Procedure

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

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INFOID:000000010596730

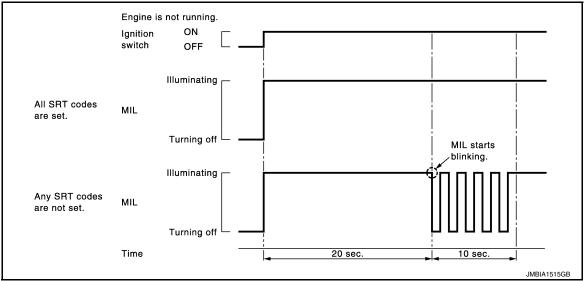
EC

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< SYSTEM DESCRIPTION >

[VQ37VHR]

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



MALFUNCTION WARNING MODE

Description

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

Operation Procedure

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

SELF-DIAGNOSTIC RESULTS MODE

Description

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

How to Set Self-diagnostic Results Mode

NOTE:

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

NOTE:

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

 Fully release the accelerator pedal. ECM has entered to "Self-diagnostic results" mode.

Diagnostic test mode II

(Self-diagnostic results)

starts

Approx. 10 sec.

More than

Erasing ECM

Mode I

PBIB0092E

memory

10 sec.

Mode II

< SYSTEM DESCRIPTION >

ON

OFF

NOTE:

Ignition switch

Accelerator

pedal





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How to Read Self-diagnostic Results

Diagnostic test mode

Fully depressed

Fully

released

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

Mode I

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

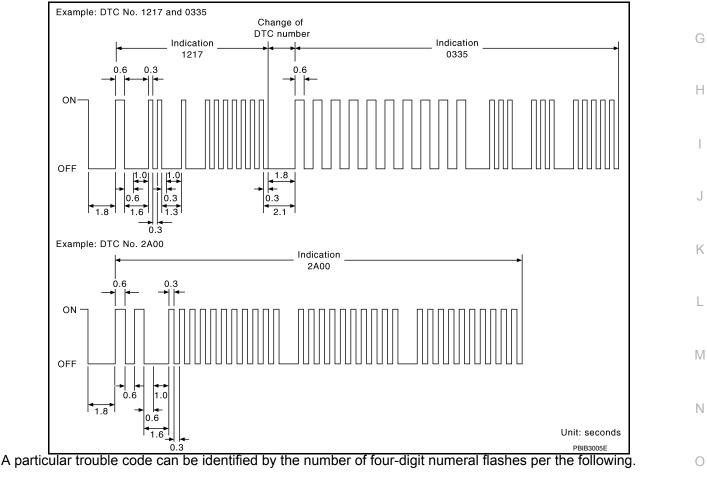
7 sec

Within

5 sec

3 sec.

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



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

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

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle. A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared. A change from one trouble code to another occurs at an interval of 1.8-seconds OFF.

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< SYSTEM DESCRIPTION >

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to <u>EC-576</u>, "<u>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.
- 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:000000010596731

IVQ37VHR1

FUNCTION

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

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

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

SELF DIAGNOSTIC RESULT MODE

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

How to Read DTC and 1st Trip DTC

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

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

How to Erase DTC and 1st Trip DTC

Revision: February 2015

EC-146

< SYSTEM DESCRIPTION >

EC

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 А seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see EC-576, "DTC Index"), skip step 1.
- Erase DTC in TCM. Refer to <u>TM-63, "CONSULT Function"</u>.
- 2. Select "ENGINE" with CONSULT.
- Select "SELF-DIAG RESULTS". 3.
- Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

| Freeze frame data item* | Description |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| DIAG TROUBLE CODE [PXXXX] | The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to <u>EC-576, "DTC_Index"</u> .) |
| CAL/LD VALUE [%] | The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | The engine coolant temperature at the moment a malfunction is detected is displayed. |
| L-FUEL TRM-B1 [%] | "Long-term fuel trim" at the moment a malfunction is detected is displayed. |
| L-FUEL TRM-B2 [%] | • The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| S-FUEL TRM-B1 [%] | "Short-term fuel trim" at the moment a malfunction is detected is displayed. |
| S-FUEL TRM-B2 [%] | The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel sched- ule. |
| ENGINE SPEED [rpm] | The engine speed at the moment a malfunction is detected is displayed |
| VEHICL SPEED [km/h] or [mph] | The vehicle speed at the moment a malfunction is detected is displayed |
| ABSOL TH·P/S [%] | The throttle valve opening angle at the moment a malfunction is detected is displayed |
| B/FUEL SCHDL [msec] | The base fuel schedule at the moment a malfunction is detected is displayed |
| INT/A TEMP SE [°C] or [°F] | The intake air temperature at the moment a malfunction is detected is displayed |
| FUEL SYS-B1 | • "Fuel injection system status" at the moment a malfunction is detected is displayed. |
| | One of the following mode is displayed. Mode2: Open loop due to detected system malfunction |
| FUEL SYS-B2 | 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. |

DATA MONITOR MODE

NOTE:

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

Monitored Item

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

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< SYSTEM DESCRIPTION >

[VQ37VHR]

| 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 certain |
| MAS A/F SE-B2 | V | The signal voltage of the mass air flow sensor is displayed. | value is indicated.When engine is running, specification range is indicated in "SPEC". |
| B/FUEL SCHDL | msec | "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B1 | | | • When the engine is stopped, a certain |
| A/F ALPHA-B2 | % | The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated. | 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 temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed. |
| A/F SEN1 (B1) A/F SEN1 (B2) | - V | • The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed. | |
| HO2S2 (B1) | | The signal voltage of the heated oxygen sensor 2 | |
| HO2S2 (B2) | V | is displayed. | |
| HO2S2 MNTR (B1) | | Display of heated oxygen sensor 2 signal: | |
| HO2S2 MNTR (B2) | RICH/LEAN | RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large. | • When the engine is stopped, a certain value is indicated. |
| VHCL SPEED SE | km/h or mph | • The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | |
| BATTERY VOLT | V | The power supply voltage of ECM is displayed. | |
| ACCEL SEN 1 ACCEL SEN 2 | v | The accelerator pedal position sensor signal volt- age is displayed. | ACCEL SEN 2 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal. |
| TP SEN 1-B1 | | . The throttle position concerning the literative | TP SEN 2-B1 signal is converted by |
| TP SEN 2-B1 | V | The throttle position sensor signal voltage is dis- played. | ECM internally. Thus, they differs from ECM terminal voltage signal. |
| FUEL T/TMP SE | °C or °F | • The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed. | |
| INT/A TEMP SE | °C or °F | • The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated. | |
| EVAP SYS PRES | V | The signal voltage of EVAP control system pres- sure sensor is displayed. | |
| FUEL LEVEL SE | V | The signal voltage of the fuel level sensor is dis- played. | |
| 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 dis- played regardless of the starter sig- nal. |

< SYSTEM DESCRIPTION >

[VQ37VHR]

| Monitored item | Unit | Description | Remarks |
|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| CLSD THL POS | ON/OFF | Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. | |
| AIR COND SIG | ON/OFF | Indicates [ON/OFF] condition of the air condition- er switch as determined by the air conditioner sig- nal. | |
| P/N POSI SW | ON/OFF | Indicates [ON/OFF] condition from the park/neu- tral position (PNP) signal. | |
| PW/ST SIGNAL | ON/OFF | [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated. | |
| LOAD SIGNAL | ON/OFF | Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and light- ing switch are OFF. | |
| IGNITION SW | ON/OFF | Indicates [ON/OFF] condition from ignition switch signal. | |
| HEATER FAN SW | ON/OFF | Indicates [ON/OFF] condition from the heater fan switch signal. | |
| BOOST VCUM SW | ON/OFF | Always a certain value is displayed. This item is not efficient for this models. | |
| BRAKE SW | ON/OFF | Indicates [ON/OFF] condition from the stop lamp switch signal. | |
| INJ PULSE-B1 | msec | Indicates the actual fuel injection pulse width compensated by ECM according to the input sig- | When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-B2 | BTDC | nals. 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 control 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 converted by |
| TP SEN 2-B2 | V | The throttle position sensor signal voltage is dis- played. | 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. | |

< SYSTEM DESCRIPTION >

[VQ37VHR]

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

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< SYSTEM DESCRIPTION >

[VQ37VHR]

| Monitored item | Unit | Description | Remarks |
|----------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 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. | |
| A/F ADJ-B1 | | • Indicates the correction of factor stored in ECM. | |
| A/F ADJ-B2 | | 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. | |
| FAN DUTY | % | Indicates a command value for cooling fan. The value is calculated by ECM based on input sig- nals. | |
| AC EVA TEMP | °C or °F | Indicates A/C evaporator temperature sent from "unified meter and A/C amp.". | |
| AC EVA TARGET | °C or °F | Indicates target A/C evaporator temperature sent from "unified meter and A/C amp.". | |
| ALTDUTY | % | Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal. | |
| ATOM PRES SEN | mV | Always a certain value is displayed. This item is not efficient for this models. | |
| BRAKE BST PRES SE | mV | Always a certain value is displayed. This item is not efficient for this models. | |
| VVEL SEN LEARN- B1 VVEL SEN LEARN- B2 | V | Indicates the VVEL learning value. | |
| VVEL POSITION SEN-B1 VVEL POSITION SEN-B2 | V | The VVEL control shaft position sensor signal voltage is displayed. | |
| VVEL TIM-B1 | dog | , Indicates [dog] 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* | _ | _ | |
| SYSTEM 1 DIAG- NOSIS A B1 | INCMP/CM- PLT | Indicates DTC P219A self-daiagnosis condi- tion.INCMP: Self-diagnosis is incomplete.CM- PLT: Self-diagnosis is complete. | <u> </u> |

< SYSTEM DESCRIPTION >

[VQ37VHR]

| Monitored item | Unit | Description | Remarks |
|------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| SYSTEM 1 DIAG- NOSIS A B2 | INCMP/CM- PLT | Indicates DTC P219B self-daiagnosis condi- tion.INCMP: Self-diagnosis is incomplete.CM- PLT: Self-diagnosis is complete. | |
| SYSTEM 1 DIAG- NOSIS B B1 | ABSENT/ PRSENT | Indicates DTC P219A self-daiagnosis condition. ABSENT: Self-diagnosis standbyPRSENT: Un- der self-diagnosis | |
| SYSTEM 1 DIAG- NOSIS B B2 | ABSENT/ PRSENT | Indicates DTC P219B self-daiagnosis condition. ABSENT: Self-diagnosis standbyPRSENT: Un- der self-diagnosis | |
| HO2 S2 DIAG1 (B1) | INCMP/CM- PLT | Indicates DTC P0139 self-diagnosis (delayed re- sponse) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG1 (B2) | INCMP/CM- PLT | Indicates DTC P0159 self-diagnosis (delayed re- sponse) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG2 (B1) | INCMP/CM- PLT | Indicates DTC P0139 self-diagnosis (slow re- sponse) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG2 (B2) | INCMP/CM- PLT | 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/CM- PLT | Indicates DTC P015A or P015B self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG1 (B2) | INCMP/CM- PLT | Indicates DTC P015C or P015D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG2 (B1) | INCMP/CM- PLT | Indicates DTC P014C or P014D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG2 (B2) | INCMP/CM- PLT | Indicates DTC P014E or P014F self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG3 (B1) | ABSNT/ PRSNT | Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the di- agnosis range. PRSNT: The vehicle condition is within the diag- nosis range. | |
| A/F SEN1 DIAG3 (B2) | ABSNT/ PRSNT | Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the di- agnosis range. PRSNT: The vehicle condition is within the diag- nosis range. | |

*: The item is indicated, but not used.

NOTE:

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

< SYSTEM DESCRIPTION >

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 | EC |
| | 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). | | C |
| EVAP SYSTEM CLOSE | 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 detecting EVAP vapor leak in the EVAP system | E |
| | WHEN TRYING TO EXECUTE "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. NOTE: WHEN STARTING ENGINE, CONSULT MAY DISPLAY "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN WHEN USING A CHARGED BATTERY. | | F |
| 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 | F |
| SELF-LEARNING CONT | THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT. | When clearing mixture ratio self- learning value | I |
| TARGET IDLE RPM ADJ* | IDLE CONDITION | When setting target idle speed | |
| TARGET IGN TIM ADJ* | IDLE CONDITION | When adjusting target ignition tim- ing | J |
| VIN REGISTRATION | IN THIS MODE, VIN IS REGISTERED IN ECM. | When registering VIN in ECM | |
| CLSD THL POS LEARN | IGNITION ON AND ENGINE STOPPED. | When learning the throttle valve closed position | K |
| VVEL POS SEN ADJ PREP | USE THIS ITEM ONLY WHEN REPLACING VVEL ACTU- ATOR SUB ASSEMBLY. IGNITION ON AND ENGINE STOPPED. | When adjusting VVEL control shaft position sensor | L |

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

ACTIVE TEST MODE

Test Item

| | | | | Ν |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---|
| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) | |
| VENT CON- TROL/V | Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | Harness and connectorsSolenoid valve | 0 |
| ENG COOLANT TEMP | Engine: Return to the original trouble condition Change the engine coolant tem- perature using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Engine coolant temperature sensor Fuel injector | Ρ |
| FUEL INJEC- TION | Engine: Return to the original trouble condition Change the amount of fuel injec- tion using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1 | |

M

< SYSTEM DESCRIPTION >

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

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

DTC WORK SUPPORT MODE

Test Item

| Test mode | Test item | Corresponding DTC No. | Reference page |
|--------------------|----------------------------|-----------------------|----------------|
| | EVP SML LEAK P0442*/P1442* | — | _ |
| EVAPORATIVE SYSTEM | EVP V/S LEAK P0456/P1456* | P0456 | <u>EC-346</u> |
| EVAPORATIVE STSTEM | PURG VOL CN/V P1444 | P0443 | <u>EC-315</u> |
| | PURG FLOW P0441 | P0441 | <u>EC-310</u> |
| | A/F SEN1 (B1) P1278/P1279 | — | _ |
| A/F SEN1 | A/F SEN1 (B1) P1276 | P0130 | <u>EC-224</u> |
| A/F SENT | A/F SEN1 (B2) P1288/P1289 | - | _ |
| | A/F SEN1 (B2) P1286 | P0150 | <u>EC-224</u> |
| | HO2S2 (B1) P1146 | P0138 | <u>EC-240</u> |
| | HO2S2 (B1) P1147 | P0137 | <u>EC-234</u> |
| HO2S2 | HO2S2 (B1) P0139 | P0139 | <u>EC-249</u> |
| Π0232 | HO2S2 (B2) P1166 | P0158 | <u>EC-240</u> |
| | HO2S2 (B2) P1167 | P0157 | <u>EC-234</u> |
| | HO2S2 (B2) P0159 | P0159 | <u>EC-249</u> |

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

< SYSTEM DESCRIPTION >

[VQ37VHR]

| SRT & P-DTC MODE | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--|
| SRT STATUS Mode | А | |
| 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. | EC | |
| PERMANENT DTC STATUS Mode | | |
| How to Display Permanent DTC Status 1. Turn ignition switch OFF and wait at 10 seconds. | С | |
| 2. Turn ignition switch ON. | | |
| 3. Turn ignition switch OFF and wait at 10 seconds. | D | |
| 4. Turn ignition switch ON. | D | |
| NOTE: Permanent DTCs stored in ECM memory are displayed on the CONSULT screen to show if a driving pat- tern required for erasing permanent DTCs is complete (CMPLT) or incomplete (INCMP). CAUTION: | Е | |
| 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" | F | |

and "Ignition switch ON".

| CAUTION: Turn ignition switch from O status screen. | N to OFF twice to update the informa | tion on the | |
|-----------------------------------------------------------|-------------------------------------------------|-------------------|-------|
| PERMANENT DTC | DRIVING PATTERN B | DRIVING PATTERN D | ! |
| XXXX | INCMP | INCMP | |
| XXXX | CMPLT | INCMP | |
| XXXX | INCMP | CMPLT | |
| XXXX | CMPLT | INCMP | |
| XXXX | INCMP | INCMP | |
| XXXX | INCMP | INCMP | |
| 7 | Find the previous trip information is displayed | | · |

NOTE:

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

SRT WORK SUPPORT Mode

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

PERMANENT DTC WORK SUPPORT Mode

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

NOTE:

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

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< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:000000010596732

[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:000000010596733

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
- After the engine is warmed up to normal operating temperature, drive vehicle until "ATF TEMP 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- · Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle

>> GO TO 2.

2. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT NOTE:

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

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

Is the measurement value within the SP value?

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

< DTC/CIRCUIT DIAGNOSIS >

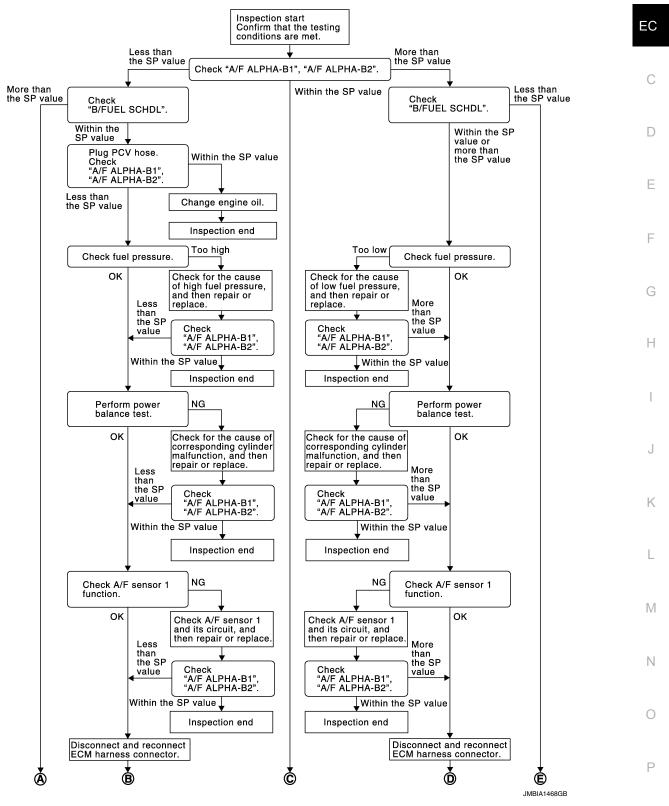
Diagnosis Procedure





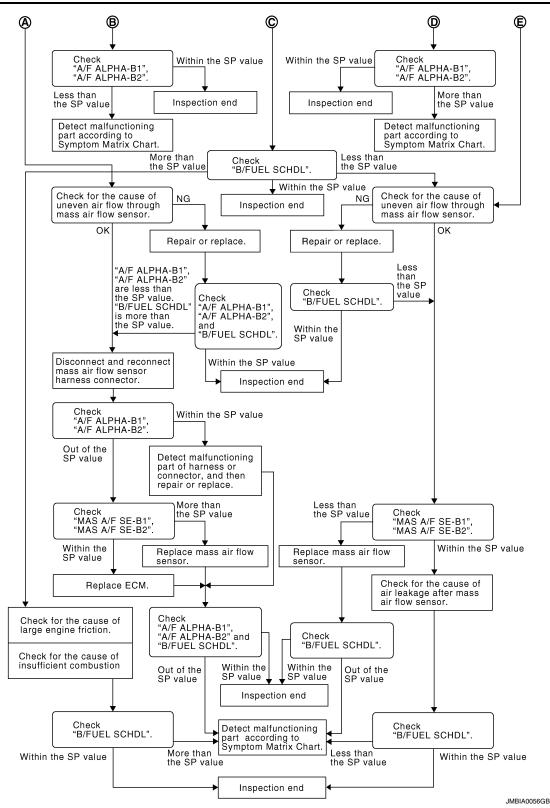
А

OVERALL SEQUENCE



< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



DETAILED PROCEDURE

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

(B) With CONSULT

- 1. Start engine.
- Confirm that the testing conditions are met. Refer to <u>EC-156, "Component Function Check"</u>.
- 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.

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EC-158

2015 QX50

| < DTC/CIRCUIT DIAGNOSIS > | VQ37VHR] |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| NOTE: Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluctu if the indication is out of the SP value even a little. | ate. It is NG |
| Is the measurement value within the SP value?YES>> GO TO 17.NO-1>> Less than the SP value: GO TO 2.NO-2>> More than the SP value: GO TO 3. | EC |
| 2.CHECK "B/FUEL SCHDL" | (|
| Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication SP value. | is within the |
| Is the measurement value within the SP value? | E |
| YES >> GO TO 4. NO >> More than the SP value: GO TO 19. | E |
| 3.CHECK "B/FUEL SCHDL" | |
| Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication SP value. | is within the |
| <u>Is the measurement value within the SP value?</u> 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" | |
| 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 makes | |
| each indication is within the SP value. <u>Is the measurement value within the SP value?</u> YES >> GO TO 5. | |
| NO $>>$ GO TO 6. | U. |
| 5. CHANGE ENGINE OIL | |
| Stop the engine. Change engine oil. NOTE: | - k |
| This symptom may occur when a large amount of gasoline is mixed with engine oil becaus conditions (such as when engine oil temperature does not rise enough since a journey dis short during winter). The symptom will not be detected after changing engine oil or changing ditions. | tance is too |
| >> INSPECTION END | |
| 6. CHECK FUEL PRESSURE | Ν |
| Check fuel pressure. (Refer to EC-628, "Inspection".) | |
| Is the inspection result normal? | C |
| YES >> GO TO 9. NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly" (Refer to <u>FL-4</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. | |
| Is the inspection result normal? | |
| YES >> Replace "fuel filter and fuel pump assembly" (Refer to <u>FL-6, "Removal and Installation</u> GO TO 8. | .) and then |

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

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

Is the inspection result normal?

- YES >> Replace fuel injector (Refer to EM-38, "Removal and Installation".) and then GO TO 11.
- NO >> Repair or replace malfunctioning part and then GO TO 11.
- 11. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"
- 1. Start engine.
- 2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

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

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

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

| <pre> TROUBLE DIAGNOSIS - SPECIFICATION VALUE < DTC/CIRCUIT DIAGNOSIS > [VQ: </pre> | 37VHR] |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR | |
| Stop the engine. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then record | |
| >> GO TO 16. 16. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2" | E |
| Start engine. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make s each indication is within the SP value. | sure that |
| <u>Is the measurement value within the SP value?</u> YES >> INSPECTION END | |
| NO >> Detect malfunctioning part according to <u>EC-616, "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 w SP value. | ithin the |
| 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 | |
| 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 | |
| <u>Is the inspection result normal?</u> 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" moments are that each indication is within the SP value. Is the measurement value within the SP value? | ode, and |
| YES >> INSPECTION END NO >> "B/FUEL SCHDL" is more, "A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value: 21. | : GO TO |
| 21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR | |

21. DISCONNECT AND RECONNECT 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-195. "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, "Exploded</u> <u>View"</u>.), and then GO TO 29.

24.REPLACE ECM

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

>> GO TO 29.

25. CHECK INTAKE SYSTEM

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

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

Is the inspection result normal?

YES >> GO TO 27.

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

26. CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> INSPECTION END

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

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

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

Is the measurement value within the SP value?

YES >> GO TO 28.

- NO >> Less than the SP value: Replace malfunctioning mass air flow sensor (Refer to <u>EM-27, "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
- · Disconnection of oil level gauge

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[VQ37VHR]

| 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 | А |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Malfunctioning seal in rocker cover gasket Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts Malfunctioning seal in intake air system, etc. | 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-616, "Symptom Table"</u> . | Е |
| 30. CHECK "B/FUEL SCHDL" | |
| Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then make sure that the indication is within the SP value. | F |
| Is the measurement value within the SP value? | |
| YES >> INSPECTION END | G |
| NO >> Detect malfunctioning part according to <u>EC-616, "Symptom Table"</u> . | |
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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-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

1. Disconnect ECM harness connector.

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

| ECM | | Ground | Continuity | | |
|-----------|----------|--------|------------|--|--|
| Connector | Terminal | Ground | Continuity | | |
| F101 | 8 | | | | |
| M107 | 123 | | Existed | | |
| | 124 | Ground | | | |
| | 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.

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

Is the inspection result normal?

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

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)

Harness for open or short between ECM and fuse

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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | | s connector terminals as follows. | | |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| ECM | | | | C | |
| + | _ | | Voltage | 0 | |
| Ferminal | Terminal | | | | |
| 125 | 128 | age will exist | for a few seconds, then drop to | D | |
| on result i | normal? | | | E | |
| O TO 7. | | | | | |
| | | | | F | |
| | | | -111 | 1 | |
| | | PDM E/R ha | rness connector and ground. | G | |
| E/R | | | | | |
| Termina | | ind V | d Voltage | | |
| 53 | Grou | ind Batte | ery voltage | | |
| on result i | normal? | | | | |
| O TO 8. | | | | I | |
| - | | | 5-35, "Removal and Installation". | | |
| | | | | J | |
| <u>, "Intermi</u> | ttent Incide | <u>ent"</u> . | | | |
| | | | | К | |
| | | | | Л | |
| | | | | | |
| | | | | L | |
| , energe : | | | | | |
| EC | М | | | M | |
| | | _ | Voltage | 141 | |
| Terminal | Connector | Terminal | | | |
| 24 | M107 | 128 | Battery voltage | Ν | |
| on result i | normal? | | | | |
| O TO 13. | | | | 0 | |
| | | | | 0 | |
| O TO 10. | | | | | |
| ECM POV | WER SUPI | PLY CIRCU | IT-V | | |
| ECM POV | WER SUP | nector. | | P | |
| ECM POV ct ECM ha ct IPDM E | VER SUPI arness cor Z/R harnes | nector. s connector | r. | P | |
| ECM POV ct ECM ha ct IPDM E | VER SUPI arness cor Z/R harnes | nector. s connector | | P | |
| | Terminal 125 On result O TO 7. O TO 9. CM POWE on switch voltage I E/R Termina 53 On result O TO 8. eplace IP TERMITT G. "Intermi ISPECTIC CM POWE on switch e voltage I EC Terminal 24 | Terminal Terminal 125 128 0n result normal? 0 TO 7. 0 TO 7. 0 TO 9. CM POWER SUPPL on switch ON. evoltage between IF Grout E/R Grout 53 Grout 0 TO 8. Grout eplace IPDM E/R. F F TERMITTENT INCH Grout S. "Intermittent Incide SPECTION END CM POWER SUPPL on switch OFF and e voltage between E ECM ECM Terminal Connector | Terminal Terminal 125 128 After turning age will exist approximatel on result normal? O TO 7. O TO 7. O TO 9. CM POWER SUPPLY CIRCUIT on switch ON. e voltage between IPDM E/R hat E/R Ground 53 Ground 53 Ground D TO 8. Batter eplace IPDM E/R. Refer to PCS TERMITTENT INCIDENT 5, "Intermittent Incident". ISPECTION END CM POWER SUPPLY CIRCUIT on switch OFF and wait at leas e voltage between ECM harness ECM - Terminal Connector | Terminal Terminal 125 128 After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V. on result normal? 0 TO 7. 0 TO 9. CM POWER SUPPLY CIRCUIT-III on switch ON. evoltage between IPDM E/R harness connector and ground. E/R Ground Voltage 3 Ground Battery voltage on result normal? O TO 8. eplace IPDM E/R. Refer to PCS-35, "Removal and Installation". TERMITTENT INCIDENT i, "Intermittent Incident". ISSPECTION END CM POWER SUPPLY CIRCUIT-IV on switch OFF and wait at least 10 seconds. evoltage between ECM harness connector terminals as follows. ECM Voltage 120 - 121 Voltage | |

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

Revision: February 2015

EC-165

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

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

12.CHECK 15 A FUSE

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

2. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace 15 A fuse.

13. CHECK ECM POWER SUPPLY CIRCUIT-VI

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

| ECM | | IPDN | 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-45, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to <u>PCS-35, "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 | Proced | lure | | | . (| INFOID:000000010596736 | ł |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------|------------------------|---|
| 1. снеск е | ROUND | CONNEC | TION | | | EC | C |
| 1. Turn igni 2. Check gu Is the inspect YES >> 0 NO >> F 2.CHECK V 1. Disconne | tion switc round con tion result GO TO 2. Repair or VEL CON ect VVEL | th OFF. nection M t normal? replace gr NTROL M control m | 195. Refer to (round connect ODULE GRO odule harness | tion. UND CIRCUIT | ion in <u>GI-48, "Circuit Inspection"</u> . FOR OPEN AND SHORT less connector and ground. | C | |
| VVFL c | ontrol modu | ıle | | | - | | |
| Connector | | minal | Ground | Continuity | | F | - |
| E14 | | 14 | Ground | Existed | - | | |
| 3. Also che | ck harnes | ss for shor | t to power. | | - | G | _ |
| Is the inspect | | t normal? | | | | G | 2 |
| NO >> F | | | • | er in harness co ER SUPPLY Cl | | Н | - |
| Turn igni Check th | tion switc | h ON. between | odule harness VVEL control | | s connector and ground. | l | J |
| | + | _ | - | Voltage | | | |
| Connector — | Terminal | Terminal | - | | | | |
| E14 | 8 | 14 | After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V. | | | | |
| Is the inspec | tion result | t normal? | | | | L | - |
| NO >> (| 30 TO 5. 30 TO 4. | | | | | M | Л |
| 4.CHECK V | VEL CON | NTROL M | ODULE POW | ER SUPPLY C | RCUIT-II | 111 | |
| Disconne Disconne | ect VVEL ect IPDM | control m E/R harne | d wait at least odule harness ess connector en VVEL conti | s connector. | ess connector and IPDM E/R ha | | |
| VVEL contr | ol module | | IPDM E/R | Continuity | - | 0 | / |
| Connector | Terminal | | | al | _ | | |
| E14 | 8 | E7 | | Existed | - | P |) |
| <u>Is the inspect</u> YES >> <u>E</u> | <u>tion result</u> EC-164, "I | <u>t normal?</u> Diagnosis | Procedure" | nd short to pow | er. ower in harness or connectors. | | |

5. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

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

< DTC/CIRCUIT DIAGNOSIS >

U0101 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

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DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------|
| U0101 | Lost communication with TCM | CAN communication line between TCM and ECM (CAN communication line is open or shorted) | |
| DTC CON | IFIRMATION PROC | EDURE | |
| 1.PERFO | RM DTC CONFIRMA | TION PROCEDURE | |
| 2. Check | DTC. | wait at least 3 seconds. | |
| | <u>EC-169, "Diagnosis</u>] INSPECTION END | Procedure". | |
| Diagnosi | is Procedure | | INFOID:000000010596739 |
| Go to <u>LAN</u> | -16, "Trouble Diagnosi | s Flow Chart". | |
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U1001 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:000000010596741

INFOID:0000000010596742

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 CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

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

Diagnosis Procedure

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

INFOID:000000010596740

U1003 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

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

DTC DETECTION LOGIC

NOTE:

If DTC U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-377. "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 | F |

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 Turn ignition switch ON and wait at least 3 seconds. 1. Check DTC. Is DTC detected? YES >> Go to EC-171, "Diagnosis Procedure". Κ >> INSPECTION END NO Diagnosis Procedure INFOID:000000010596745 L 1. CHECK VVEL CAN COMMUNICATION CIRCUIT 1. Turn ignition switch OFF. Μ 2. Disconnect ECM harness connector. Disconnect VVEL control module harness connector. 3. Check the continuity between ECM harness connector and VVEL control module harness connector. 4. Ν FCM VVFL control module Continuity Connector Terminal Connector Terminal 54 24 F102 E14 Existed 55 11 Also check harness for short to ground and power. 5 Ρ Is the inspection result normal? YES >> GO TO 3. NO >> GO TO 2. 2.DETECT MALFUNCTIONING PART Check the following. Harness connector E13, F40

EC-171

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U1003 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

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

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace.

4.REPLACE VVEL CONTROL MODULE

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

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Erase DTC.
- 4. Perform DTC Confirmation Procedure.
- See EC-171, "DTC Logic".
- 5. Check DTC.
- Is the DTC U1003 displayed again?
- YES >> GO TO 6.
- NO >> INSPECTION END
- **6.**REPLACE ECM
- 1. Replace ECM. Refer to EC-39, "Component Parts Location".
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

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

DTC DETECTION LOGIC NOTE:

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

| DTC No. Trouble diagnosis name DTC detecting condition Possible cause | — |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| U1024 VVEL CAN communication • When VVEL control module cannot transmit/receive can communication signal from ECM. • When detecting error during the initial diagnosis of CAN controller of VVEL control module. • Harness or connectors (CAN communication line is open of shorted) | or |
| 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 | |
| Turn ignition switch ON and wait at least 3 seconds. Check DTC. | |
| Is DTC detected? | |
| YES >> Go to <u>EC-173, "Diagnosis Procedure"</u> . | |
| NO >> INSPECTION END | |
| Diagnosis Procedure | 6748 |
| 1. CHECK VVEL CAN COMMUNICATION CIRCUIT | |
| 1. Turn ignition switch OFF. | — |
| Disconnect ECM harness connector. Disconnect VVEL control module harness connector. Check the continuity between ECM harness connector and VVEL control module harness connector. | |
| ECM VVEL control module | |
| Connector Terminal Connector Terminal | |
| F102 55 E14 24 Existed | |
| 5. Also check harness for short to ground and power. | |
| | |
| s the inspection result normal? | |
| Is the inspection result normal? YES >> GO TO 3. NO >> GO TO 2. | |

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U1024 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Harness connector E13, F40
- Harness for open or short between ECM and VVEL control module

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

3. CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace.

4.REPLACE VVEL CONTROL MODULE

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

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Erase DTC.
- 4. Perform DTC Confirmation Procedure. See <u>EC-173, "DTC Logic"</u>.

Is the DTC U1024 displayed again?

YES >> GO TO 6.

NO >> INSPECTION END

6.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".

2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P0011, P0021 IVT CONTROL

DTC Logic

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-185, "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-367, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | Detecting condition | Possible cause | D |
|---------|--------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| P0011 | Intake valve timing control performance (bank 1) | | Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Intake valve control solenoid valve | E |
| 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 | F |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

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

| VHCL SPEED SE | 100 - 120 km/h (63 - 75 mph) |
|----------------|------------------------------|
| ENG SPEED | 525 - 2,000 rpm |
| COOLAN TEMP/S | More than 60°C (140°F) |
| B/FUEL SCHDL | More than 7.3 msec |
| Selector lever | D position |

CAUTION:

Always drive at a safe speed.

- 4. Stop vehicle with engine running and let engine idle for 10 seconds.
- 5. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> Go to EC-176, "Diagnosis Procedure"
- NO >> GO TO 3.

3.perform dtc confirmation procedure-II

1. Select "DATA MONITOR" mode with CONSULT.

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< DTC/CIRCUIT DIAGNOSIS >

2. Maintain the following conditions for at least 20 consecutive seconds.

| ENG SPEED | 1,400 - 3,175 rpm (A constant rotation is maintained.) |
|------------------|------------------------------------------------------------------------------------------------------------------------|
| COOLAN TEMP/S | More than 70°C (158°F) |
| Selector lever | D position |
| Driving location | Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) |

CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-176, "Diagnosis Procedure"

NO >> INSPECTION END

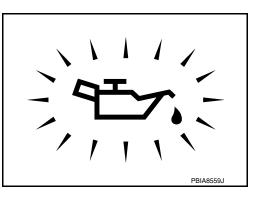
Diagnosis Procedure

1. CHECK OIL PRESSURE WARNING LAMP

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

Is oil pressure warning lamp illuminated?

- YES >> Go to LU-7, "Inspection".
- NO >> GO TO 2.



2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-177, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-51, "Exploded</u> <u>View"</u>.

3. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-300, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS). Refer to <u>EM-122, "Exploded View"</u>.

4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-304, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to <u>EM-51, "Exploded View"</u>.

5.CHECK CAMSHAFT (INTAKE)

Check the following.

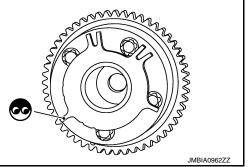
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< DTC/CIRCUIT DIAGNOSIS >

- · 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-51</u>, <u>"Exploded View"</u>.



D 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? Ε >> Check timing chain installation. Refer to EM-52, "Removal and Installation". YES NO >> GO TO 7. 7. CHECK LUBRICATION CIRCUIT F Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-105, "Inspection". Is the inspection result normal? YES >> GO TO 8. NO >> Clean lubrication line. **O**.CHECK INTERMITTENT INCIDENT Н Refer to GI-45, "Intermittent Incident". >> INSPECTION END Component Inspection INFOID:0000000010596751 1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I 1. Turn ignition switch OFF. 2. Disconnect intake valve timing control solenoid valve harness connector. Κ 3. Check resistance between intake valve timing control solenoid valve terminals as follows. Terminals Resistance (Ω) 7.0 - 7.7 [at 20°C (68°F)] 1 and 2 ∞ 1 or 2 and ground (Continuity should not exist) Μ Is the inspection result normal? YES >> GO TO 2. Ν NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View". 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II Remove intake valve timing control solenoid valve. Refer to EM-51, "Exploded View". 1.

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

 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:

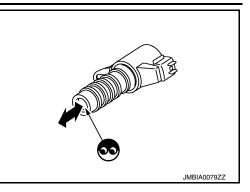
Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve. NOTE:

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-51</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:000000010596752

[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 | C |
| 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 on the condition to keep the temperature of A/F sensor 1 element at the specified range.

DTC Logic

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DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

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

NG >> INSPECTION END

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

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

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1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.

2. Turn ignition switch ON.

3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor | 1 | Ground | Voltage | |
|--------------|------|------------|----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Ground | voltage | |
| P0031, P0032 | 1 | F123 | 4 | Ground | Battery voltage | |
| P0051, P0052 | 2 | F124 | 4 | 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 E13, F40

IPDM E/R harness connector E7

15 A fuse (No. 46)

· Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4.CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

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

| DTC | | A/F sensor | ⁻ 1 | ECM | | Continuity | |
|--------------|------|------------|----------------|-----------|----------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0031, P0032 | 1 | F123 | 3 | F101 | 1 | Existed | |
| P0051, P0052 | 2 | F124 | 3 | FIUI | 5 | Existed | |

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK A/F SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

 $\mathbf{6}$.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:

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

| < DTC/CIRCUIT DI | AGNOSIS > | [VQ37VHR] |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| hard surface such Before installing Cleaner [commer | h as a concrete floor; use a new new A/F sensor, clean exhau rcial service tool (J-43897-18 d | d from a height of more than 0.5 m (19.7 in) onto a one. Ist system threads using Oxygen Sensor Thread or J-43897-12)] and approved Anti-seize Lubricant |
| (commercial serv | ice tool). | EC |
| >> INSPEC | TION END | |
| 7.CHECK INTERM | ITTENT INCIDENT | C |
| Perform GI-45, "Inter | rmittent Incident". | |
| b b Demoire | | D |
| >> Repair o | | |
| Component Insp | Dection | INFOID:000000010596755 |
| 1. CHECK AIR FUE | L RATIO (A/F) SENSOR 1 | |
| | tch OFF. sensor 1 harness connector. e between A/F sensor 1 terminals | as follows. |
| Terminal | Resistance (Ω) | G |
| 3 and 4 | 1.8 - 2.44 [at 25°C (77°F)] | |
| 3 and 1, 2 | x | Н |
| 4 and 1, 2 | (Continuity should not exist) | |
| Is the inspection result YES >> INSPEC NO >> GO TO 2 | TION END | I |
| 2.REPLACE AIR FU | UEL RATIO (A/F) SENSOR 1 | |
| | ing air fuel ratio (A/F) sensor 1. R | efer to EM-34, "Exploded View". |
| hard surface suchBefore installing | h as a concrete floor; use a new new A/F sensor, clean exhau | d from a height of more than 0.5 m (19.7 in) onto a one. Ist system threads using Heated Oxygen Sensor 7-18 or J-43897-12)] and approved Anti-seize Lubri- |
| cant (commercial | | |
| >> INSPEC | TION END | M |
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P0037, P0038, P0057, P0058 HO2S2 HEATER

Description

INFOID:000000010596756

[VQ37VHR]

SYSTEM DESCRIPTION

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

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

OPERATION

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

DTC Logic

INFOID:000000010596757

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0037 | Heated oxygen sensor 2 heater (bank 1) control circuit low | The current amperage in the heated oxygen 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.

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

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

TESTING CONDITION:

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

P0037, P0038, P0057, P0058 HO2S2 HEATER

IVQ37VHR < DTC/CIRCUIT DIAGNOSIS > 2.PERFORM DTC CONFIRMATION PROCEDURE А 1. Start engine and warm it up to the normal operating temperature. Turn ignition switch OFF and wait at least 10 seconds. 2. 3. Turn ignition switch ON. EC 4. Turn ignition switch OFF and wait at least 10 seconds. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 5. Let engine idle for 1 minute. 6. 7. Check 1st trip DTC. Is 1st tip DTC detected? YES >> Go to EC-183, "Diagnosis Procedure". >> INSPECTION END NO D Diagnosis Procedure INFOID:000000010596758 Ε 1. CHECK GROUND CONNECTION 1. Turn ignition switch OFF. 2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". Is the inspection result normal? >> GO TO 2. YES NO >> Repair or replace ground connection. 2.CHECK HO2S2 POWER SUPPLY CIRCUIT Disconnect heated oxygen sensor 2 (HO2S2) harness connector. 1. Н 2. Turn ignition switch ON. 3. Check the voltage between HO2S2 harness connector and ground. HO2S2 DTC Ground Voltage Bank Connector Terminal P0037, P0038 1 F122 2 Ground Battery voltage P0057, P0058 2 F121 2 Is the inspection result normal? YES >> GO TO 4. Κ NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. Harness connectors E13, F40 IPDM E/R harness connector E7 15 A fuse (No. 46) M Harness for open or short between heated oxygen sensor 2 and fuse Ν >> Repair open circuit, short to ground or short to power in harness or connectors. ${f 4}$. 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. Ρ

| DTC | HO2S2 | | ECM | | Continuity | |
|--------------|-------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0037, P0038 | 1 | F122 | 3 | F101 | 17 | Existed |
| P0057, P0058 | 2 | F121 | 3 | 1 101 | 33 | LAISteu |

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 DIAGNOSIS >

YES >> GO TO 5.

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

5.CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-184, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

• Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

• Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK HEATED OXYGEN SENSOR 2 HEATER

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 2 harness connector.

3. Check resistance between HO2S2 terminals as follows.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0075, P0081 IVT CONTROL SOLENOID VALVE

< 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

Possible cause

| 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-185, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

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

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

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

Revision: February 2015

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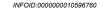
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Coil

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E13, F40

· Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

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

 $\mathbf{3}$.check intake value timing control solenoid value output signal circuit for open and short

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

| DTC | IVT control solenoid valve | | ECM | | Continuity | |
|-------|----------------------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0075 | 1 | F28 | 1 | F101 | 18 | Existed |
| P0081 | 2 | F29 | 1 | 1 101 | 29 | LAISIEU |

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-186, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-51</u>, "<u>Exploded</u> <u>View</u>".

5. CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010596763

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 | $^\infty$ (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-51</u>, "<u>Exploded</u> <u>View</u>".

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

 $\overline{2.\text{check}}$ intake valve timing control solenoid valve-ii

- 1. Remove intake valve timing control solenoid valve. Refer to EM-51, "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 accords or more

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-51, "Exploded</u> <u>View"</u>.



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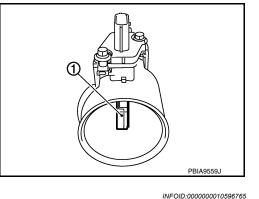
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P0101, P010B MAF SENSOR

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.



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. | 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) | A low voltage from the sensor is sent to ECM under heavy load driving condition. | Harness or connectors (The sensor circuit is open or shorted.) Mass air flow sensor (bank 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.
- 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-188

| 1.cHECK INTAKE SYSTEM Check the following items to see the installation condition and the connection condition of the joint. Air dud 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 Mass air flow sensor P0101 1 F31 90108 2 F42 90108 | • | IRCUIT | | SIS > | | 010B M | | | | | [VQ37VHR] |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------|---------|------------|---------------|------------------------|
| YES >> Proceed to EC-189. "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 dud 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. Image: 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 Lose 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. | | >> Proc | ceed to EC- | | <u>inosis Prc</u> | ocedure". | | | | | |
| 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. Voltage DTC | Diagno | sis Pr | ocedure | | | | | | | | INFOID:000000010596766 |
| Air dud 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 OFF. 2. More and the result normal? | 1.снес | K INTA | KE SYSTE | M | | | | | | | |
| 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. Image: transport of the voltage between mass air flow sensor harness connector and ground. Image: transport of the voltage between mass air flow sensor harness connector and ground. Image: transport of the voltage between mass air flow sensor harness connector and ground. Image: transport of the voltage between mass air flow sensor harness connector and ground. Image: transport of the voltage between mass air flow sensor harness connector and ground. Image: transport of the voltage between mass air flow sensor and ECM 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. A.CHECK MASS AIR FLOW SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. <td>Air ducVacuur</td> <td>:t n hoses</td> <td>;</td> <td></td> <td></td> <td></td> <td></td> <td>e conne</td> <td>ction cond</td> <td>dition of the</td> <td>e joint.</td> | Air ducVacuur | :t n hoses | ; | | | | | e conne | ction cond | dition of the | e joint. |
| 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. Voltage DTC | | | | nal? | | | | | | | |
| 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. The sensor of the voltage between mass air flow sensor harness connector and ground. The sensor of the voltage between mass air flow sensor harness connector and ground. The sensor of the voltage between mass air flow sensor harness connector and ground. The sensor of the voltage between mass air flow sensor harness connector and ground. The sensor of the voltage between mass air flow sensor harness connector and ground. The sensor of the voltage between mass air flow sensor harness connector and ground. The sense of the voltage between mass air flow sensor and ECM Poiloi 1 F31 5 Ground 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 | | | | eplace erre | or-detecte | d parts. | | | | | |
| Disconnect mass air flow sensor harness connector. Turn ignition switch ON. Check the voltage between mass air flow sensor harness connector and ground. Interval 1 Inte | - | | | | | • | Y CIRC | UIT | | | |
| DTC Mass air flow sensor - Voltage P0101 1 F31 5 Ground Battery voltage P0108 2 F42 5 Ground 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. | 2. Turn | ignition | switch ON | l. | | | ness col | nnector | r and grou | nd. | |
| Bank Connector Terminal P0101 1 F31 5 Ground Battery voltage P0108 2 F42 5 Ground 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. | | | + | | | | | | | | |
| P0101 1 F31 5 Ground 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. | DTC | 1 | Mass air flow s | sensor | | Voltag | e | | | | |
| P010B 2 F42 5 Ground 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. | | - | | Terminal | | | | | | | |
| 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. | | - | - | - 5 | Ground | Battery vo | oltage | | | | |
| >> 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. | | e follow ss for op | ring. en or short en or short | between | mass air f mass air f | low senso | r and IP | | R | | |
| CHECK MASS AIR FLOW SENSOR GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect ECM harness connector. | Harnes Harnes | | | for each o | onnector | | | | | | |
| Turn ignition switch OFF. Disconnect ECM harness connector. | Harnes Harnes | | connection | | | and harne | ess | | | | |
| 2. Disconnect ECM harness connector. | Harnes Harnes Loose | or poor | | | | | SS | | | | |
| 3. Check the continuity between mass air flow sensor harness connector and ECM harness connector. | Harnes Harnes Loose | or poor >> Rep | air or repla | ce error-de | etected pa | ırts. | | | N AND SH | ORT | |
| Mass air flow sensor ECM | Harnes Harnes Loose 4.CHEC | or poor >> Rep CK MAS ignition onnect I | air or replao S AIR FLO switch OF ECM harne | ce error-de W SENSC F. ss connec | etected pa DR GROU | nts. ND CIRCI | JIT FOF | | | | s connector. |
| Bank Connector Terminal Connector Terminal | Harnes Harnes Loose 4.CHEC 1. Turn 2. Disc 3. Che | or poor >> Rep CK MAS ignition onnect I ck the c | air or replace S AIR FLO Switch OF ECM harne ontinuity be | ce error-de W SENSC F. ss connec etween ma | etected pa DR GROU tor. ss air flow | nts. ND CIRCI v sensor h | JIT FOF arness (| connect | | | s connector. |
| F102 Existed | Harnes Harnes Loose 4.CHEC | or poor >> Rep CK MAS ignition onnect I ck the co | air or replace S AIR FLO Switch OF ECM harne ontinuity be ass air flow se Connector | ce error-de W SENSC F. ess connec etween ma | etected pa DR GROU tor. ss air flow EC | nts. ND CIRCU v sensor h | JIT FOF | connect | | | s connector. |
| | Harnes Harnes Loose 4.CHEC 1. Turn 2. Disc 3. Chec DTC P0101 | or poor >> Rep CK MAS ignition onnect I ck the co Ma Bank 1 | air or replace S AIR FLO I switch OF ECM harne ontinuity be ass air flow se Connector F31 | ce error-de W SENSC F. ess connec etween ma ensor Terminal 4 | etected pa DR GROU tor. ss air flow EC Connector | nts. ND CIRCU v sensor h M Terminal 68 | JIT FOF arness (Continui | connect | | | s connector. |
| Also check harness for short to ground and short to power. <u>Is the inspection result normal?</u> YES >> GO TO 5. NO >> Repair or replace error-detected parts. 5.CHECK MASS AIR FLOW SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT | Harnes Harnes Loose 4.CHEC 1. Turn 2. Disc 3. Cher DTC P0101 P010B | or poor >> Rep CK MAS ignition onnect I ck the c Bank 1 2 | air or replace S AIR FLO I switch OF ECM harne ontinuity be ass air flow se Connector F31 F42 | ce error-de W SENSC F. ess connec etween ma ensor Terminal 4 4 | etected pa DR GROU tor. ss air flow EC Connector F102 | nrts. ND CIRCU v sensor h M Terminal 68 94 | JIT FOF arness (Continui Existed | connect | | | s connector. |

< DTC/CIRCUIT DIAGNOSIS >

| DTC | N | lass air flow s | ensor | EC | Continuity | |
|-------|------|-----------------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0101 | 1 | F31 | 3 | F102 | 77 | Existed |
| P010B | 2 | F42 | 3 | 1102 | 79 | |

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace error-detected parts.

6.CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to EC-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27,</u> <u>"Exploded View"</u>.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES-1 (DTC P0101 is detected)>>GO TO 8.

YES-2 (DTC P010B is detected)>>GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u>.

Ö.CHECK MASS AIR FLOW SENSOR (BANK 1)

Check mass air flow sensor (bank 1). Refer to EC-190, "Component Inspection".

Is the inspection result normal?

- YES >> Check intermittent Incident. Refer to GI-45, "Intermittent Incident".
- NO >> Replace mass air flow sensor (bank 1). Refer to EM-27, "Exploded View".

9.CHECK MASS AIR FLOW SENSOR (BANK 2)

Check mass air flow sensor (bank 2). Refer to EC-190, "Component Inspection".

Is the inspection result normal?

- YES >> Check intermittent Incident. Refer to GI-45. "Intermittent Incident".
- NO >> Replace mass air flow sensor (bank 2). Refer to <u>EM-27, "Exploded View"</u>.

Component Inspection

INFOID:000000010596767

1.CHECK MASS AIR FLOW SENSOR-I

With CONSULT

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

| Monitor item | Condition | Indication (V) |
|---------------|------------------------------------------------------------------|---------------------------|
| | 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. Turn ignition switch OFF.

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А

- 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 | |
| 5400 | 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 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| F102 | 79 | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | | | 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* | |

| Is the inspection result normal? | |
|------------------------------------------------------------------------------------------------------|-----|
| YES >> INSPECTION END | Н |
| NO >> GO TO 2. | |
| 2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR | 1 |
| 1. Turn ignition switch OFF. | I |
| 2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following. | |
| - Crushed air ducts | J |
| - Malfunctioning seal of air cleaner element | 0 |
| - Uneven dirt of air cleaner element | |
| Intake valve deposits Improper specification of intake air system parts | К |
| Is the inspection result normal? | |
| YES >> GO TO 4. | |
| NO >> GO TO 3. | 1 |
| | L |
| 3.CHECK MASS AIR FLOW SENSOR-II | |
| With CONSULT | M |
| 1. Repair or replace malfunctioning part. | 111 |

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 | F |
| | 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.

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< DTC/CIRCUIT DIAGNOSIS >

| 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 | 04 | 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 4.

4.CHECK MASS AIR FLOW SENSOR-III

()With CONSULT

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

| Monitor item | Condition | Indication (V) |
|---------------|------------------------------------------------------------------|---------------------------|
| | 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. 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.

< 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] | 08 | 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* | - |
| F 102 | | | 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. Refer to EM-27, "Exploded View".

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< 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 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.

PBIA9559J

INFOID:000000010596769

DTC Logic

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

Which DTC is detected?

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

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102 AND P010C

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

Is DTC detected?

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

NO >> INSPECTION END

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

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

2. Check DTC.

EC-194

| | | | | , P0100 | C, P010D M | AF SENSOR | |
|----------------------------------------------------|------------------|--------------------|--------------|----------------|-----------------|---------------------------|------------------------|
| < DTC/CIRCU | | GNOSIS > | | | | | [VQ37VHR] |
| Is DTC detecter YES >> Get | | 105 "Diag | nocio Droc | oduro" | | | Д |
| | 0 TO 4 | <u>-195, "Diag</u> | | <u>equie</u> . | | | |
| 4.PERFORM | DTC C | ONFIRMA | | CEDURE | FOR DTC P01 | 03 AND P010D-II | E0 |
| | | wait at leas | t 5 seconds | 6. | | | |
| 2. Check DT Is DTC detected | | | | | | | |
| | | -195, "Diag | nosis Proce | edure" | | | C |
| | | ION END | | <u>.</u> . | | | |
| Diagnosis F | Proced | dure | | | | | INFOID:000000010596770 |
| 1.INSPECTIO | ON STA | RT | | | | | |
| Confirm the de | etected | DTC. | | | | | E |
| Which DTC is | | | | | | | |
| P0102, P010 P0103, P010 | | | | | | | F |
| 2. CHECK IN ⁻ | | | | | | | |
| Check the follo | | - | n | | | | |
| Air duct | • | | | | | | G |
| Vacuum hosIntake air pa | | otwoon air | duct to inte | ko mani | fold | | |
| Is the inspection | - | | | | ioiu | | H |
| | 0 TO 3 | | | | | | |
| • | | ct the parts. | | | | | |
| 3.CHECK GF | ROUND | CONNECT | FION | | | | |
| 1. Turn igniti | | | | 0 | | | |
| 2. Check gro | | | 95. Relef ic | Ground | Inspection in G | I-48, "Circuit Inspection | <u>l</u> . J |
| | 0 TO 4 | | | | | | |
| NO >> Re | - | replace gro | | | | | K |
| 4.CHECK MA | AF SEN | SOR POW | ER SUPPL | Y CIRCL | ЛТ | | |
| | | | AF) sensor | harness | connector. | | L |
| Turn igniti Check the | | | MAF senso | r harnes | s connector and | around | |
| | | | | | | 9.00.00 | |
| DTC | | MAF sense | or | Ground | Voltage | | \mathbb{N} |
| DIC | Bank | Connector | Terminal | Giouna | voltage | | |
| P0102, P0103 | 1 | F31 | 5 | Ground | Battery voltage | | Ν |
| P010C, P010D | 2 | F42 | 5 | Croana | Battery Voltage | | |
| Is the inspection | | | | | | | C |
| | O TO 6 O TO 5 | | | | | | |
| 5.DETECT M | | | PART | | | | _ |
| Check the follo | | | - | | | | P |
| Harness con | inectors | | - | | | | |
| Harness con | inectors | s M116, F10 |)3 | | | | |

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.

< DTC/CIRCUIT DIAGNOSIS >

6. Check maf sensor ground circuit for open and short

1. Turn ignition switch OFF.

- Disconnect ECM harness connector. 2.
- 3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| DTC | | MAF sense | or | EC | Continuity | |
|--------------|------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0102, P0103 | 1 | F31 | 4 | F102 | 68 | Existed |
| P010C, P010D | 2 | F42 | 4 | 1102 | 94 | LAISIEU |

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

Is the inspection result normal?

YES >> GO TO 7.

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

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

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

| DTC | | MAF sensor | | ECM | | Continuity |
|--------------|------|------------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0102, P0103 | 1 | F31 | 3 | F102 | 77 | Existed |
| P010C, P010D | 2 | F42 | 3 | F IUZ | 79 | Existed |

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

Is the inspection result normal?

YES >> GO TO 8.

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

Ö.CHECK MASS AIR FLOW SENSOR

Refer to EC-196, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK MASS AIR FLOW SENSOR-I

With CONSULT 1. Turn ignition sv

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

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

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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.
- 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 [MAF sensor (bank 1) signal] | [MAF sensor (bank 1) 68 2 500 rmm (Engine is wormed up to permet | 0.7 - 1.2 | |
| | | | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |
| F 102 | | | 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 |
| | | 2 E00 rpm (Engine is wormed up to normal | 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 | |
| Turn ignition switch OFF. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following. Crushed air ducts | J |
| Malfunctioning seal of air cleaner element Uneven dirt of air cleaner element Intake valve deposits | Κ |
| - Improper specification of intake air system parts | L |
| Is the inspection result normal? | |
| YES >> GO TO 4. NO >> GO TO 3. | M |
| 3. CHECK MASS AIR FLOW SENSOR-II | IVI |
| With CONSULT Repair or replace malfunctioning part. Start engine and warm it up to normal operating temperature. Operating temperature. | Ν |
| Connect CONSULT and select "DATA MONITOR" mode. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication. | 0 |

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

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

Without CONSULT

1. Repair or replace malfunctioning part.

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

| | ECM | | | |
|-----------------------------------------|---------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|---------------------------|
| 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] F102 | signal] 2,500 rpm (Engine is | 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. | |
| F IUZ | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 79 | | Idle (Engine is warmed-up to normal operat- ing temperature.) | 0.7 - 1.2 |
| [MAF Serisor (bar signal] | [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 4.

4. CHECK MASS AIR FLOW SENSOR-III

(B) With CONSULT

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

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

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

Without CONSULT

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| ECM | | | | - | |
|-----------|-------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|---------------------------|-----|
| Connector | + | _ | Condition | Voltage (V) | _ |
| CONNECIO | Terminal | Terminal Terminal | | | . F |
| | | | 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] 2,500 rpm (Engine is warmed-up to norma | 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) 94 | 0.7 - 1.2 | - | | |
| | | signal] 2,500 rpm (Engine is warmed-up to normal | | 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".

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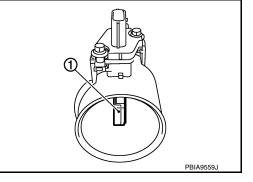
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P0111 IAT SENSOR

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.

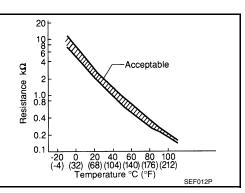
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<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).



INFOID:000000010596777

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| P0111 | IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/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 |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-201, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-201, "Diagnosis Procedure".

P0111 IAT SENSOR

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 3. PRECONDITIONING | |
| dure before conducting the next test. 1. Turn ignition switch OFF and wait at least 10 set 2. Turn ignition switch ON. 3. Turn ignition switch OFF and wait at least 10 set TESTING CONDITION: Before performing the following procedure, de Before performing the following procedure, ch | econds. |
| >> GO TO 4. | D |
| 4.PERFORM DTC CONFIRMATION PROCEDUR | E |
| Start engine and let it idle for 60 minutes. Move the vehicle to a cool place. NOTE: | E |
| - | air temperature between -10° C (14°F) and 35°C (95°F). F for 12 hours. |
| Never turn ignition switch ON during soakir NOTE: | |
| The vehicle must be cooled with the hood oper 4. Start engine and let it idle for 5 minutes or more CAUTION: | e. H |
| Never turn ignition switch OFF during idling5. Check 1st trip DTC. | j. |
| <u>Is 1st trip DTC detected?</u> YES >> Proceed to <u>EC-201, "Diagnosis Proced</u> | lure". |
| NO >> INSPECTION END | |
| Component Function Check | U INFOID:000000010596778 |
| 1. CHECK INTAKE AIR TEMPERATURE (IAT) SEI | NSOR K |
| Turn ignition switch OFF. Disconnect mass air flow sensor (bank 1) harne | ess connector. |
| 3. Check resistance between mass air flow senso | r (bank 1) terminals as follows. |
| Terminals Condition | Resistance (kΩ) |
| 1 and 2 Temperature [°C (°F)] 25 (77) | 1.800 – 2.200 M |
| Is the inspection result normal? YES >> GO TO 2. NO >> Proceed to EC-201, "Diagnosis Proced 2.CHECK INTERMITTENT INCIDENT | lure". N |
| Check intermittent incident. Refer to GI-45, "Intermi | ittent Incident". |
| <u>Is the inspection result normal?</u> YES >> INSPECTION END | |
| NO >> Proceed to <u>EC-201, "Diagnosis Proced</u> | lure". |
| Diagnosis Procedure | INFOID:000000010596779 |
| 1. CHECK INTAKE AIR TEMPERATURE (IAT) SEI | NSOR |
| Check intake air temperature sensor. Refer to EC-2 | 202. "Component Inspection". |
| <u>Is the inspection result normal?</u> YES >> GO TO 2. | |

P0111 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27.</u> <u>"Exploded View"</u>.

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45. "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

- 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 >> INSPECTION END

^{1.} Turn ignition switch OFF.

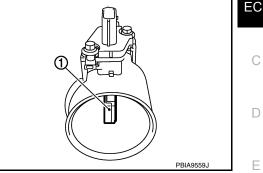
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27.</u> <u>"Exploded View"</u>.

P0112, P0113 IAT SENSOR

Description

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

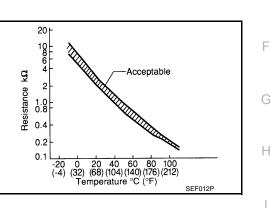
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<Reference data>

| Intake air temperature [°C (°F)] | Voltage* (V) | Resistance (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:000000010596782

DTC Logic

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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

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

Is 1st trip DTC detected?

- >> Go to EC-204, "Diagnosis Procedure". YES
- >> INSPECTION END NO

INFOID:000000010596781

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P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

INFOID:000000010596783

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor (intake air temperature sensor is built-into) harness connector.

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

| MAF sensor (bank 1) | | Ground | Voltage (V) | |
|---------------------|----------|--------|-------------|--|
| Connector | Terminal | Ground | 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.

 ${\it 3.}$ 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-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27</u>, <u>"Exploded View"</u>.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK INTAKE AIR TEMPERATURE SENSOR

- 2. Disconnect mass air flow sensor (bank 1) harness connector.
- 3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | IIT DIAGNOSIS > | | | | [VQ37VHR] |
|---------------|------------------------------------------------|-----------|--------------------|----------------|--------------------------------|
| Terminals | Condition | | Resistance (kΩ) | | |
| 1 and 2 | Temperature [°C (°F)] | 25 (77) | 1.800 - 2.200 | | |
| he inspectio | on result normal? | | | | |
| ES >> IN | SPECTION END | , | | | |
| 0 >> Re "F | eplace mass air flow <u>xploded View"</u> . | sensor (v | with intake air te | mperature sens | sor) (bank 1). Refer to EM-27, |
| | <u></u> . | | | | |
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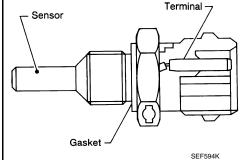
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P0116 ECT SENSOR

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.



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<Reference data>

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

Cy 2 1.0 0.8 0.4 0.2 0.1 -20 0 20 (-4) (32) (68) (104) (140) (176) (212) Temperature °C (°F) SEED12P

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

INFOID:000000010596786

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-209, "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 EC-207, "Component Function Check".

NOTE:

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

Is the inspection result normal?

Revision: February 2015

P0116 ECT SENSOR

| [VQ37 | VNKJ |
|-------|------|

| DTC/CIRCUIT DIAGNOSIS > | | | [VQ37VHR] |
|---------------------------------------------------------------------------------------|-----------------------|--------------------------------|---------------------------------------------------------------|
| YES >> INSPECTION END | ie energie Dre | e e du une ll | |
| NO >> Proceed to <u>EC-208, "E</u> PRECONDITIONING | lagnosis Pro | <u>cedure"</u> . | |
| | | | |
| DTC Confirmation Procedure h before conducting the next test. | as been pre | viously conducted, a | always perform the following procedure |
| . Turn ignition switch OFF and w | ait at least 1 | 0 seconds. | |
| Turn ignition switch ON. Turn ignition switch OFF and v | nit at loast 1 | 0 cocondo | |
| EST CONDITION: | | o seconos. | |
| Before performing the followin Before performing the followin | | | el is between 1/4 and 4/4 |
| | | | y voltage is 11 V or more at idle. |
| >> GO TO 4. | | | |
| PERFORM DTC CONFIRMATIO | ON PROCED | URE | |
| . Start engine and let it idle for 6 | | | |
| Move the vehicle to a cool plac NOTE: | e. | | |
| Cool the vehicle in an environr | | | etween –10°C (14°F) and 35°C (95°F). |
| Turn ignition switch OFF and s CAUTION: | oak the vehic | cle for 12 hours. | |
| Never turn ignition switch O | N during soa | aking. | |
| NOTE: The vehicle must be cooled wi | h the hood o | non | |
| . Start engine and let it idle for 5 | | | |
| CAUTION: | المتربية محتمد | line | |
| Never turn ignition switch O . Check 1st trip DTC. | -F auring la | ling. | |
| s 1st trip DTC detected? | | | |
| YES >> Proceed to <u>EC-208, "D</u> | <u>iagnosis Pro</u> | <u>cedure"</u> . | |
| NO >> INSPECTION END | | | |
| component Function Chec | K | | INFOID:000000010596787 |
| .CHECK ENGINE COOLANT TE | MPERATUR | E (ECT) SENSOR | |
| . Turn ignition switch OFF. | | | |
| Disconnect ECT sensor harnes Remove ECT sensor. Refer to | | | |
| . Check resistance between E | | | |
| with hot water as shown in the | figure. | | |
| Torminala | | Posistance (kO) | •a ≤ 5 L <u>U = 1</u> J < ² |
| Terminals Condition | 20 (68) | Resistance (kΩ) 2.37 - 2.63 | |
| 1 and 2 Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 | |
| | 90 (122) | 0.236 - 0.260 | |
| the inspection result normal? | 00(104) | 0.200 - 0.200 | |
| YES >> GO TO 2. | | | |
| NO >> Proceed to <u>EC-208, "E</u> | iagnosis Pro | <u>cedure"</u> . | JMBIA0080ZZ |
| CHECK INTERMITTENT INCID | ENT | | |
| heck intermittent incident. Refer t | o <u>GI-45, "Inte</u> | ermittent Incident". | |
| the inspection result normal? | | | |

YES >> INSPECTION END

NO >> Proceed to <u>EC-208, "Diagnosis Procedure"</u>.

P0116 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to EC-208, "Component Inspection".

Is the inspection result normal?

OK >> GO TO 2.

NG >> Replace ECT sensor. Refer to CO-24, "Exploded View".

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

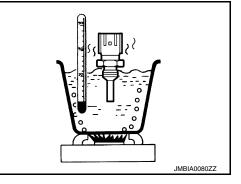
>> INSPECTION END

Component Inspection

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- Remove engine coolant temperature sensor. Refer to <u>CO-24</u>, "Exploded View".
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

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



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

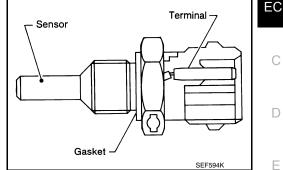
[VQ37VHR]

INFOID:000000010596788

P0117, P0118 ECT SENSOR

Description

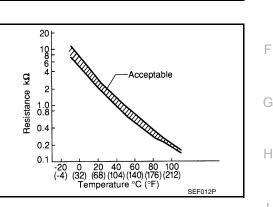
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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 | 2.37 - 2.63 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

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



DTC Logic

INFOID:000000010596791

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DTC DETECTION LOGIC

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause | K |
|---------|----------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------|---|
| 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.) | I |
| 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 procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-210, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596792

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

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

| ECT s | sensor | Ground | Voltage (V) | |
|-----------|----------|--------|-------------|--|
| Connector | Terminal | Ground | voltage (v) | |
| F17 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 4. NO

>> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F109, F110

Harness for open or short between engine coolant temperature sensor and ECM

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

4.CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between ECT sensor harness connector and ECM harness connector.

| ECT s | ensor | EC | CM | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F17 | 2 | F102 | 84 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-211, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

O.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Component Inspection

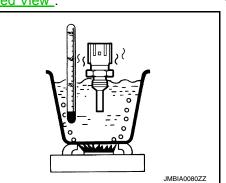
$1. {\sf CHECK} \ {\sf ENGINE} \ {\sf COOLANT} \ {\sf TEMPERATURE} \ {\sf SENSOR}$

- 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>.
- 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) | 2.37 - 2.63 |
| 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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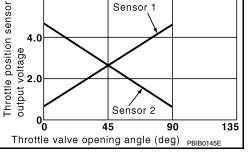
< DTC/CIRCUIT DIAGNOSIS >

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.



Throttle position sensor

Sensor 1

6.0

4.0

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-378, "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 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?

- >> Go to EC-213, "Diagnosis Procedure". YES
- NO >> INSPECTION END

INFOID:000000010596794

IVQ37VHR1

| DTC/CIRCU | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------|------------------------------------------------------|
| iagnosis F | roce | aure | | | | | | INFOID:000000010596796 |
| .CHECK GF | ROUNE | | TION | | | | | |
| . Turn igniti | | | | _ | | | | |
| - | | | 195. Refe | r to Ground | l Inspectio | on in <u>GI-48</u> | <u>, "Circuit Inspe</u> | ection". |
| <u>s the inspection</u> YES >> G | on resu O TO 2 | | | | | | | |
| | | ∠. r replace gr | round cor | nection. | | | | |
| 2.CHECK TH | • | • | | | VER SUP | PLY CIRC | UIT | |
| | | ric throttle o | | | | | | |
| 2. Turn igniti | | | | | | | | |
| 3. Check the | voltag | je between | electric ti | nrottle cont | rol actuat | or harness | connector and | ground. |
| | Flect | ric throttle cor | ntrol actuato | r | | | | |
| DTC | Bank | Connector | Termina | Ground | Voltage (| V) | | |
| P0122, P0123 | 1 | F6 | 6 | | | | | |
| P0227, P0228 | 2 | F27 | 1 | Ground | Approx. | 5 | | |
| s the inspection | on resu | ult normal? | | | | | | |
| | | | | | | | | |
| YES >> G | о то з | 3. | | | | | | |
| | | | short to g | ground or s | hort to po | wer in harr | ness or connec | ctors. |
| NO >> Ro CHECK TH . Turn igniti . Disconnec . Check the | epair o IROTT on swit | pen circuit, LE POSITI tch OFF. I harness co | ON SENS | SOR 2 GRO | | RCUIT FOF | R OPEN AND | SHORT |
| NO >> Ro B.CHECK TH I. Turn igniti 2. Disconnec | epair o IROTT on swit ct ECM contir | pen circuit, LE POSITI tch OFF. I harness co nuity betwee | ON SENS | SOR 2 GRC | DUND CIF | RCUIT FOF | R OPEN AND | |
| NO >> Ro CHECK TH . Turn igniti . Disconnec . Check the | epair o IROTT on swit ct ECM contir | pen circuit, LE POSITI tch OFF. I harness co | ON SENS | SOR 2 GRO | DUND CIF | RCUIT FOF | R OPEN AND | SHORT |
| NO >> Re CHECK TH . Turn igniti . Disconned . Check the nector. | epair o IROTT on swif ct ECM contir Electric | pen circuit, LE POSITIO tch OFF. I harness co nuity betwee c throttle contr | ON SENS | SOR 2 GRC c throttle co EC Connector | DUND CIF | CUIT FOF | R OPEN AND | SHORT |
| NO >> Re CHECK TH . Turn igniti . Disconned . Check the nector. DTC | epair o IROTT on swit ct ECM e contir Electric Bank | pen circuit, LE POSITIO tch OFF. I harness co nuity betwee c throttle contr Connector | ON SENS onnector. en electric | SOR 2 GRC | DUND CIF | RCUIT FOF | R OPEN AND | SHORT |
| NO >> Re B.CHECK TH Disconner Check the nector. DTC P0122, P0123 P0227, P0228 | epair o IROTT on swit t ECM contir Electric Bank 1 2 | pen circuit, LE POSITIO tch OFF. I harness con nuity betwee c throttle contr Connector F6 F27 | ON SENS onnector. en electric rol actuator Terminal 3 4 | SOR 2 GRC c throttle co EC Connector F101 | DUND CIF Dontrol actu M Terminal 40 48 | CUIT FOF | R OPEN AND | SHORT |
| NO >> Re CHECK TH . Turn igniti . Disconner . Check the nector. DTC P0122, P0123 P0227, P0228 . Also check | epair o IROTT on swit ct ECM e contir Electric Bank 1 2 k harne | pen circuit, LE POSITIO tch OFF. I harness con nuity between c throttle contro Connector F6 F27 ess for shor | ON SENS onnector. en electric rol actuator Terminal 3 4 | SOR 2 GRC c throttle co EC Connector F101 | DUND CIF Dontrol actu M Terminal 40 48 | CUIT FOF | R OPEN AND | SHORT |
| NO >> Re CHECK TH Disconner Check the nector. DTC P0122, P0123 P0227, P0228 Also check s the inspection YES >> G | epair o IROTT on swit t ECM contir Electric Bank 1 2 k harne on resu | pen circuit, LE POSITIO tch OFF. I harness con nuity betwee c throttle contr Connector F6 F27 ess for shor ult normal? | ON SENS onnector. en electric rol actuator Terminal 3 4 t to grour | SOR 2 GRC c throttle co Connector F101 nd and sho | DUND CIF Dontrol actu M Terminal 40 48 rt to powe | CONTINUITY | R OPEN AND | SHORT and ECM harness con- |
| NO >> Re CHECK TH Disconner Disconner Check the nector. DTC P0122, P0123 P0227, P0228 Also check Sthe inspection YES >> G NO >> Re | epair o IROTT on swit ct ECM e contir Electric Bank 1 2 k harne on resu on resu 0 TO 4 epair o | pen circuit, LE POSITIO tch OFF. I harness con huity between c throttle contro Connector F6 F27 ess for shor <u>ult normal?</u> 4. pen circuit, | ON SENS onnector. en electric rol actuator Terminal 3 4 t to grour short to g | SOR 2 GRC c throttle co EC Connector F101 nd and show | DUND CIF Dontrol actu M Terminal 40 48 rt to powe hort to po | CUIT FOF | R OPEN AND | SHORT and ECM harness con- |
| NO >> Re CHECK TH Disconner Disconner Check the nector. DTC P0122, P0123 P0227, P0228 Also check Sthe inspection YES >> G NO >> Re | epair o IROTT on swit ct ECM e contir Electric Bank 1 2 k harne on resu on resu 0 TO 4 epair o | pen circuit, LE POSITIO tch OFF. I harness con huity between c throttle contro Connector F6 F27 ess for shor <u>ult normal?</u> 4. pen circuit, | ON SENS onnector. en electric rol actuator Terminal 3 4 t to grour short to g | SOR 2 GRC c throttle co EC Connector F101 nd and show | DUND CIF Dontrol actu M Terminal 40 48 rt to powe hort to po | CUIT FOF | R OPEN AND | SHORT and ECM harness con- |
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| NO >> Re 3. CHECK TH 1. Turn igniti 2. Disconned 3. Check the nector. DTC P0122, P0123 P0227, P0228 4. Also chect S the inspection YES >> G NO >> Re 4. CHECK TH 1. Check the nector. DTC P0122, P0123 | epair o IROTT on swift t ECM contin Electric Bank 1 2 k harne on resu O TO 4 epair o IROTT contin Electric Bank 1 1 | pen circuit, LE POSITIO tch OFF. I harness con nuity betwee c throttle contr Connector F6 F27 ess for shor alt normal? 4. pen circuit, LE POSITIO nuity betwee c throttle contr Connector F6 | ON SENS onnector. en electric rol actuator Terminal 3 4 t to grour short to g ON SENS en electric rol actuator Terminal 5 | SOR 2 GRC c throttle co Connector F101 nd and show ground or s SOR 2 INPU c throttle co EC | DUND CIF Control actu M Terminal 40 48 rt to powe hort to powe UT SIGNA control actu | RCUIT FOF | R OPEN AND ess connector hess or connector T FOR OPEN | SHORT and ECM harness con- ctors. AND SHORT |
| NO >> Re 3. CHECK TH 1. Turn igniti 2. Disconner 3. Check the nector. DTC P0122, P0123 P0227, P0228 4. Also chect s the inspection YES >> G NO >> Re 4. CHECK TH 1. Check the nector. DTC P0122, P0123 P0227, P0228 | epair o IROTT on switt ct ECM e contir Electric Bank 1 2 k harne on resu on resu on ro 4 epair o IROTT e contir Electric Bank 1 2 contir | pen circuit, LE POSITIO tch OFF. I harness con huity betwee c throttle contro F6 F27 ess for shor <u>alt normal?</u> 4. pen circuit, LE POSITIO huity betwee c throttle contro Connector F6 F27 | ON SENS onnector. en electric rol actuator Terminal 3 4 t to grour short to g ON SENS en electric rol actuator Terminal 5 3 | SOR 2 GRC C throttle co Connector F101 and and sho ground or s SOR 2 INPL c throttle co Connector F101 | DUND CIF Dontrol actu M Terminal 40 48 rt to powe hort to po UT SIGNA Dontrol actu M Terminal 34 35 | RCUIT FOF | R OPEN AND ess connector hess or connector T FOR OPEN | SHORT and ECM harness con- ctors. AND SHORT |
| NO >> Re 3. CHECK TH 1. Turn igniti 2. Disconner 3. Check the nector. DTC P0122, P0123 P0227, P0228 4. Also chect s the inspection YES >> G NO >> Re 4. CHECK TH 1. Check the nector. DTC P0122, P0123 P0227, P0228 | epair o IROTT on switt et ECM e contir Electric Bank 1 2 k harne on resu O TO 4 epair o IROTT e contir Electric Bank 1 2 k harne epair o IROTT e contir | pen circuit, LE POSITIO tch OFF. I harness con nuity between c throttle contre F6 F27 ess for shor alt normal? 4. pen circuit, LE POSITIO nuity between c throttle contre Connector F6 F27 ess for shor | ON SENS onnector. en electric rol actuator Terminal 3 4 t to grour short to g ON SENS en electric rol actuator Terminal 5 3 | SOR 2 GRC C throttle co Connector F101 and and sho ground or s SOR 2 INPL c throttle co Connector F101 | DUND CIF Dontrol actu M Terminal 40 48 rt to powe hort to po UT SIGNA Dontrol actu M Terminal 34 35 | RCUIT FOF | R OPEN AND ess connector hess or connector T FOR OPEN | SHORT and ECM harness con- ctors. AND SHORT |

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-214, "Component Inspection".

< 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, "Removal and Installation".
- 2. Go to EC-214, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010596797

1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".
- 4. Turn ignition switch ON.
- 5. Set selector lever to D position.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | | |
|-----------|----------------------------|----------|-------------------|-----------------|----------------|--|
| Connector | + | - | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| | 30 ITP sensor 1 (bank 1)] | 40 | | Fully released | More than 0.36 | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | 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 | |
| FIUI | 34 [TP sensor 2 (bank 1)] | 40 | | Fully released | Less than 4.75 | |
| | 54 [TF Sensor 2 (ballk T)] | 40 | | Fully depressed | More than 0.36 | |
| | 35 [TP sensor 2 (bank 2)] | 48 | | Fully released | Less than 4.75 | |
| | JUDIN Z (DUN Z) | | | Fully depressed | More than 0.36 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".

2. Go to EC-214, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

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< DTC/CIRCUIT DIAGNOSIS >

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

>> END

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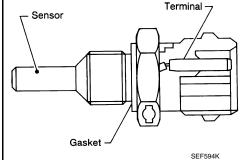
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P0125 ECT SENSOR

Description

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



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<Reference data>

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

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

DTC Logic

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-209, "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 |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

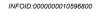
- 1. Turn ignition switch ON.
- 2. Select "DATA MONITOR" mode with CONSULT.
- 3. Check that "COOLAN TEMP/S" is above -10°C (14°F).
- Is the temperature above -10°C (14°F)?

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EC-216

2015 QX50

[VQ37VHR]



| P0125 | ECT | SENSOR |
|-------|-----|--------|
|-------|-----|--------|

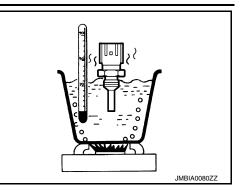
| < DTC/ | CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| YES NO | >> INSPECTION END >> GO TO 3. | |
| 3.per | FORM DTC CONFIRMATION PROCEDURE | |
| lf " the | rt engine and run it for 65 minutes at idle speed. COOLAN TEMP/S" increases to more than -10°C (14°F) within 65 minutes, stop o test result will be OK. UTION: | engine because |
| Ве | careful not to overheat engine. eck 1st trip DTC. | |
| <u>s 1st tr</u> | p DTC detected? | |
| YES NO | >> <u>EC-217, "Diagnosis Procedure"</u> >> INSPECTION END | |
| Diagn | osis Procedure | INFOID:000000010596801 |
| 1.сне | CK GROUND CONNECTION | |
| 2. Ch | n ignition switch OFF. eck ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u> . <u>spection result normal?</u> | |
| YES NO | >> GO TO 2. >> Repair or replace ground connection. | |
| 2.сне | CK ENGINE COOLANT TEMPERATURE SENSOR | |
| | EC-217. "Component Inspection". | |
| YES | | |
| NO | >> Replace engine coolant temperature sensor. Refer to <u>CO-24. "Exploded View"</u> . | |
| 3. CHE | CK THERMOSTAT OPERATION | |
| coolant | ne engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and co does not flow. | onfirm the engine |
| | spection result normal? | |
| YES NO | >> GO TO 4. >> Repair or replace thermostat. Refer to <u>CO-22, "Removal and Installation".</u> | |
| 4 | CK INTERMITTENT INCIDENT | |
| | GI-45, "Intermittent Incident". | |
| | >> INSPECTION END | |
| Comp | onent Inspection | INFOID:0000000010596802 |
| | CK ENGINE COOLANT TEMPERATURE SENSOR | INFOID.000000010396802 |
| | | |
| | n ignition switch OFF. connect engine coolant temperature sensor harness connector. | |
| | move engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u> . | |

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) | 2.37 - 2.63 |
| 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>.

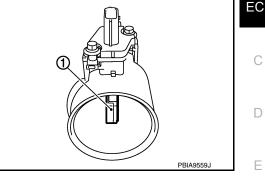
[VQ37VHR]

P0127 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.

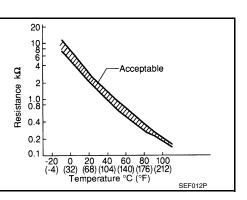
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<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

| 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 | K |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Wait until engine coolant temperature is less than 96°C (205°F)
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.

[VQ37VHR]

P0127 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

NOTE:

Perform the following steps before engine coolant temperature is above 96°C (205°F).

- 2. Turn ignition switch ON.
- 3. Select "DATA MONITOR" mode with CONSULT.
- 4. Start engine.
- 5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds. CAUTION:

Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-220, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-220, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-27.</u> <u>"Exploded View"</u>.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010596806

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 >> 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>.

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

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-288</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 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 20128 | 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 |
| TC CON | FIRMATION PROCE | DURE | |
| OTE: | | . | |
| | el before and during the | following procedure. | |
| .PRECO | NDITIONING-I | | |
| | | nas been previously conducted, alw | ays perform the following procedure |
| | ducting the next test. Inition switch OFE and v | wait at least 10 seconds. | |
| . Turn ig | nition switch ON. | | |
| . Turn ig | nition switch OFF and v | wait at least 10 seconds. | |
| | | | |
| | • GO TO 2. | | |
| .PRECO | NDITIONING-II | | |
| With CO | | | |
| Turn io | nition owitch ON | | |
| | nition switch ON. | | |
| | the following conditions | 3: | |
| . Check | the following conditions | | |
| . Check | the following conditions | -10°C (14°F) or more | |
| Ambient ten | the following conditions | -10°C (14°F) or more OFF | |
| . Check Ambient ten A/C switch Blower fan s | the following conditions | -10°C (14°F) or more OFF OFF | |
| Ambient ten A/C switch Blower fan s | the following conditions | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. | |
| Ambient ten A/C switch Blower fan s | the following conditions | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. | |
| Ambient ten A/C switch Blower fan s Select Check | the following conditions | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. | |
| Check | the following conditions | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. S: | |
| Ambient ten A/C switch Blower fan s Select COOLAN TI the cond YES >> | the following conditions apperature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. S: -10°C - 52°C (14 - 126°F) | |
| . Check Ambient ten A/C switch Blower fan s . Select . Check COOLAN TI s the cond YES >> | the following conditions apperature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. > 1. Satisfy the conditi | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. S: -10°C - 52°C (14 - 126°F) | |
| Ambient ten A/C switch Blower fan s Select COOLAN TI the cond YES >> NO >> | the following conditions perature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. > 1. Satisfy the conditi 2. GO TO 3. | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. 5: -10°C - 52°C (14 - 126°F) on. | |
| Ambient ten A/C switch Blower fan s Select COOLAN TI COOLAN TI the cond YES >> NO >> | the following conditions perature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. > 1. Satisfy the conditi 2. GO TO 3. RM DTC CONFIRMATI | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. 5: -10°C - 52°C (14 - 126°F) on. | |
| . Check Ambient ten A/C switch Blower fan s . Select . Check COOLAN TI s the cond YES >> NO >> .PERFO With CO | the following conditions perature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. > 1. Satisfy the conditi 2. GO TO 3. RM DTC CONFIRMATI NSULT | -10°C (14°F) or more OFF OFF de of "ENGINE" using CONSULT. 5: -10°C - 52°C (14 - 126°F) on. | |
| . Check Ambient ten A/C switch Blower fan s . Select . Check COOLAN TI s the cond YES >> NO >> .PERFO With CO . Start e | the following conditions perature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. > 1. Satisfy the conditi 2. GO TO 3. RM DTC CONFIRMATI NSULT ngine. | $-10^{\circ}C (14^{\circ}F) \text{ or more}$ OFF OFF de of "ENGINE" using CONSULT. $-10^{\circ}C - 52^{\circ}C (14 - 126^{\circ}F)$ on. ON PROCEDURE-I | |
| Ambient ten A/C switch Blower fan s Select COOLAN TI COOLAN TI THE COND YES NO PERFO With CO Start e Drive t | the following conditions perature witch "DATA MONITOR" mod the following conditions EMP/S ition satisfied? > GO TO 3. > 1. Satisfy the conditi 2. GO TO 3. > 1. Satisfy the conditi 1. Satisfy the conditi 2. GO TO 3. RM DTC CONFIRMATI NSULT ngine. he vehicle until the follo | $-10^{\circ}C (14^{\circ}F) \text{ or more}$ OFF OFF de of "ENGINE" using CONSULT. $-10^{\circ}C - 52^{\circ}C (14 - 126^{\circ}F)$ on. ON PROCEDURE-I wing condition is satisfied. | |

"FUEL T/TMP SE" becomes at least 25°C (45°F).

INFOID:000000010596807

А

EC

С

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

| 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".* |

*: Example

| COOLAN TEMP/S | FUEL T/TMP SE |
|---------------|----------------------|
| 70°C (158°F) | 45°C (113°F) or less |
| 65°C (149°F) | 40°C (104°F) or less |
| 60°C (140°F) | 35°C (95°F) or less |

STEP 2

Drive the vehicle at 50 km/h (32 MPH) or more with the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" maintained at 25°C (45°F) or more.

NOTE:

Keep the accelerator pedal as steady as possible during cruising.

STEP 3

Drive the vehicle at 50 km/h (32 MPH) or more until "COOLAN TEMP/S" increases by 6°C (11°F). **NOTE:**

Keep the accelerator pedal as steady as possible during cruising.

Is the condition satisfied?

YES >> GO TO 4. NO >> GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

(P)With CONSULT

1. Drive the vehicle until the following condition is satisfied.

COOLAN TEMP/S

71°C (159°F) or more

CAUTION:

Always drive vehicle at safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-222, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000010596808

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-222, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.

2.CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace thermostat. Refer to <u>CO-22, "Removal and Installation"</u>.

Component Inspection

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.

2. Disconnect engine coolant temperature sensor harness connector.

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

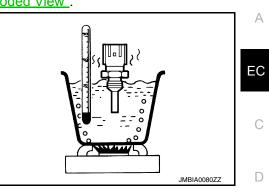
- 3. Remove engine coolant temperature sensor. Refer to CO-24, "Exploded View".
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance (k Ω) |
|-----------|---------------------|----------|--------------------------|
| | | 20 (68) | 2.37 - 2.63 |
| 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]

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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 |
|---------|---------------------------------------------------|----|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 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. | |
| | | 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 (bank 2) circuit | A) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | or shorted.) • A/F sensor 1 |
| | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | |

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.

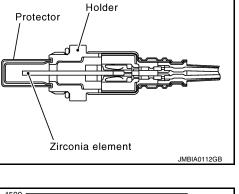
3. Turn ignition switch OFF and wait at least 10 seconds.

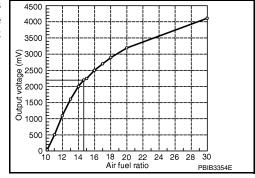
TESTING CONDITION:

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

idle.

INFOID:000000010596810





P0130, P0150 A/F SENSOR 1

| < DTC/CIRCUIT DIAGNO | ISIS > [VQ37VHR] |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.PERFORM DTC CONF | IRMATION PROCEDURE FOR MALFUNCTION A |
| . Start engine and warm | it up to normal operating temperature. |
| Let engine idle for 2 m Check 1st trip DTC. | inutes. |
| s 1st trip DTC detected? | |
| | <u>"Diagnosis Procedure"</u> . |
| NO-1 >> With CONSUL NO-2 >> Without CONS | |
| CHECK AIR FUEL RAT | IO (A/F) SENSOR 1 FUNCTION |
| . Start engine and warm . Select "A/F SEN1 (B1) | it up to normal operating temperature. " or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT. " or "A/F SEN1 (B2)" indication. |
| YES >> GO TO 4. | |
| | "Diagnosis Procedure". |
| 1. PERFORM DTC CONF | IRMATION PROCEDURE FOR MALFUNCTION B-I |
| |) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/I |
| SEN1" in "DTC WORK 2. Touch "START". | SUPPORT" mode with CONSULT. |
| | nditions are met, "TESTING" will be displayed on the CONSULT screen. |
| . When the following co | iditions are met, reorino will be displayed on the concoll sciech. |
| . When the following co | |
| 5 | 1,100 - 3,200 rpm |
| ENG SPEED | |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever | 1,100 - 3,200 rpmMore than 64 km/h (40 mph)1.0 - 8.0 msecD positionisplayed after 20 seconds, retry from step 2. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle <u>s "TESTING" displayed on</u> YES >> GO TO 5. NO >> Check A/F ser | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? usor 1 function again. GO TO 3. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? asor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF Release accelerator pedal | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? asor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF Release accelerator pedal IOTE: | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? asor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F sen D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? usor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. eleasing the accelerator pedal. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Vhich does "TESTING" ch COMPLETED>>GO TO 6 | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? asor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. deasing the accelerator pedal. ange to? i. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F sen D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Vhich does "TESTING" ch COMPLETED>>GO TO 6 OUT OF CONDITION>>F | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. ICONSULT screen? usor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. eleasing the accelerator pedal. ange to? setry DTC CONFIRMATION PROCEDURE. GO TO 4. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F sen D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Vhich does "TESTING" ch COMPLETED>>GO TO 6 OUT OF CONDITION>>F D.PERFORM DTC CONF | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? usor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. eleasing the accelerator pedal. ange to? x. x. Retry DTC CONFIRMATION PROCEDURE. GO TO 4. IRMATION PROCEDURE FOR MALFUNCTION B-III |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Which does "TESTING" ch COMPLETED>>GO TO 6 OUT OF CONDITION>>F D.PERFORM DTC CONF TOUCH "SELF-DIAG RESUL | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? usor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. eleasing the accelerator pedal. ange to? x. x. T. |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Which does "TESTING" ch COMPLETED>>GO TO 6 OUT OF CONDITION>>F D.PERFORM DTC CONF Touch "SELF-DIAG RESULT Which is displayed on CON | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. LCONSULT screen? sor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. eleasing the accelerator pedal. ange to? . . RMATION PROCEDURE FOR MALFUNCTION B-III </td |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser D.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Which does "TESTING" ch COMPLETED>>GO TO 6 OUT OF CONDITION>>F D.PERFORM DTC CONF Touch "SELF-DIAG RESUI Which is displayed on CON OK >> INSPECTION | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. CONSULT screen? isor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. leasing the accelerator pedal. ange to? |
| ENG SPEED VHCL SPEED SE B/FUEL SCHDL Selector lever If "TESTING" is not d CAUTION: Always drive vehicle s "TESTING" displayed on YES >> GO TO 5. NO >> Check A/F ser 5.PERFORM DTC CONF Release accelerator pedal NOTE: Never apply brake when re Which does "TESTING" ch COMPLETED>>GO TO 6 OUT OF CONDITION>>F 0.PERFORM DTC CONF Touch "SELF-DIAG RESUI Which is displayed on CON OK >> INSPECTION NG >> Go to EC-226. | 1,100 - 3,200 rpm More than 64 km/h (40 mph) 1.0 - 8.0 msec D position isplayed after 20 seconds, retry from step 2. at a safe speed. LCONSULT screen? sor 1 function again. GO TO 3. IRMATION PROCEDURE FOR MALFUNCTION B-II fully. eleasing the accelerator pedal. ange to? . . RMATION PROCEDURE FOR MALFUNCTION B-III </td |

1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-226. "Diagnosis Procedure".

Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK

With GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
- 3. Shift the selector lever to D position, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

CAUTION:

Always drive vehicle at a safe speed. NOTE:

Never apply brake when releasing the accelerator pedal.

- 4. Repeat steps 2 and 3 for five times.
- 5. Stop the vehicle and turn ignition switch OFF.
- 6. Turn ignition switch ON.
- 7. Turn ignition switch OFF and wait at least 10 seconds.
- 8. Restart engine.
- 9. Repeat steps 2 and 3 for five times.
- 10. Stop the vehicle and connect GST to the vehicle.
- 11. Check 1st trip DTC.

Is 1st trip DTC detected?

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

Diagnosis Procedure

1. CHECK GROUND CONNECTION

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

EC-226

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

| DTC | A/F sensor 1 | | | Ground | Voltage | |
|-------|--------------|-----------|----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Giouna | voltage | |
| P0130 | 1 | F123 | 4 | Ground | Battery voltage | |
| P0150 | 2 | F124 | 4 | Ground | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7

• Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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[VQ37VHR]

^{• 15} A fuse (No. 46)

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

${f 4}.$ 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 | F123 | 1 | | 57 | |
| 10150 | 0130 1 | 1123 | 2 | F102 | 61 | Existed |
| P0150 | 2 | F124 | 1 | FIUZ | 65 | Existed |
| F 0130 | P0150 2 | | 2 | | 66 | 1 |

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 | k Connector Terminal | | Ground | Continuity | |
| P0130 | 1 | F123 | 1 | | Not existed | |
| F 0130 | I | 1 125 | 2 | Ground | | |
| P0150 | 2 | F124 | 1 | | NOL EXISLED | |
| P0150 | P0150 2 | | 2 | | | |

| DTC | ECM | | | Ground | Continuity |
|-------|------|-------------------------|----|----------|-------------|
| DIC | Bank | Bank Connector Terminal | | Ground | Continuity |
| P0130 | 1 | F102 | 57 | - Ground | Not existed |
| F0130 | | | 61 | | |
| P0150 | 2 | | 65 | | |
| | | | 66 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace.

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 P 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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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 |
|---------|---------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------------|
| 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 |

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.

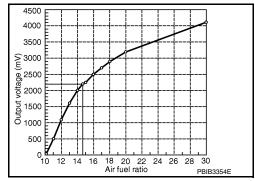
EC-228

>> 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. 0 V?



| DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] VES >> Go to EC-229. "Diagnosis Procedure". NO >> GO TO 3. B-PERFORM DTC CONFIRMATION PROCEDURE | | P0131, P0 | 151 A/F SEN | ISOR 1 | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------|-------------------|--------------------------------------------|---|
| NO >> GO TO 3. PERFORM DTC CONFIRMATION PROCEDURE Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch OFF and wait at least 10 seconds. Restat engine. 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. 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) BrUEL SCHD 1.5 - 90 mse 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. • Check 1st trip DTC. • 1st trip DTC detected? • 1st trip DTC detected? • YES >> Go to EC-222, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure • Check GROUND CONNECTION • Turn ignition switch OFF. • Check AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT • Disconnect A/F sensor 1 harness connector. • Check the voltage between A/F sensor 1 harness connector | < DTC/CIRCUIT DIAGNO | | | | |
| PERFORM DTC CONFIRMATION PROCEDURE Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch OFF and wait at least 10 seconds. Restart engine. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine. Always drive vehicle at a safe speed. 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 Sutable position NOTE: Check for User is not completed within 1 minute after restarting engine at step 4, return to step 1. Check 1st trip DTC. Stattine DTC. Stattine DTC. Check for User Constrained at the organise procedure". NO >> Repair or replace ground connection. CHECK GROUND CONNECTION Check CAR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT Disconnect A/F sensor 1 harness connector. Turn ignition switch ON. Check the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 Check for OT 1. Check the voltage between A/F sensor 1 harness connector and ground. CHECK AR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT Disconnect A/F sensor 1 harness connector. Check the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 Check the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 Check the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the voltage between A/F sensor 1 harness connector and ground. DTC AF sensor 1 CHECK the volta | | "Diagnosis Procedure | <u>e"</u> . | | |
| Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. Restart engine. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine. Always drive vehicle at a safe speed. 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, Check 1st trip DTC. 151thip DTC. Statting DTC detected2 YES >> Go to EC-229. "Diagnosis Procedure" NO >> INSPECTION END Diagnosis Procedure .CHECK GROUND CONNECTION .Turn ignition switch OFF. .Check Ropund connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection". .CHECK AR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT Disconnect A/F sensor 1 harness connector. .CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT D | - | RMATION PROCED | URE | | |
| 1 Umi ignition switch OFF and wait at least 10 seconds. Restart engine. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine. Always drive vehicle at a safe speed. 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) BirFUEL SCHDL 1.5 - 9.0 mec Selector lever Suitable position NOTE: Suitable position NOTE: Suitable position NOTE: Statistip DTC. 1 ft his procedure is not completed within 1 minute after restarting engine at step 4, return to step 1. Check 1st trip DTC. Statistip DTC detected? YES > Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Imm ignition switch OFF. CHECK GROUND CONNECTION Imm ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection". Sthe inspection result normal? YES >> Go TO 2. NO >> Repair or replace ground connection. .CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT Disconnect A/F sensor 1 harness connector and ground. DTC | | | | | ļ |
| Restart engine. 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. 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) Bir/UEL SCHDL 1.5 - 9.0 msec Selector lever Suitable position NOTE: Suitable position • 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, . • Check 1st trip DTC. 115 thip DTC detected? YES >> Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END . Diagnosis Procedure | | |) seconds | | |
| CAUTION: Always drive vehicle at a safe speed. 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) BirUEL 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. Check 1st trip DTC. Stat trip DTC detected? YES >> Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure .vcccccccccccccccccccccccccccccccccccc | 4. Restart engine. | | | | |
| 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) BirFUEL SCHDL 1.5 - 9.0 msec Selector lever Suitable position NOTE: Selector lever • 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. • Check 1st trip DTC. Salist trip DTC detected? YES >> Go to E_C-229 "Diagnosis Procedure". NO >> INSPECTION END Viagnosis Procedure were concomments .CHECK GROUND CONNECTION . . Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". . CHECK AR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . . Disconnect A/F sensor 1 harness connector. . . Turn ignition switch ON. . . Check the voltage between A/F sensor 1 harness connector and ground. . Disconnect A/F sensor 1 harness connector and ground. . DTC Main Connector Terminal Ground Voltage . P0130 1 F123 4 . P0130 1 < | | ehicle to more than 4 | 0 km/h (25 MPH) | within 20 seconds after restarting engine. | |
| 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. . Check 1st trip DTC. 2.1st trip DTC detected? YES > Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure | | | | eende | |
| WHCL 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. • Check 1st trip DTC. 1 stat trip DTC detected? YES > Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure //////////////////////////////////// | Maintain the following c | | o consecutive se | conds. | |
| BF/UEL 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, . Otheck 1st trip DTC. 21st trip DTC detected? YES >> Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure #################################### | ENG SPEED | 1,000 - 3,200 rpm | | | |
| Note: Suitable position NOTE: Suitable position • 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. • Check 1st trip DTC. • Inspection restarting engine at step 4, return to step 1. • Check 1st trip DTC. • Inspection restarting engine at step 4, return to step 1. • Check 1st trip DTC detected? • Inspection restarting engine at step 4, return to step 1. • Or to Convert the step 1. • Inspection restarting engine at step 4, return to step 1. • Check 1st trip DTC detected? • Inspection result for the step 1. • Or the step 1. • Inspection result normal? • CHECK GROUND CONNECTION • Inspection result normal? • Check are ound connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". • the inspection result normal? YES > GO TO 2. NO >> Repair or replace ground connection. • CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT • Disconnect A/F sensor 1 harness connector and ground. • Droc A/F sensor 1 harness connector and ground. • Droc Inspection result normal? • Otios is 1 fi23 d Ground Battery voitage Battery voitage | VHCL SPEED SE | More than 40 km/h (25 r | mph) | | |
| 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, • Check 1st trip DTC. a 1st trip DTC detected? YES >> Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure www.coccccccccccccccccccccccccccccccccc | B/FUEL SCHDL | | | | |
| 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, Check 1st trip DTC. A trip DTC detected? YES >> Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure CHECK GROUND CONNECTION Turn ignition switch OFF. Check stron result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT Disconnect A/F sensor 1 harness connector. Turn ignition switch ON. Check the voltage between A/F sensor 1 harness connector and ground. | Selector lever | Suitable position | | | |
| If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 1. Check 1st trip DTC. Stat trip DTC detected? YES >> Go to EC-229. "Diagnosis Procedure". NO >> INSPECTION END Work-concentration of the step of the s | _ | or pedal as steady as | s possible durin | a cruising. | |
| a 1st trip DTC detected? YES >> Go to EC-229, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure | | | | | |
| a 1st trip DTC detected? YES >> Go to EC-229, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure | 7. Check 1st trip DTC. | | | | |
| NO >> INSPECTION END Diagnosis Procedure .CHECK GROUND CONNECTION . Turn ignition switch OFF. . Check ground connection M95. Refer to Ground Inspection in <u>GI-48</u> , "Circuit Inspection". . The inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. .CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . Disconnect A/F sensor 1 harness connector. . Turn ignition switch ON. . Check the voltage between A/F sensor 1 harness connector and ground. $ \frac{DTC}{\frac{A/F sensor 1}{\frac{Bank}{Connector} \frac{Terminal}{Terminal}} \frac{Ground}{Battery voltage}} $ the inspection result normal? YES >> GO TO 4. | s 1st trip DTC detected? | | | | |
| Diagnosis Procedure | | | <u>e"</u> . | | |
| .CHECK GROUND CONNECTION . Turn ignition switch OFF. . Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". a the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . Disconnect A/F sensor 1 harness connector. . Turn ignition switch ON. . Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Bank Connector Terminal P0130 Ground P0130 1 F123 4 Ground P0150 2 F124 4 Sthe inspection result normal? Yes >> GO TO 4. | | END | | | |
| . Turn ignition switch OFF. . Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". . the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . Disconnect A/F sensor 1 harness connector. . Turn ignition switch ON. . Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Bank Connector Terminal P0130 Ground Voltage Battery voltage P0150 2 F124 4 Sthe inspection result normal? YES >> GO TO 4. | | | | INFOID:000000010596816 | |
| Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u>. The inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT Disconnect A/F sensor 1 harness connector. Turn ignition switch ON. Check the voltage between A/F sensor 1 harness connector and ground. | 1. CHECK GROUND CON | NECTION | | | |
| a the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . Disconnect A/F sensor 1 harness connector. . Turn ignition switch ON. . Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Bank Connector P0130 1 F123 4 P0150 2 F124 4 Ground Battery voltage athe inspection result normal? YES >> GO TO 4. | | | | | |
| YES >> GO TO 2. NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . Disconnect A/F sensor 1 harness connector. . Turn ignition switch ON. . Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Bank Connector Terminal Ground Voltage P0130 1 F123 4 Ground Battery voltage Sthe inspection result normal? YES >> GO TO 4. | • | | ound Inspection i | n <u>GI-48, "Circuit Inspection"</u> . | |
| NO >> Repair or replace ground connection. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT . Disconnect A/F sensor 1 harness connector. . Turn ignition switch ON. . Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Bank Connector Terminal P0130 1 F123 4 Ground P0150 2 F124 4 Sthe inspection result normal? YES >> GO TO 4. | | <u>na:</u> | | | |
| Disconnect A/F sensor 1 harness connector. Turn ignition switch ON. Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Ground Voltage P0130 1 F123 4 Ground Battery voltage P0150 2 F124 4 Ground Battery voltage Sthe inspection result normal? YES >> GO TO 4. | NO >> Repair or replace | • | | | |
| Turn ignition switch ON. Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Ground Voltage Bank Connector Terminal Ground Voltage P0130 1 F123 4 Ground Battery voltage P0150 2 F124 4 Ground Battery voltage Sthe inspection result normal? YES >> GO TO 4. | CHECK AIR FUEL RATI | O (A/F) SENSOR 1 F | POWER SUPPLY | CIRCUIT | |
| . Check the voltage between A/F sensor 1 harness connector and ground. DTC A/F sensor 1 Ground Voltage P0130 1 F123 4 Ground Battery voltage P0150 2 F124 4 Battery voltage Sthe inspection result normal? YES >> GO TO 4. | | | | | |
| DTC Bank Connector Terminal Ground Voltage P0130 1 F123 4 Ground Battery voltage P0150 2 F124 4 Battery voltage Sthe inspection result normal? YES >> GO TO 4. | | | rness connector | and ground. | |
| DTC Bank Connector Terminal Ground Voltage P0130 1 F123 4 Ground Battery voltage P0150 2 F124 4 Battery voltage Sthe inspection result normal? YES >> GO TO 4. | | | | | |
| Bank Connector Terminal P0130 1 F123 4 P0150 2 F124 4 Battery voltage Sthe inspection result normal? YES >> GO TO 4. | DTC | Ground | Voltage | | |
| P0150 2 F124 4 Ground Battery voltage s the inspection result normal? YES >> GO TO 4. | | | | | |
| s the inspection result normal? YES >> GO TO 4. | | Ground | Battery voltage | | |
| YES >> GO TO 4. | | | | | |
| NO >> GO TO 3. | • | | | | |
| | _ | | | | |
| DETECT MALFUNCTIONING PART | 5. DETECT MALFUNCTIO | NING PART | | | |
| | Check the following. | E40 | | | |
| Harness connectors E13, F40 IPDM E/R harness connector E7 | | | | | |
| | 15 A fuse (No. 46) | | 1 and first | | |

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 | F123 | 1 | | 57 | | |
| F0130 | 1 | F 123 | 2 | F102 | 61 | Existed | |
| D0150 | 2 | E124 | 1 | F102 | 65 | Existed | |
| F0150 | P0150 2 | F124 | 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 | | Continuity | |
| P0130 | 1 | F123 | 1 | | Not existed | |
| F0130 | I | F 123 | 2 | Ground | | |
| P0150 | 2 | E104 | 1 | Ground | NUL EXISTED | |
| P0150 | 2 F124 - | | 2 | | | |

| DTC | ECM | | | Ground | Continuity |
|-----------|-----------------------|----------------|----------|----------|-------------|
| DIC | Bank Connector Termin | | Terminal | Ground | Continuity |
| P0130 | 1 | 1 F102 2 | 57 | - Ground | Not existed |
| F 0 1 3 0 | 1 | | 61 | | |
| P0150 | 2 | | 65 | | |
| | | | 66 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

Ó.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

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 | k |
|---------|----------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------|---|
| 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 | 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.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

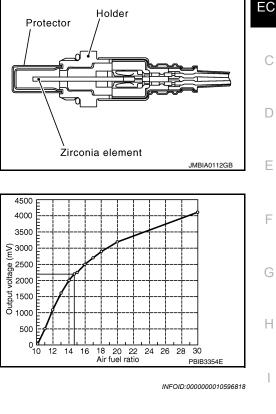
2. CHECK A/F SENSOR FUNCTION

- 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?

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P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

YES >> Go to EC-232, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Restart engine.
- 5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine. CAUTION:

Always drive vehicle at a safe speed.

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

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

NOTE:

• Keep the accelerator pedal as steady as possible during cruising.

• If this procedure is not completed within 1 minute after restarting engine at step 4, return to step

1.

7. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-232, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000010596819

1. CHECK GROUND CONNECTION

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

| DTC | A/F sensor 1 | | | Ground | Voltage | |
|-------|--------------|-----------|----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Ciouna | voltage | |
| P0130 | 1 | F123 | 4 | Ground | Battery voltage | |
| P0150 | 2 | F124 | 4 | Ciouna | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7

15 A fuse (No. 46)

Harness for open or short between A/F sensor 1 and fuse

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 | CM | Continuity |
|---|--------|------|------------|----------|-----------|----------|------------|
| | DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| - | P0130 | 1 | F123 | 1 | | 57 | |
| | F 0130 | 1 | 1 125 | 2 | F102 | 61 | Existed |
| - | P0150 | 2 | F124 | 1 | F IUZ | 65 | Existed |
| | P0150 | 2 | F124 | 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 | Continuity |
| P0130 | 1 | F123 | 1 | | |
| F 0130 | 1 | 1 125 | 2 | Ground | Not existed |
| P0150 | 2 | F124 | 1 | Ground | NUL EXISIEU |
| P0150 | 2 | F124 | 2 | | |

| DTC | | ECM | Ground | Continuity | | |
|--------|------|-----------|----------|------------|-------------|-------------|
| DIC | Bank | Connector | Terminal | Ground | Continuity | |
| P0130 | 1 | | 57 | | | |
| F 0130 | 1 | E400 | 61 | Ground | Not existed | |
| P0150 | 0 | 2 | F102 | 65 | Ground | NOL EXISTED |
| P0150 | 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 <u>GI-45, "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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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.

| 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 |
| P0157 | Heated oxygen sensor 2 (bank 2) circuit low volt- age | reach the specified voltage. | Fuel pressureFuel injectorIntake air leaks |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2. PRECONDITIONING

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

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

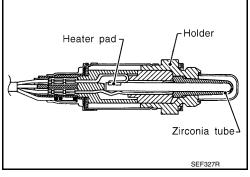
- 2. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds. 3.

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

Revision: February 2015



INFOID:000000010596821

[VQ37VHR]

ΟK NG 0.74V ٥v JMBIA1572GE

< DTC/CIRCUIT DIAGNOSIS >

| | FORM DTO | CONFIF | RMATION | I PROCEDURE | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 1. Turn | | | | ct "DATA MONITOR" mode with CON e normal operating temperature. | ISULT. |
| 3. Turn | n ignition sv | witch OFF | and wai | t at least 10 seconds. | |
| 5. Turn 6. Star | n ignition sy n ignition sy t engine ar engine idle | witch OFF | [:] and wai he engine | t at least 10 seconds. speed between 3,500 and 4,000 rpn | n for at least 1 minute under no load. |
| Mak If no | e sure that | t "COOLA engine a | N TEMP | /S" indicates more than 70°C (158°F next step when "COOLAN TEMP/S" |). indication reaches 70°C (158°F). |
| 10. Sele "DT(| ect "HO2S2 C WORK S | 2 (B1) P1 SUPPORT | r" mode v | DTC P0137) or "HO2S2 (B2) P116 vith CONSULT. | 67" (for DTC P0157) of "HO2S2" in |
| 1. Star NO1 | | nd follow t | the instru | ction of CONSULT display. | |
| | ll take at m ch "SELF-D | | | til "COMPLETED" is displayed. | |
| Vhich is | displayed | on CONS | SULT scre | een? | |
| OK NG CAN N | >> INSPE >> Go to <u>I</u> OT BE DIA | <u> =C-236, "</u> | Diagnosis | <u>s Procedure"</u> . O 4. | |
| I.PERF | FORM DTO | CONFIF | RMATION | I PROCEDURE AGAIN | |
| | | | | | |
| | | | | ve the vehicle in a cool place (soak tl dure again. | ne vehicle). |
| | | confirmati | | | ne vehicle). |
| . Perf | orm DTC o | confirmation 3. | on proced | | ne vehicle). |
| D.PERF | Form DTC C >> GO TC FORM COM | confirmation 0 3. MPONEN | on proced | dure again. | |
| D.PERF Perform IOTE: Jse corr | Sorm DTC c >> GO TC FORM COI componen | confirmation 3. MPONEN It function | on proced T FUNCT check. F | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated | on Check". |
| . Perf Perform OTE: Ise corr heck, a | Form DTC c >> GO TC FORM COI component ponent fur 1st trip DT spection re | Confirmation 3. MPONEN It function Inction che IC might in Sult norm | T FUNCT check. F eck to che not be co <u>al?</u> | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated | on Check". |
| . Perf P.PERF erform OTE: se com heck, a the ins YES | Form DTC c >> GO TC FORM COI Component function fur 1st trip DT spection re >> INSPE | Confirmation 3. MPONEN It function Inction che Inction | T FUNCI check. F eck to che not be co <u>al?</u> ND | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated | on Check". |
| . Perf P.PERF erform OTE: se corr heck, a s the ins YES NO | Form DTC c >> GO TC FORM COI Component function fur 1st trip DT spection re >> INSPE | Confirmation 3. MPONEN at function at fu | T FUNCI check. F eck to che not be co <u>al?</u> ND Diagnosis | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated nfirmed. | on Check". |
| D.PERF Perform IOTE: Jse com heck, a s the ins YES NO | Sorm DTC of Sorm DTC of Component Component fur Office of the spectron reported of the spectron report of the spectron of the spectro of the | Confirmation 3. MPONEN It function Conception Conception CTION E CTION E CTION E CTION E CTION (| T FUNCI check. F eck to che not be co al? ND Diagnosis Check | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated nfirmed. | on Check". oxygen sensor 2 circuit. During this |
| 2. Perf Perform NOTE: Jse com check, a s the ins YES NO COMPC 1.PERF Witho 1. Star 2. Turn 3. Star 4. Let e | FORM CON Some DTC of Some DTC | confirmation o 3. MPONEN it function it function ction che fC might in sult norm CTION E <u>SULT</u> in CTION EN JLT ind warm in witch OFF ind keep the for 1 min | T FUNCT check. F ock to che not be co al? ND Diagnosis Check T FUNCT t up to the and wait he engine jute. | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated nfirmed. <u>s Procedure"</u> . | on Check". oxygen sensor 2 circuit. During this |
| D.PERF Perform NOTE: Jse com theck, a s the ins YES NO COMPC . PERF . PERF . Star . Star . Let e | FORM CON Some DTC of Some DTC | confirmation o 3. MPONEN it function nction cher C might in sult norm CTION E C-236, " NCTION E C-236, | T FUNCT check. F ock to che not be co al? ND Diagnosis Check T FUNCT t up to the and wait he engine jute. | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated nfirmed. <u>S Procedure"</u> . FION CHECK-I e normal operating temperature. t at least 10 seconds. speed between 3,500 and 4,000 rpn | on Check". oxygen sensor 2 circuit. During this |
| 2. Perf Perform NOTE: Jse com check, a s the ins YES NO COMPC 1.PERF Witho 1. Star 2. Turn 3. Star 4. Let e | FORM CON Source of the second | confirmation o 3. MPONEN it function it function ction che fC might in sult norm CTION E <u>SULT</u> in CTION EN JLT ind warm in witch OFF ind keep the for 1 min | T FUNCT check. F ock to che not be co al? ND Diagnosis Check T FUNCT t up to the and wait he engine jute. | dure again. FION CHECK Refer to <u>EC-235, "Component Function</u> eck the overall function of the heated nfirmed. <u>S Procedure"</u> . FION CHECK-I e normal operating temperature. t at least 10 seconds. speed between 3,500 and 4,000 rpn | on Check". oxygen sensor 2 circuit. During this |

Is the inspection result normal?

76

80

84

least 10 times

YES >> INSPECTION END

F102

P0137

P0157

Revving up to 4,000 rpm under no load at

The voltage should be above 0.74 V at

least once during this procedure.

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

| | | ECM | | | | | |
|-------|-----------|----------|----------|---------------------------------------|---------------------------------------|---------------------------------------|--|
| DTC | Connector | + | - | Condition | Voltage | | |
| | Connector | Terminal | Terminal | | | | |
| P0137 | 76 | | | | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at | |
| P0157 | 1 102 | 80 | -10 | Reeping engine at fait for to minutes | least once during this procedure. | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

| | | ECM | | | | |
|-------|-----------|------------|----------|-----------------------------------------|---------------------------------------|--|
| DTC | Connector | + | - | Condition | Voltage | |
| | Connector | Terminal | Terminal | | | |
| P0137 | F102 | F102 76 84 | | Coasting from 80 km/h (50 MPH) in D po- | The voltage should be above 0.74 V at | |
| P0157 | 1 102 | 80 | 04 | sition | least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>EC-236, "Diagnosis Procedure"</u>.

Diagnosis Procedure

INFOID:000000010596823

1.CHECK GROUND CONNECTION

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "MIXTURE RATIO SELF-LEARNING VALUE <u>CLEAR : Description"</u>.
- 2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to <u>EC-262, "DTC Logic"</u>. NO >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F122 | 1 | F102 | 84 | Existed |
| P0157 | 2 | F121 | 1 | 1 102 | 04 | LAISLEU |

| | | | | P0137 | ', PU15 <i>1</i> | HU254 | <u>_</u> | |
|--------------------|------------------|---------------------------|--------------------|---------------|------------------|------------|----------------------------------------|---|
| < DTC/CIF | RCUIT | DIAGNOS | 3IS > | | | | [VQ37VHR] | |
| 5. Also c | heck h | arness for s | short to gi | round and | short to po | ower. | | |
| | | result norm | al? | | | | | |
| | > GO T | | | 1 | | | L | _ |
| | | | | | | | harness or connectors. | E |
| | | S2 INPUT S | | | | | | |
| 1. Check | the co | ntinuity bet | tween HO | 2S2 harne | ss connec | ctor and E | CM harness connector. | |
| | | HO2S2 | | | СМ | | | |
| DTC | Denk | 1 | Torminal | | | Continuity | | |
| P0137 | Bank 1 | Connector F122 | Terminal | Connector | Terminal 76 | | - | |
| P0137 | 2 | F122 | 4 | F102 | 80 | Existed | | |
| | | | | 0000 harr | | actor and | | |
| 2. Check ground | | Shuhulty be | | JZSZ nam | less conne | ector and | ground, or ECM harness connector and | |
| 5 | | | | | | | | |
| DTC | | HO2S2 | | Cround | Continuit | | | |
| DTC | Bank | Connector | Terminal | Ground | Continuity | | | |
| P0137 | 1 | F122 | 4 | Ground | Not existed | | | |
| P0157 | 2 | F121 | 4 | Ground | | u | | |
| | | | | | | | | |
| DTC | | ECM | | Ground | Continuity | , | | |
| ы | Bank | Connector | Terminal | Cround | Continuity | | | |
| P0137 | 1 | F102 | 76 | Ground | Not existed | | | |
| P0157 | 2 | 1 102 | 80 | Cround | | | | |
| | | arness for s | • | ower. | | | | |
| | | result norm | <u>al?</u> | | | | | |
| | > GO 1 > Rena | | ruit short | to around | or short to | nower in | harness or connectors. | |
| _ | | ED OXYG | | • | | power in | namess of connectors. | |
| | | | | | | | | |
| | | "Compone result norm | - | <u>tion</u> . | | | | |
| · · · | > GO T | | <u>ai :</u> | | | | | |
| | > GO T | | | | | | | |
| 6.REPLA | CE HE | ATED OXY | GEN SE | NSOR 2 | | | | |
| Replace m | alfunct | tioning hea | ted oxyge | n sensor 2 | . Refer to | EM-34, "E | xploded View". | |
| CAUTION | : | - | | | | | | |
| | | eated oxyg I surface s | | | | | from a height of more than 0.5 m (19.7 | |
| • Béfore i | nstalli | ng new he | eated oxy | /gen sens | or, clean | exhaust : | system threads using Oxygen Sensor | |
| | | | | ice tool (J | -43897-18 | 3 or J-438 | 97-12)] and approved Anti-seize Lubri- | |
| cant (co | mmero | cial service | ϶ τοοl). | | | | | |
| | | PECTION E | | | | | | |
| _ | | | | іт | | | | |
| | | | | | | | | |
| Refer to <u>G</u> | <u>1-45, "l</u> | ntermittent | <u>incident"</u> . | | | | | |

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT?

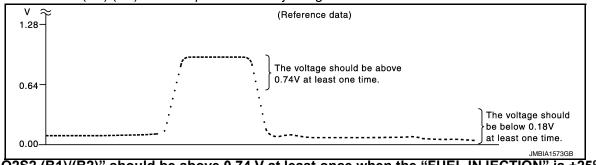
Do you have CONSULT?

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

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

- 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%.



"HO2S2 (B1)/(B2)" should be above 0.74 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

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

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

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

3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.

- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

| | ECM | | | | |
|-----------|---------------------------|----------|------------------------------------------|-------------------------------------------------------------------------|--|
| 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 0.74 V at least once during this procedure. | |
| 1 102 | 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.

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Connector - | ECM | | | |
|-----------------------|--------------------------------------------------------|---------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connector | + | _ | Condition | Voltage |
| | Terminal | Terminal | | |
| F102 – | 76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| <u>s the inspe</u> | ction result r | normal? | | |
| | INSPECTIC | ON END | | |
| _ | GO TO 5. | | | |
| D. CHECK | HEATED OX | YGEN SEN | NSOR 2-III | |
| Check the v | oltage betwo | een ECM ha | arness connector terminals under the | e following condition. |
| | | | Ĩ | |
| | ECM | | Condition | Valtara |
| Connector | + Terminal | – Terminal | Condition | Voltage |
| | | Terminal | | |
| F102 - | 76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)] | 84 | Coasting from 80 km/h (50 MPH) in D po- sition | The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| s the inspe | ction result r | normal? | | |
| YES >> | INSPECTIO | | | |
| ~ | GO TO 6. | | | |
| D .REPLAC | E HEATED | OXYGEN S | ENSOR 2 | |
| | alfunctioning | heated oxy | gen sensor 2. Refer to <u>EM-34, "Expl</u> | oded View". |
| CAUTION: | any heated | oxvaen sei | sor which has been dropped from | m a height of more than 0.5 m (19.7 |
| in) onto a | a hard surfa | ce such as | a concrete floor; use a new one. | - |
| Before in | | | | tem threads using Oxygen Sensor 12)] and approved Anti-seize Lubri |
| | nmercial se | | | |
| Thread C | | rvice tool). | | |
| Thread C | | rvice tool). | | |
| Thread C cant (con | INSPECTIC | | | |
| Thread C cant (con | INSPECTIC | | | |
| Thread C cant (con | INSPECTIO | | | |
| Thread C cant (con | INSPECTIC | | | |
| Thread C cant (con | INSPECTIC | | | |
| Thread C cant (con | INSPECTIC | | | |
| Thread C cant (con | INSPECTIC | | | |

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

INFOID:000000010596826

NG

PBIB1848

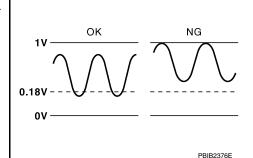
DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/ F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. **MALFUNCTION A**

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.

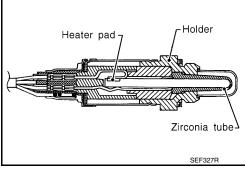
MALFUNCTION B

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---------|------------------------------------|-------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Heated oxygen sensor 2 | 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 |
| P0138 | (bank 1) 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 |

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P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| DTC No. | Trouble diagnosis name | | DTC detecting condition | Possible cause |
|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Heated aware concer? | A) | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 |
| P0158 | Heated oxygen sensor 2 (bank 2) circuit high volt- age | | 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 |
| | FIRMATION PROC | EDU | RE | |
| efore cond . Turn ig . Turn ig | nfirmation Procedure ducting the next test. nition switch OFF and nition switch ON. nition switch OFF and | l wai | | s perform the following procedure |
| ~ | • GO TO 2. | | | |
| | | | PROCEDURE FOR MALFUNCTION | N A |
| Turn ig Turn ig Turn ig Turn ig Start er Let eng | nition switch OFF and nition switch ON. nition switch OFF and ngine and keep the en gine idle for 2 minutes | l wai [:] l wai [:] gine | | for at least 1 minute under no load. |
| | 1st trip DTC. <u>TC detected?</u> | | | |
| YES >> NO-1 >> NO-2 >> | • Go to <u>EC-243, "Diag</u> • With CONSULT: GO • Without CONSULT: (| то : 30 т | 3. | |
| | | | PROCEDURE FOR MALFUNCTION | |
| For better 1. Select 2. Start er 3. Turn ig 4. Turn ig 5. Turn ig 6. Start er 7. Let eng | "DATA MONITOR" mon ngine and warm it up t nition switch OFF and nition switch ON. nition switch OFF and ngine and keep the en gine idle for 1 minute. | ode v to the I wai I wai gine | e normal operating temperature. t at least 10 seconds. t at least 10 seconds. speed between 3,500 and 4,000 rpm | for at least 1 minute under no load. |
| lf not, v | warm up engine and g | | /S" indicates more than 70°C (158°F) next step when "COOLAN TEMP/S" | |
| 10. Select "DTC V | VORK SUPPORT" monopole Note that the monopole of the second | ode v | DTC P0138) or "HO2S2 (B2) P116 vith CONSULT. ction of CONSULT display. | 6" (for DTC P0158) of "HO2S2" in |
| It will ta | | | til "COMPLETED" is displayed. | |
| OK >> NG >> CON NOT | splayed on CONSULT INSPECTION END Go to <u>EC-243, "Diag</u> BE DIAGNOSED>>0 RM DTC CONFIRMA ⁻ | <u>nosi</u> 30 T | s Procedure". | N B AGAIN |
| | | | | |

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

2. Perform DTC confirmation procedure again.

>> GO TO 3.

5. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to <u>EC-242, "Component Function Check"</u>.

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 <u>EC-243</u>, "Diagnosis Procedure".

Component Function Check

INFOID:000000010596827

[VQ37VHR]

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 | | | |
| P0138 | F102 | 76 | 84 | Revving up to 4,000 rpm under no load at | The voltage should be below 0.18 V at | |
| P0158 | 1 102 | 80 | 04 | least 10 times | least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

| | ECM | | | | | |
|-------|-----------|----------|----------|---------------------------------------|---------------------------------------|--|
| DTC | Connector | + | - | Condition | Voltage | |
| | Connector | Terminal | Terminal | | | |
| P0138 | F102 | 76 | 84 | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at | |
| P0158 | | | 04 | Reeping engine at the for To minutes | least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

| | | ECM | | | | |
|-------|-----------|----------|----------|-----------------------------------------|---------------------------------------|--|
| 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 | |
| P0158 | 1 102 | 80 | 04 | sition | least once during this procedure. | |

| | | | | FUIJO | , FUI30 | 110232 | |
|----------------|---------|----------------------------|-------------|--------------|-------------|----------------------------------------|------------------------|
| < DTC/CI | RCUIT | DIAGNOS | SIS > | | | | [VQ37VHR] |
| s the insp | ection | result norm | al? | | | | |
| | | ECTION E | | D | | | |
| | | 0 <u>EC-243, "</u> | Diagnosis | s Procedur | <u>e"</u> . | | |
| Diagnos | is Pro | ocedure | | | | | INFOID:000000010596828 |
| .INSPE | CTION | START | | | | | |
| | | | nction (A d | or B), Refe | r to EC-24 | 0, "DTC Logic". | |
| | | n is detecte | • | | | <u></u> . | |
| | > GO 1 | | | | | | |
| | > GO 1 | | | | | | |
| .CHECK | GRO | JND CON | NECTION | | | | |
| | | switch OFF | | | | | |
| | • | a connectic result norm | | kerer to Gro | ouna insp | ection in <u>GI-48, "Circuit Inspe</u> | <u>cuon</u> . |
| | > GO 1 | | | | | | |
| - | | air or replac | e ground | connectior | า. | | |
| .CHECK | K HO2S | 2 GROUN | D CIRCU | IT FOR OF | PEN AND | SHORT | |
| | | | | | | s connector. | |
| . Discor | nnect E | CM harnes | ss connec | ctor. | , | | |
| . Check | the co | ontinuity be | tween HC | 02S2 harne | ess conne | ctor and ECM harness conne | ctor. |
| | | HO2S2 | | E | CM | | |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0138 | 1 | F122 | 1 | | | | |
| P0158 | 2 | F121 | 1 | F102 | 84 | Existed | |
| . Also c | heck h | arness for s | short to a | round and | short to p | ower. | |
| | | result norm | 0 | | · | | |
| | > GO 1 | | | | | | |
| | | • | | • | | power in harness or connec | tors. |
| CHECK | KHO2S | S2 INPUT S | SIGNAL C | IRCUIT FO | DR OPEN | AND SHORT | |
| . Check | the co | ontinuity be | tween HC | 02S2 harne | ess conne | ctor and ECM harness conne | ctor. |
| | | | | | | | |
| DTC | Deal | HO2S2 | T | | CM | Continuity | |
| D 0400 | Bank | Connector | Terminal | Connector | Terminal | | |
| P0138 | 1 | F122 | 4 | F102 | 76 | Existed | |
| P0158 | 2 | F121 | 4 | | 80 | | |
| . Check ground | | ontinuity de | eiween H | 0252 narr | iess conn | ector and ground, or ECM h | amess connector and |
| 9.041 | | | | | | | |
| | | HO2S2 | | | 0 | _ | |
| DTC | Bank | Connector | Terminal | Ground | Continuit | / | |

| DTC | | H0252 | | Ground | Continuity | |
|-------|------|-----------|----------|--------|-------------|--|
| ыс | Bank | Connector | Terminal | | Continuity | |
| P0138 | 1 | F122 | 4 | Ground | Not existed | |
| P0158 | 2 | F121 | 4 | Ground | NOL EXISTED | |

| DTC | | ECM | Ground | Continuity | |
|-------|------|-----------|----------|------------|-------------|
| ыс | Bank | Connector | Terminal | Cround | Continuity |
| P0138 | 1 | F102 | 76 | Ground | Not existed |
| P0158 | 2 | 1 102 | 80 | Ground | |

Ρ

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace harness or connectors.

O.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-246, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

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

>> INSPECTION END

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

9.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> Repair or replace ground connection.

10.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Description</u>".
- 2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-266, "DTC Logic".

NO >> GO TO 11.

11. CHECK H02S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect heated oxygen sensor 2 harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between HO2S2 harness connector and ECM harness connector.

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| | | HO2S2 | | F (| CM | | - |
|----------------------|-------------------|---------------------------|--------------------|-----------------------|-------------|------------------|----------------------------------------|
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0138 | валк 1 | F122 | 1 | Connector | | | - |
| P0158 | 2 | F121 | 1 | F102 | 84 | Existed | |
| | | arness for s | short to a | round and | short to po | ower. | - |
| | | result norm | | | | | |
| | > GO T | | | | | | |
| | | | | | | | harness or connectors. |
| 12.CHE | CK HO | 2S2 INPUT | SIGNAL | CIRCUIT | FOR OPE | N AND SH | IORT |
| 1. Check | the co | ntinuity bet | ween HC | 2S2 harne | ess connec | ctor and EC | CM harness connector. |
| | 1 | 110000 | | 54 | 214 | | - |
| DTC | Deal | HO2S2 | T | | CM | Continuity | |
| | Bank | Connector | Terminal | Connector | Terminal | | - |
| P0138 | 1 | F122 | 4 | F102 | 76 | Existed | |
| P0158 | 2 | F121 | 4 | | 80 | | . |
| 2. Check | the co | ntinuity bei | ween HC | 2S2 harne | ess connec | ctor or ECN | M harness connector and ground. |
| | | HO2S2 | | FC | CM | | |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Ground | Continuity |
| P0138 | 1 | F122 | 4 | | 76 | | |
| P0158 | 2 | F121 | 4 | F102 | 80 | Ground | Not existed |
| | | | - | ower | 00 | | |
| | | arness for s | • | Uwer. | | | |
| | | result norm | <u>ar :</u> | | | | |
| | > GO T | | suit chort | to around | or short to | nower in l | harness or connectors. |
| | | ATED OXY | | | | power in i | namess of connectors. |
| | | | | | | | |
| | | "Compone | | on Check". | | | |
| - | | result norm | <u>al?</u> | | | | |
| | > GO T > GO T | | | | | | |
| | | | | | | | |
| | | | | | | EM 04 " | |
| Replace m CAUTION | | ioning heat | iea oxyge | n sensor 2 | . Refer to | <u>ЕМ-34, "E</u> | xploded View". |
| | | eated oxyg | en sens | or which ł | nas been | dropped f | from a height of more than 0.5 m (19.7 |
| in) onto | a hard | surface s | uch as a | concrete [•] | floor; use | a new on | 16. |
| | | | | | | | system threads using Oxygen Sensor |
| | | r [commei cial service | | ice tool (J | -43897-18 | 8 or J-438 | 97-12)] and approved Anti-seize Lubri- |
| cant (co | miner | | , 1001). | | | | |
| > | > INSP | ECTION E | ND | | | | |
| | | ERMITTEN | | ENT | | | |
| | | | | | | | |
| Refer to G | <u>1-45, "l</u> l | ntermittent | <u>incident"</u> . | | | | |
| > | > N.S.P | ECTION E | ND | | | | |
| | | | | | | | |
| | | nspectior | I | | | | INFOID:000000010596829 |
| 1.INSPEC | CTION | START | | | | | |
| | | | | | FC 24 | _ | |

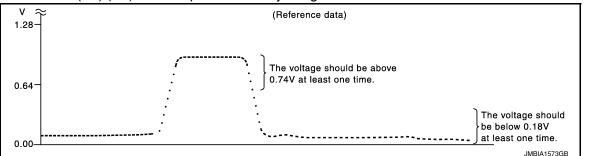
Do you have CONSULT? Do you have CONSULT?

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

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

- 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%.



"HO2S2 (B1)/(B2)" should be above 0.74 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

YES >> INSPECTION END

3.CHECK HEATED OXYGEN SENSOR 2-I

6.

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. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | | | |
|-----------|---------------------------|----------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Connector | + | - | Condition | Voltage | |
| | 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 0.74 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.

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | ECM | | | | |
|--------------------------------------------|--------------------------------------------------------|---------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Connector | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F102 | 76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)] | - 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. | |
| Is the inspe | ection result r | normal? | | | |
| | > INSPECTIO | ON END | | | |
| _ | > GO TO 5. | | | | |
| | HEATED O | | | | |
| Check the | voltage betw | een ECM ha | arness connector terminals under the | e following condition. | |
| | ECM | | | | |
| | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F102 | 76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)] | - 84 | Coasting from 80 km/h (50 MPH) in D po- sition | The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. | |
| | ection result r | | | | |
| | > INSPECTIC > GO TO 6. | ON END | | | |
| • | CE HEATED | OXYGEN S | SENSOR 2 | | |
| | | | gen sensor 2. Refer to EM-34, "Expl | oded View" | |
| CAUTION: | | - | | | |
| | | | nsor which has been dropped from a concrete floor; use a new one. | m a height of more than 0.5 m (19.7 | |
| Before in Thread C | nstalling nev | w heated o nmercial se | oxygen sensor, clean exhaust sys ervice tool (J-43897-18 or J-43897- | tem threads using Oxygen Sensor 12)] and approved Anti-seize Lubri | |
| | | | | | |
| | > INSPECTIC | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

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 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

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| P0139 | Heated oxygen sensor 2 (bank 1) circuit slow 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 Fuel system EVAP system Intake air system | |
| P0159 | Heated oxygen sensor 2 (bank 2) circuit slow re- sponse | than the specified time computed by ECM. | | |

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.

EC-248

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

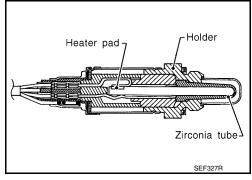
2. Turn ignition switch ON.

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

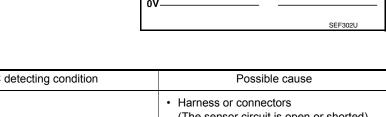
TESTING CONDITION:

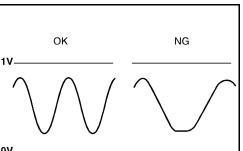
For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.



OK NG 1V 0V SEF302U





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< DTC/CIRCUIT DIAGNOSIS >

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$\overline{\mathbf{3.}}_{\mathsf{PERFORM}}$ dTC CONFIRMATION PROCEDURE With CONSULT Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT. 2. Start engine and warm it up to the normal operating temperature. 3. Turn ignition switch OFF and wait at least 10 seconds. 4. Turn ignition switch ON. 5. Turn ignition switch OFF and wait at least 10 seconds. 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 7. Let engine idle for 1 minute. 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F). 9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed. **CAUTION:** Always drive vehicle at a safe speed. 10. Release the accelerator pedal fully at least 5 seconds. CAUTION: Enable the engine brake. Always drive carefully. Never apply brake when releasing the accelerator pedal. 11. Repeat step 9 and 10 at least 8 times. 12. Check the following item of "DATA MONITOR". DTC Data monitor item Status HO2 S2 DIAG1 (B1) P0139 HO2 S2 DIAG2 (B1) CMPLT HO2 S2 DIAG1 (B2) P0159 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-252, "Diagnosis Procedure".

NO >> INSPECTION END

1.PERFORM COMPONENT FUNCTION CHECK

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Perform component function check. Refer to <u>EC-251, "Component Function Check"</u>.

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END NO >> Proceed to <u>EC-252</u>, "Diagnosis Procedure".

Component Function Check

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 | | | Voltage | |
|-------|-----------|----------|----------|------------------------------------------|--------------------------------------------|--|
| DTC | Connector | + | - | Condition | | |
| | | Terminal | Terminal | | | |
| P0139 | F102 | 76 | 84 | Revving up to 4,000 rpm under no load at | | |
| P0159 | 1 102 | 80 | 04 | least 10 times | 0.96 V for 1 second during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

| | | ECM | | | | |
|-------|-----------|----------|----------|---------------------------------------|------------------------------------------------------------------------------------|--|
| DTC | Connector | + | - | Condition | Voltage | |
| | | Terminal | Terminal | | | |
| P0139 | F102 | 76 | 84 | Keeping engine at idle for 10 minutes | A change of voltage should be more than 0.96 V for 1 second during this procedure. | |
| P0159 | 1 102 | 80 | 04 | | | |

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.

| | | ECM | | | Voltage | |
|-------|-----------|----------|----------|-----------------------------------------|-------------------------------------------|--|
| DTC | Connector | + | - | Condition | | |
| | | Terminal | Terminal | | | |
| P0139 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) in D po- | 0 0 | |
| P0159 | 1102 | 80 | 04 | sition | 0.96 V for 1 second during this procedure | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-252, "Diagnosis Procedure".

| | | | | P013 |), PU15 | 9 HO252 | | | |
|-------------|--------------|-------------------------------------------------|-------------|--------------|------------|------------------------|----------------------------------------------|----|--|
| < DTC/CIF | RCUIT | DIAGNOS | SIS > | | | | [VQ37VHR] | | |
| Diagnos | is Pro | ocedure | | | | | INFOID:000000010596833 | ٨ | |
| 1.снеск | GRO | | ECTION | | | | | A | |
| | | switch OFF | | | | | | EC | |
| 2. Check | - | | | leter to Gro | ound Insp | ection in <u>GI-48</u> | 8, "Circuit Inspection". | LO | |
| | > GO 1 | | | | | | | | |
| - | | air or replac | e ground | connectio | n. | | | С | |
| 2.CLEAR | THE N | | RATIO SE | LF-LEARN | ING VAL | UE | | | |
| 1. Clear | the mix | kture ratio | self-learni | ng value. | Refer to E | <u>-24, "MIXTU</u> | JRE RATIO SELF-LEARNING VALUE | D | |
| | | <u>scription"</u> . or at least [·] | 10 minuto | e at idle er | hood | | | | |
| | - | | | • | | ed? Is it difficu | ult to start engine? | E | |
| | | | | | | | , P0175. Refer to <u>EC-262, "DTC Logic"</u> | | |
| | or <u>EC</u> | <u>C-266, "DT(</u> | | | | , | | | |
| • | > GO 1 | | | | | OUODT | | F | |
| - | | 2 GROUN | | IT FOR OF | PEN AND | SHURI | | | |
| | | switch OFF | | r 2 (HO2S | 2) harnes | s connector. | | G | |
| 3. Discor | nnect E | CM harnes | s connec | tor. | | | | | |
| 4. Check | the co | ontinuity bei | ween HC | 2S2 harne | ess conne | ctor and ECM | harness connector. | | |
| | | HO2S2 | | F | CM | | | Η | |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | |
| P0139 | 1 | F122 | 1 | | | | | | |
| P0159 | 2 | F121 | 1 | F102 | 84 | Existed | | | |
| 5. Also c | heck h | arness for s | short to g | round and | short to p | ower. | | J | |
| Is the insp | ection | result norm | al? | | | | | 0 | |
| - | > GO 1 | - | | 4 | | | | | |
| 4 | • | • | | - | | • | ness or connectors. | Κ | |
| | | | | | | AND SHORT | | | |
| 1. Check | the co | ontinuity bei | ween HC | 2S2 harne | ess conne | ctor and ECM | harness connector. | L | |
| | | HO2S2 | | E | CM | | | | |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | M | |
| P0139 | 1 | F122 | 4 | | 76 | 76 | | | |
| P0159 | 2 | F121 | 4 | F102 | 80 | - Existed | | | |
| 2. Check | the co | ontinuity be | etween H | O2S2 harr | ness conn | ector and gro | ound, or ECM harness connector and | Ν | |

ground.

| DTC | | HO2S2 | Ground | Continuity | | |
|-------|------|-----------|----------|------------|--------------|--|
| DIC | Bank | Connector | Terminal | Oround | Continuity | |
| P0139 | 1 | F122 | 4 | Ground | Not existed | |
| P0159 | 2 | F121 | 4 | Oround | INOL EXISTED | |

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| DTC | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Ground | |
| P0139 | 1 | F102 | 76 | Ground | Not existed |
| P0159 | 2 | 1102 | 80 | Ground | NUL EXISIEU |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-253, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View". CAUTION:

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

>> INSPECTION END

7 CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2. >> GO TO 3.

NO

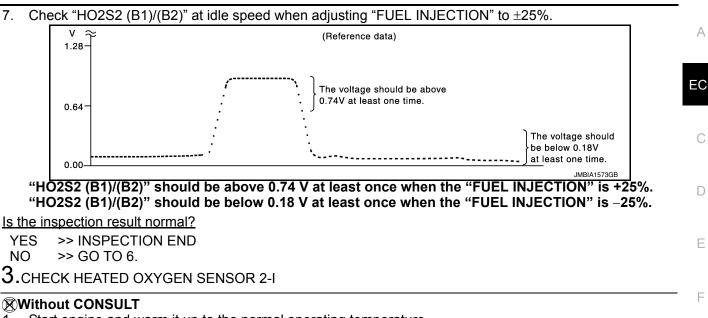
2. CHECK HEATED OXYGEN SENSOR 2

(P)With CONSULT

- Turn ignition switch ON and select "DATA MONITOR" mode with 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.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.

P0139, P0159 HO2S2

< DTC/CIRCUIT DIAGNOSIS >



- 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 (ba | 76 [HO2S2 (bank 1)] | 84 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.74 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | 64 | 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.

| | ECM | | | | |
|-----------|---------------------------|----------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Connector | + | - | Condition | Voltage | |
| | Terminal | Terminal | | | |
| E102 | 76 [HO2S2 (bank 1)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. | |
| F102 - | 80 [HO2S2 (bank 2)] | 64 | Keeping engine at idle for 10 minutes | | |

is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

b.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

Revision: February 2015

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[VQ37VHR]

P0139, P0159 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

| | ECM | | | | |
|-------------|---------------------------|----------|---------------------------------------------------|-------------------------------------------------------------------------|--|
| Connector - | + – | | Condition | Voltage | |
| | Terminal | Terminal | | | |
| F102 - | 76 [HO2S2 (bank 1)] | 84 | Coasting from 80 km/h (50 MPH) in D po- sition | The voltage should be above 0.74 V at least once during this procedure. | |
| | 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 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

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

>> INSPECTION END

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR

DTC Logic

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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 A/F sen- | | |
| P015B | circuit delayed response | response sor 1 signal delays more than F) sensor 1 (bank 2) ECM | Harness or connectors (The A/E sensor 1 circuit is open or shorted.) | F |
| P014E | Air fuel ratio (A/F) sensor 1 (bank 2) | | | 1 |
| 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.

 $\mathbf{2}$

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-226, "Component Function Check".

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P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

| DTC | Data monitor item | Status |
|------------------------------------------------------------------------|---------------------|--------|
| P014C P014D P015A P015B | A/F SEN1 DIAG3 (B1) | PRSNT |
| P014E P014F P015C P015D | A/F SEN1 DIAG3 (B2) | FRONT |

Is "PRSNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

Perform DTC confirmation procedure-1 again.

Is "PRSNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> Refer to EC-226, "Component Function Check".

4.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

- 1. Wait for about 20 seconds at idle.
- 2. Check the items status of "DATA MONITOR" as follows.
- NOTE:

If "CMPLT" changed to "INCMP", refer to EC-226, "Component Function Check".

| DTC | Data monitor item | Status |
|-----------------------------------------------------|---------------------|---------|
| • P014C | A/F SEN1 DIAG1 (B1) | |
| P014DP015AP015B | A/F SEN1 DIAG2 (B1) | CMPLT |
| • P014E | A/F SEN1 DIAG1 (B2) | CIVIFEI |
| P014FP015CP015D | A/F SEN1 DIAG2 (B2) | |

Is "CMPLT" displayed on CONSULT screen?

- YES >> GO TO 5.
- NO >> Refer to EC-226, "Component Function Check".

5.PERFORM SELF-DIAGNOSIS

(B) With CONSULT

Check the "SELF-DIAG RESULT".

Is any DTC detected?

YES >> Proceed to EC-258, "Diagnosis Procedure".

NO >> INSPECTION END

6.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

With GST

- T. Start engine and warm it up to normal operating temperature.
- 2. Select Service \$01 with GST.
- 3. Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.

Is the total percentage within ±15%?

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

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 [VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

| I .DETECT MALFUNCTIONING PART | Δ |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Check the following. | / \ |
| Intake air leaks | |
| Exhaust gas leaks Incorrect fuel pressure | EC |
| Lack of fuel | |
| Fuel injector | |
| Incorrect PCV hose connection | С |
| PCV valve Mass air flow sensor | |
| | _ |
| >> Repair or replace malfunctioning part. | D |
| 8.PERFORM DTC CONFIRMATION PROCEDURE | _ |
| 1. Turn ignition switch OFF and wait at least 10 seconds. | Ε |
| 2. Turn ignition switch ON. | |
| Turn ignition switch OFF and wait at least 10 seconds. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. | F |
| 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. | G |
| 8. Check 1st trip DTC. | |
| Is 1st trip DTC detected? | |
| YES >> Proceed to <u>EC-258, "Diagnosis Procedure"</u> . NO >> INSPECTION END | Η |
| Diagnosis Procedure | |
| 1. CHECK GROUND CONNECTION | |
| | |
| 1. Turn ignition switch OFF. | J |
| 2. Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u> . | Ŭ |
| <u>Is the inspection result normal?</u> YES >> GO TO 2. | |
| NO >> Repair or replace ground connection. | Κ |
| 2.RETIGHTEN A/F SENSOR 1 | |
| | |
| Loosen and retighten the A/F sensor 1. Refer to EM-34, "Exploded View". | L |
| >> GO TO 3. | |
| 3. CHECK EXHAUST GAS LEAK | M |
| | |
| Start engine and run it at idle. Listen for an exhaust gas leak before three way catalyst 1. | |
| | Ν |
| Three way catalyst 1 | |
| Three way catalyst 2 | 0 |
| A/F sensor 1 HO2S2 / Muffler | 0 |
| | |
| | Ρ |
| To exhaust manifold | |
| Exhaust gas | |
| 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 INTAKE AIR LEAK

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

<u>Is intake air leak detected?</u> YES >> Repair or replace.

NO >> GO TO 5.

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "MIXTURE RATIO SELF-LEARNING VALUE <u>CLEAR : Description"</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-262. "DTC Logic"</u> or <u>EC-266. "DTC Logic"</u>.

NO >> GO TO 6.

 ${f 6}$.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect A/F sensor 1 harness connector.

2. Turn ignition switch ON.

3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor | 1 | Ground | Voltago | |
|------------------------------------------------------------------------|------|-------------------------|---|--------|-----------------|--|
| DIC | Bank | Bank Connector Terminal | | Giouna | Voltage | |
| P014C P014D P015A P015B | 1 | F123 | 4 | Ground | Battery voltage | |
| P014E P014F P015C P015D | 2 | F124 | 4 | Cround | Dattery voltage | |

Is the inspection result normal?

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

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)

Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

$\mathbf{8}$. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

| DTC | | A/F sensor | 1 | EC | Continuity | |
|-----------------------------------------------------|------|------------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| • P014C | | | 1 | | 57 | |
| P014DP015AP015B | 1 | F123 | 2 | F8 | 61 | Existed |
| • P014E | | | 1 | 10 | 65 | LAISIEU |
| P014FP015CP015D | 2 | F124 | 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 | Continuity | |
| • P014C | | | 1 | | | |
| P014DP015AP015B | 1 | F123 | 2 | Ground | Not existed | |
| • P014E | | | 1 | Ground | NUL EXISIEU | |
| P014FP015CP015D | 2 F124 | 2 | | | | |

| DTC - | | ECM | | Ground | Continuity |
|-----------------------------------------------------|------|-----------|----------|--------|-------------|
| | Bank | Connector | Terminal | Ground | Continuity |
| | | 1 | 57 | | |
| P014DP015AP015B | 1 | | 61 | Ground | Not existed |
| • P014E | | F102 | 65 | Ground | NUL EXISLEU |
| P014FP015CP015D | 2 | | 66 | | |

5. Also check harness for short to power. L Is the inspection result normal? YES >> GO TO 9. NO >> Repair open circuit, short to ground or short to power in harness or connectors. Μ 9.CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER Refer to EC-181, "Component Inspection". Ν Is the inspection result normal? YES >> GO TO 10. >> GO TO 13. NO Ο **10.**CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2). Refer to <u>EC-190, "Component Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 11.

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

11.CHECK PCV VALVE

Refer to EC-527, "Component Inspection".

Is the inspection result normal?

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P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1 [VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 12.

NO >> Repair or replace PCV valve. Refer to EM-48, "Exploded View".

12. CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View". **CAUTION:**

• Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

• Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

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[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 | E |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | F |
|---------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---|
| P0171 | Fuel injection system too lean (bank 1) | | Intake air leaks A/F sensor 1 | I |
| 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 | G |
| | | | Incorrect PCV hose connection | 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

| | 1 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR</u>: <u>Description</u>". | L |
| 2. Start engine. | вл |
| Is it difficult to start engine? | M |
| YES >> GO TO 3. NO >> GO TO 4. | NI |
| 3.RESTART ENGINE | IN |
| If it is difficult to start engine, the fuel injection system has a malfunction, too. Crank engine while depressing accelerator pedal. NOTE: | 0 |
| 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. | P |
| Does engine start? | Ľ |
| YES >> Go to EC-263 "Diagnosis Procedure" | |

>> Go to EC-263, "Diagnosis Procedure" TEO NO

>> Check exhaust and intake air leak visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.

Check 1st trip DTC. 2.

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< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

YES >> Go to EC-263, "Diagnosis Procedure".

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Start engine.
- 3. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

|--|

CAUTION:

Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

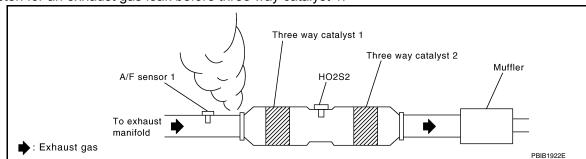
Is 1st trip DTC detected?

YES >> Go to <u>EC-263, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1.CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

- 2. CHECK FOR INTAKE AIR LEAK
- 1. Listen for an intake air leak after the mass air flow sensor.
- 2. Check PCV hose connection.

Is intake air leak detected?

YES >> Repair or replace.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

| DTC | A/F sensor 1 | | ECM | | Continuity | |
|-------|--------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0171 | 1 | F123 | 1 | | 57 | |
| FUT | | 1 125 | 2 | F102 | 61 | Existed |
| P0174 | 20174 2 F124 | 1 | F IUZ | 65 | Existed | |
| FU1/4 | 2 | F 124 | 2 | | 66 | |

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< 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 | Connector | Terminal | | Continuity |
| P0171 | 1 | F123 | 1 | | |
| FUITI | 1 | F123 | 2 | Ground | Not existed |
| P0174 | P0174 2 F124 | | 1 | Ground | NUL EXISLEU |
| FVI/4 2 F124 | | 2 | | | |

| DTC | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Ground | Continuity |
| P0171 | | – F102 | 57 | Ground | Not existed |
| FUITI | | | 61 | | |
| P0174 | | | 65 | | |
| FU1/4 | 2 | | 66 | | |

6. Also check harness for short to power.

Is the inspection result normal?

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 <u>EC-628, "Inspection"</u>.
- Install fuel pressure gauge and check fuel pressure. Refer to <u>EC-628</u>, "Inspection".

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

| At luing. Approximately 550 kFa (5.57 kg/cm , 51 ps) | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|--|--|
| Is the inspection result normal? | J | | | |
| YES >> GO TO 6. | | | | |
| NO >> GO TO 5. | LZ. | | | |
| 5. DETECT MALFUNCTIONING PART | K | | | |
| Check fuel hoses and fuel tubes for clogging. | | | | |
| Is the inspection result normal? | L | | | |
| YES >> Replace "fuel filter and fuel pump assembly". Refer to <u>FL-6, "Removal and Installation"</u>. NO >> Repair or replace. | | | | |
| 6.CHECK MASS AIR FLOW SENSOR | M | | | |
| With CONSULT | | | | |
| 1. Install all removed parts. | Ν | | | |
| 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT. | IN | | | |
| For specification, refer to <u>EC-631, "Mass Air Flow Sensor"</u> . | | | | |
| With GST Install all removed parts. | \bigcirc | | | |
| Check mass air flow sensor signal in Service \$01 with GST. | 0 | | | |
| For specification, refer to <u>EC-631, "Mass Air Flow Sensor"</u> . | | | | |
| Is the measurement value within the specification? | Р | | | |
| 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-195, "Diagnosis Procedure"</u> . | | | | |
| 7. CHECK FUNCTION OF FUEL INJECTOR | | | | |

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.

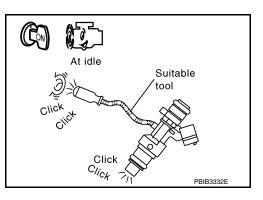
Without CONSULT

- 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-506, "Diagnosis Procedure"</u>.



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-38</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 P0174, make sure that fuel sprays out from fuel injectors on bank 2.

Fuel should be sprayed evenly for each fuel injector.

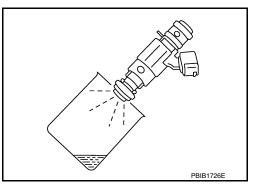
Is the inspection result normal?

NO >> Replace fuel injectors from which fuel does not spray out. (Refer to <u>EM-38, "Removal and Installation"</u>.) Always replace O-ring with new ones.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

>> INSPECTION END



[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000010596839

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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 | D |
|--------------|---------------------------------------------------------------------|------------------------|---------------|---|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector | _ |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| P0172 | Fuel injection system too rich (bank 1) | Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. | A/F sensor 1 Fuel injector Subjust accludes |
| P0175 | Fuel injection system too rich (bank 2) | (The mixture ratio is too rich.) | Exhaust gas leaksIncorrect fuel pressureMass air flow sensor |
| DTC CO | NFIRMATION PROC | CEDURE | |
| 1.PREC | ONDITIONING | | |
| before co 1. Turn 2. Turn | onducting the next test. ignition switch OFF an ignition switch ON. | e has been previously conducted, always perfo id wait at least 10 seconds. id wait at least 10 seconds. | orm the following procedure |
| | >> GO TO 2. | | |
| ~ | >> GO TO 2. ORM DTC CONFIRMA | | |
| | | learning value. Refer to <u>EC-24, "MIXTURE RAT</u> | IO SELE-LEARNING VALUE |
| <u>CLE</u> | AR : Description". | | |
| | engine. ult to start engine? | | |
| YES | >> GO TO 3. | | |
| <u> </u> | >> GO TO 4. | | |
| | ART ENGINE | | |
| | icult to start engine, the gine while depressing a | e fuel injection system has a malfunction, too. accelerator pedal. | |
| NOTE: | | | |
| | pressing accelerator pe epress accelerator ped | edal three fourths (3/4) or more, the control syste al too much | m does not start the engine. |
| | aine start? | | |
| YES | >> Go to <u>EC-267, "Dia</u> | | |
| 4 | | s and check for fouling, etc. Refer to EM-48, "Exp | oloded View". |
| 4.PERF | ORM DTC CONFIRMA | ATION PROCEDURE-II | |
| | engine idle for at leas | t 10 minutes. | |
| | ck 1st trip DTC. | | |

Is 1st trip DTC detected?

YES >> Go to EC-267, "Diagnosis Procedure".

NO >> GO TO 5.

< DTC/CIRCUIT DIAGNOSIS >

5.PERFORM DTC CONFIRMATION PROCEDURE-III

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Start engine.
- 3. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

| VHCL SPEED SE 50 - | - 120 km/h (31 - 75 MPH) |
|--------------------|--------------------------|
|--------------------|--------------------------|

CAUTION:

Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>EC-267, "Diagnosis Procedure"</u>. NO >> INSPECTION END

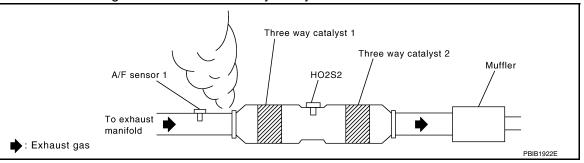
Diagnosis Procedure

INFOID:000000010596840

[VQ37VHR]

1.CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

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

2.CHECK FOR INTAKE AIR LEAK

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

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

 ${\it 3.}$ CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect corresponding A/F sensor 1 harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | |
|-------|--------------|------------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0172 | 1 | F123 | 1 | | 57 | |
| FUITZ | 1 | | F123 = | 2 | F102 | 61 |
| P0175 | 2 | F124 | 1 | F IUZ | 65 | Existed |
| F0175 | 175 Z F124 | 5 2 F124 2 | | 66 | | |

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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| DTC | | A/F sensor | r 1 | Ground | Continuity | |
|----------------------|------------------|---------------|--------------------|---------------------|-------------------------------------|----------------------------------------------------|
| | Bank | Connector | Terminal | | | |
| P0172 | 1 | F123 | 1 | | | |
| 10172 | | 1 120 | 2 | Ground | Not existed | |
| D0175 | 2 | E104 | 1 | Ground | NUL EXISIEU | |
| P0175 | 2 | F124 | 2 | | | |
| | 1 | 1 | l. | 1 | u | |
| | | ECM | | | | |
| DTC | Bank | Connector | Terminal | Ground | Continuity | |
| | | | 57 | | | |
| P0172 | 1 | - | 61 | | | |
| | | F102 | 65 | Ground | Not existed | |
| P0175 | 2 | - | | | | |
| | | | 66 | | | |
| 6. Also c | | | • | ower. | | |
| Is the insp | | | <u>iai ?</u> | | | |
| - | > GO 1 > Rena | - | cuit short | to around | or short to | power in harness or connectors. |
| 4.CHECK | - | - | | to ground | | |
| | | | | | | |
| | | | | | 628, "Inspe | |
| 2. Install | tuel pr | essure gau | ige and cr | песк тиег р | ressure. Re | fer to <u>EC-628, "Inspection"</u> . |
| ۸+ | idlina | Approvin | atoly 250 | kPa (2.57 | ⁷ kg/cm ² , 5 | 1 pci) |
| | | | | 1 KPa (3.51 | ky/cm , 5 | i psi) |
| Is the insp | | | <u>nal?</u> | | | |
| | > GO T | | tor and fu | ol numn or | noomblu" D | efer to FL-6, "Removal and Installation". |
| - | - | | | | Sembly . R | eler to <u>FL-0, Removal and Installation</u> . |
| 5.CHECK | MASS | S AIR FLO | W SENSC | R | | |
| With CC | | | | | | |
| | | oved parts | | | | |
| | | | | | OR [#] mode r Flow Sens | with CONSULT. |
| [©] With GS | | | 0 <u>LC-031</u> | <u>, iviass Ali</u> | | <u>or</u> . |
| 9 | | oved parts | . | | | |
| 2. Check | mass | air flow sei | nsor signa | | ce \$01" with | |
| • | | | | | r Flow Sens | <u>.or"</u> . |
| Is the mea | | | <u>ithin the s</u> | specificatio | <u>n?</u> | |
| | > GO 1 | | | | | |
| NO >: | | | | | als or loose | connections in the mass air flow sensor circuit or |
| 6 | | | | | SIS FIUCEUU | <u>e</u> . |
| 6. CHECK | FUNC | TION OF | FUEL INJ | ECTOR | | |
| With CC | | .т | | | | |
| 1. Start e | | | NCE" in ' | | EST" mode | with CONSULT. |
| | | | | | | ine speed drop. |
| Without | | | | | including only | |
| • | | and let it id | le. | | | |
| | | | | | | |

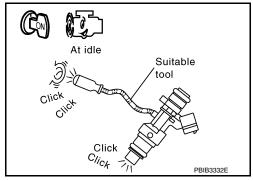
< DTC/CIRCUIT DIAGNOSIS >

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-506, "Diagnosis Procedure"</u>.



7. CHECK FUEL INJECTOR

- 1. Remove fuel injector assembly. Refer to <u>EM-38</u>, "<u>Removal and Installation</u>". Keep fuel hose and all fuel injectors connected to fuel tube.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- 4. Disconnect all ignition coil harness connectors.
- 5. Prepare pans or saucers under each fuel injector.
- Crank engine for about 3 seconds. Make sure fuel that does not drip from fuel injector.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Replace the fuel injectors from which fuel is dripping. (Refer to <u>EM-38</u>, "<u>Removal and Installa-</u> <u>tion</u>".) Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0181 FTT SENSOR

< 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 (k Ω) |
|--------------------------------|--------------|--------------------------|
| 20 (68) | 3.5 | 2.3 - 2.7 |
| 50 (122) | 2.2 | 0.79 - 0.90 |

*: These data are reference values and are measured between ECM terminals 106 (Fuel tank temperature sensor) and 128 (ECM ground).

DTC Logic

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?

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.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

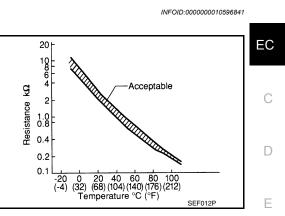
1. Turn ignition switch ON and wait at least 10 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-272, "Diagnosis Procedure".

Revision: February 2015



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P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 4.

4.CHECK ENGINE COOLANT TEMPERATURE

1. Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT.

2. Check "COOLAN TEMP/S" value.

"COOLAN TEMP/S" less than 60°C (140°F)?

YES >> INSPECTION END

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).

- 2. Wait at least 10 seconds.
- 3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-272, "Diagnosis Procedure".

NO >> GO TO 6.

6.PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to <u>EC-272, "Component Function Check"</u>. **NOTE:**

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

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to EC-272, "Diagnosis Procedure".

7. PRECONDITIONING

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

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

TEST CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 8.

8.PERFORM DTC CONFIRMATION PROCEDURE B

- 1. Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place. **NOTE:**

Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F). 3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION: Never turn ignition switch ON during soaking. NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more. CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to <u>EC-272, "Diagnosis Procedure"</u>.
- NO >> INSPECTION END

IVQ37VHR < DTC/CIRCUIT DIAGNOSIS > **Component Function Check** 1.CHECK FUEL TANK TEMPERATURE SENSOR Turn ignition switch OFF. Disconnect "fuel level sensor unit and fuel pump" harness connector. 3. Remove fuel level sensor unit. 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 $(k\Omega)$ 2.3 - 2.7 20 (68) 4 and 5 Temperature [°C (°F)] 50 (122) 0.79 - 0.90 Is the inspection result normal? >> GO TO 2. >> Proceed to EC-272, "Diagnosis Procedure". JMBIA0167ZZ 2.CHECK INTERMITTENT INCIDENT Check intermittent incident. Refer to GI-45. "Intermittent Incident". Is the inspection result normal? >> INSPECTION END >> Proceed to EC-272, "Diagnosis Procedure". Diagnosis Procedure INFOID:000000010596844 **1.**INSPECTION START Confirm the detected malfunction (A or B). Refer to EC-270, "DTC Logic". Which malfunction is detected? >> GO TO 2. >> GO TO 7.

 ${f 2}.$ CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

1.

2.

YES

YES

NO

YES

NO

NO

NO >> Go to MWI-58, "Component Function Check".

3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect "fuel level sensor unit and fuel pump" harness connector.

3. Turn ignition switch ON.

4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

| | 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"

P0181 FTT SENSOR

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P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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

5. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect "unified meter and A/C amp." harness connector.
- 3. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and "unified meter and A/C amp." harness connector.

| Fuel level sensor unit and fuel pump | | Unified met an | Continuity | |
|-----------------------------------------|----------|--------------------|------------|---------|
| Connector | Terminal | Connector Terminal | | |
| B22 | 5 | M67 | 58 | Existed |

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.

· Harness connectors M7, B1

• Harness for open or short between "fuel level sensor unit and fuel pump" and "unified meter and A/C amp."

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

1.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-273, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump". Refer to <u>FL-6, "Removal and Installation"</u>.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010596845

1.CHECK FUEL TANK TEMPERATURE SENSOR

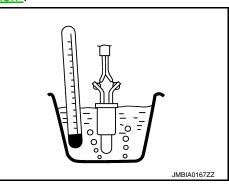
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to <u>FL-6, "Removal and Installation"</u>.
- Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (k Ω) | |
|-----------|-----------------------|--------------------------|-------------|
| 4 and 5 | Temperature [°C (°F)] | 20 (68) | 2.3 - 2.7 |
| | | 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>.



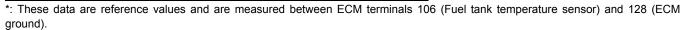
< DTC/CIRCUIT DIAGNOSIS >

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 (k Ω) |
|---|--------------------------------|--------------|--------------------------|
| | 20 (68) | 3.5 | 2.3 - 2.7 |
| | 50 (122) | 2.2 | 0.79 - 0.90 |



DTC Logic

INFOID:000000010596847

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 CON | FIRMATION PROCE | EDURE | | |
| 1.PRECO | NDITIONING | | | |
| before cond 1. Turn ig | ducting the next test. | has been previously conducted, alwa wait at least 10 seconds. | ys perform the following procedure | |
| | | wait at least 10 seconds. | | |
| >> | • GO TO 2. | | | |
| 2.PERFO | RM DTC CONFIRMAT | ION PROCEDURE | | |
| | nition switch ON and v 1st trip DTC. | wait at least 5 seconds. | | |
| | TC detected? | | | |
| YES >> | Go to <u>EC-274, "Diag</u>e INSPECTION END | nosis Procedure". | | |
| - | s Procedure | | | |
| | | | INFOID:000000010596848 | |
| I.INSPEC | TION START | | | |
| | | (A or B). Refer to <u>EC-270, "DTC Logic"</u> | | |
| | function is detected? | | | |
| - | • GO TO 2. • GO TO 7. | | | |
| ^ | | METER AND A/C AMP." | | |
| L .UNEUK | | | | |

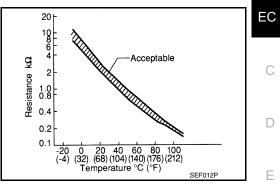
EC-273

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P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to <u>MWI-58</u>, "Component Function Check".

3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect "fuel level sensor unit and fuel pump" harness connector.

3. Turn ignition switch ON.

4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

| | 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"

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

5. Check fuel tank temperature sensor ground circuit for open and short

1. Turn ignition switch OFF.

2. Disconnect "unified meter and A/C amp." harness connector.

3. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and "unified meter and A/C amp." harness connector.

| Fuel level sensor unit and fuel pump | | Unified me an | Continuity | |
|-----------------------------------------|----------|--------------------|------------|---------|
| Connector | Terminal | Connector Terminal | | |
| B22 | 5 | M67 | 58 | Existed |

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.

· Harness connectors M7, B1

• Harness for open or short between "fuel level sensor unit and fuel pump" and "unified meter and A/C amp."

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

7.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-276, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump". Refer to <u>FL-6, "Removal and Installation"</u>.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

< DTC/CIRCUIT DIAGNOSIS >

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>> INSPECTION END

Component Inspection

$1. {\sf CHECK FUEL TANK TEMPERATURE SENSOR}$

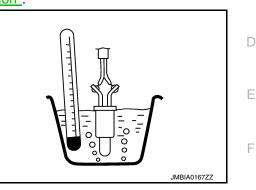
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance (k Ω) |
|-----------|-----------------------|----------|--------------------------|
| 4 and 5 | Temperature [°C (°F)] | 20 (68) | 2.3 - 2.7 |
| 4 and 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>.





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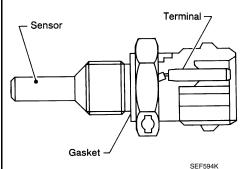
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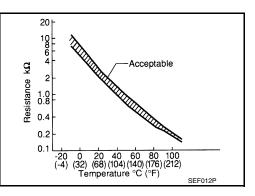
Description

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

INFOID:000000010596851

DTC DETECTION LOGIC **NOTE**:

If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198. Refer to <u>EC-281, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|-----------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| | EOT SENSOR | | 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 |
| 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 |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

| YES | >> GO TO 6. |
|-------|---------------|
| NO | >> GO TO 2. |
| 2.PRE | ECONDITIONING |

Revision: February 2015

INFOID:000000010596850

| DTC/CIRCUIT DIAGNOSIS > | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | [VQ37VHR] |
| | y conducted, always perform the following procedure |
| efore conducting the next test. Turn ignition switch OFF and wait at least 10 seco | nde |
| Turn ignition switch ON. | nus. |
| Turn ignition switch OFF and wait at least 10 seco | nds. |
| ESTING CONDITION: efore performing the following procedure, confin | n that hattery voltage is more than 11 V at idle |
| erore performing the following procedure, comm | in that battery voltage is more than in v at the. |
| >> GO TO 3. | |
| PERFORM DTC CONFIRMATION PROCEDURE-I | |
| Start engine and warm it up to normal operating te | |
| Turn ignition switch OFF and wait at least 10 seco Turn ignition switch ON. | nds. |
| Turn ignition switch OFF and wait at least 10 seco | nds. |
| Start engine and let it idle for 5 minutes and 10 se | |
| Check 1st trip DTC. | |
| <u>1st trip DTC detected?</u> | |
| 'ES >> EC-280, "Diagnosis Procedure". IO >> GO TO 4. | |
| .PERFORM DTC CONFIRMATION PROCEDURE-I | 1 |
| Select "DATA MONITOR" mode with CONSULT. | |
| Check that "COOLAN TEMP/S" indicates above 8 | 0°C (176°F). |
| If it is above 80°C (176°F), go to the following step | |
| Then perform the following steps. | "COOLAN TEMP/S" indicates more than 80°C (176°F). |
| Turn ignition switch OFF and soak the vehicle in a | cool place. |
| Turn ignition switch ON. | ndo |
| Turn ignition switch OFF and wait at least 10 seco Turn ignition switch ON. | nus. |
| | |
| NOTE: | |
| Do not turn ignition switch OFF until step 10. | |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. | |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. | |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) Within 6°C (11°F) |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) Within 6°C (11°F) following steps. |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) Within 6°C (11°F) following steps. |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) Within 6°C (11°F) following steps. |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) Within 6°C (11°F) following steps. icle to meet the above conditions. Then perform the fol- |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. OOLAN TEMP/S MT/A TEMP SE ifference between "COOLAN TEMP/S" and "INT/A TEMP SE" If they are within the specified range, perform the If they are out of the specified range, soak the veh lowing steps. NOTE: | Below 40°C (104°F) Within 6°C (11°F) following steps. icle to meet the above conditions. Then perform the fol- |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. COOLAN TEMP/S NT/A TEMP SE Difference between "COOLAN TEMP/S" and "INT/A TEMP SE" If they are within the specified range, perform the If they are out of the specified range, soak the veh lowing steps. NOTE: • Do not turn ignition switch OFF. • If it is supposed to need a long period of time Start engine and let it idle for 5 minutes. | Below 40°C (104°F) Within 6°C (11°F) following steps. icle to meet the above conditions. Then perform the fol- |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. | Below 40°C (104°F) Within 6°C (11°F) following steps. icle to meet the above conditions. Then perform the fol- |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. COOLAN TEMP/S NT/A TEMP SE Difference between "COOLAN TEMP/S" and "INT/A TEMP SE" If they are within the specified range, perform the If they are out of the specified range, soak the veh lowing steps. NOTE: • Do not turn ignition switch OFF. • If it is supposed to need a long period of time Start engine and let it idle for 5 minutes. 0. Check 1st trip DTC. 1st trip DTC detected? (ES >> EC-280, "Diagnosis Procedure". | Below 40°C (104°F) Within 6°C (11°F) following steps. icle to meet the above conditions. Then perform the fol- |
| Do not turn ignition switch OFF until step 10. Select "DATA MONITOR" mode with CONSULT. Check the following. COOLAN TEMP/S NT/A TEMP SE Difference between "COOLAN TEMP/S" and "INT/A TEMP SE" If they are within the specified range, perform the If they are out of the specified range, soak the veh lowing steps. NOTE: • Do not turn ignition switch OFF. • If it is supposed to need a long period of time Start engine and let it idle for 5 minutes. 0. Check 1st trip DTC. 1st trip DTC detected? | Below 40°C (104°F) Within 6°C (11°F) following steps. icle to meet the above conditions. Then perform the fol- e, do not deplete the battery. |

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

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< DTC/CIRCUIT DIAGNOSIS >

NO >> Proceed to <u>EC-280, "Diagnosis Procedure"</u>.

6.PRECONDITIONING

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

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

TEST CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 7.

7.PERFORM DTC CONFIRMATION PROCEDURE B

- 1. Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place.

Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F). Turn ignition switch OFF and soak the vehicle for 12 hours.

 Turn ignition switch OFF and soak the vehicle for 12 CAUTION: Never turn ignition switch ON during soaking. NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more. CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to EC-280, "Diagnosis Procedure".
- NO >> INSPECTION END

Component Function Check

1.CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect EOT sensor harness connector.
- 3. Remove EOT sensor. Refer to EM-44, "Exploded View".
- 4. Check resistance between EOT sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance (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 >> GO TO 2.

NO >> Proceed to <u>EC-280, "Diagnosis Procedure"</u>.

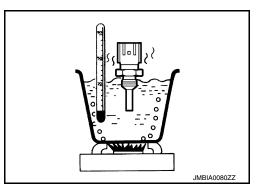
2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to <u>EC-280, "Diagnosis Procedure"</u>.



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[VQ37VHR]

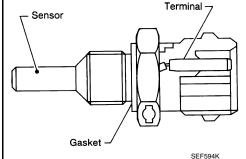
| | | F | 20196 EOT S | ENSOR | | |
|--------------|-----------------------------------------------------|-----------------|--------------------------|------------------------------------|------------------------|------|
| < DTC/CIR | RCUIT DIAGNOSIS | > | | | [VQ37VHR] | |
| Diagnosi | s Procedure | | | | INFOID:000000010596853 | Δ |
| 1.снеск | GROUND CONNEC | CTION | | | | A |
| | nition switch OFF. | ADE Defe | to Cround Inone | ation in CL 49. "Circuit I | noncotion" | EC |
| | ection result normal? | | to Ground Inspe | ction in <u>GI-48, "Circuit I</u> | <u>Inspection</u> . | |
| YES >> | > GO TO 2. | | | | | C |
| - | Repair or replace g | | | | | C |
| | ENGINE OIL TEMP | | | | | |
| | <u>C-280, "Component I</u> ection result normal? | | <u>_</u> . | | | D |
| - | > GO TO 3. | | | | | |
| - | | | ire sensor. Refer | o EM-44, "Exploded Vi | <u>ew"</u> . | Ε |
| 3.CHECK | INTERMITTENT IN | CIDENT | | | | |
| Refer to GI | -45, "Intermittent Inc | <u>ident"</u> . | | | | F |
| ~ | > INSPECTION END | | | | | |
| | ent Inspection | | | | | G |
| | - | | | | INFOID:000000010596854 | |
| 1.CHECK | ENGINE OIL TEMP | ERATURE | ESENSOR | | | Н |
| | inition switch OFF. Inect engine oil temp | oraturo se | nsor harness cor | nector | | |
| 3. Remov | e engine oil tempera | ature sens | or. Refer to EM-4 | "Exploded View". | | |
| | resistance between / heating with hot wa | | | sor termi- | G | |
| | | | | | | |
| Terminals | Condition | | Resistance (k Ω) | | | J |
| | | 20 (68) | 2.1 - 2.9 | | | |
| 1 and 2 | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 | | | Κ |
| le the incre | ection result normal? | 90 (194) | 0.236 - 0.260 | | | |
| - | > INSPECTION END | | | | | L |
| NO >> | Replace engine oil "Evaluated View" | temperatu | ire sensor. Refer | to <u>EM-44.</u> | JMBIA0080ZZ | |
| | "Exploded View". | | | | | Ъ. Л |
| | | | | | | Μ |
| | | | | | | |
| | | | | | | Ν |
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| | | | | | | 0 |
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< DTC/CIRCUIT DIAGNOSIS >

P0197, P0198 EOT SENSOR

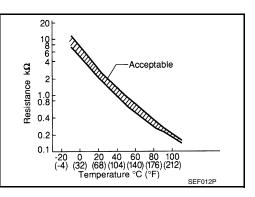
Description

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 ($k\Omega$) |
|-------------------------------------|--------------|--------------------------|
| -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

DTC DETECTION LOGIC

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---------|----------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 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.) |
| P0198 | Engine oil tempera- ture sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | Engine oil temperature sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> 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?

INFOID:000000010596855

INFOID:000000010596856

P0197, P0198 EOT SENSOR

| | [VQ37VHR] |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| YES >> Go to <u>EC-282, "Diagnosis Procedure"</u> . NO >> INSPECTION END | |
| Diagnosis Procedure | INFOID:000000010596857 |
| 1. CHECK GROUND CONNECTION | |
| 1. Turn ignition switch OFF. | |
| 2. Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u> . | |
| <u>ls the inspection result normal?</u> YES >> GO TO 2. | |
| NO >> Repair or replace ground connection. | |
| 2. CHECK EOT SENSOR POWER SUPPLY CIRCUIT | |
| Disconnect engine oil temperature (EOT) sensor harness connector. Turn ignition switch ON. | |
| 3. Check the voltage between EOT sensor harness connector and ground. | |
| EOT sensor | |
| Connector Terminal Ground Voltage (V) | |
| F38 1 Ground Approx. 5 | |
| s the inspection result normal? YES >> GO TO 3. | |
| NO >> Repair open circuit, short to ground or short to power in harness or connectors. | |
| 3 .CHECK EOT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT | |
| Turn ignition switch OFF. Disconnect ECM harness connector. | |
| | |
| | |
| Check the continuity between EOT sensor harness connector and ECM harness connector. | |
| | : |
| Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor ECM Continuity | |
| Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor ECM Continuity Connector Terminal Connector Terminal F38 2 F102 84 Existed Also check harness for short to ground and short to power. | |
| Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor ECM Continuity Connector Terminal Connector Terminal F38 2 F102 84 Existed Also check harness for short to ground and short to power. | |
| Check the continuity between EOT sensor harness connector and ECM harness connector. <u>EOT sensor</u> <u>ECM</u> <u>Continuity</u> <u>Connector</u> <u>Terminal</u> <u>Connector</u> <u>Terminal</u> <u>F38</u> <u>2</u> <u>F102</u> <u>84</u> <u>Existed</u> Also check harness for short to ground and short to power. <u>s the inspection result normal?</u> YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. | |
| Check the continuity between EOT sensor harness connector and ECM harness connector. <u>EOT sensor</u> <u>ECM</u> <u>Continuity</u> <u>Connector</u> <u>Terminal</u> <u>Connector</u> <u>Terminal</u> <u>F38</u> <u>2</u> <u>F102</u> <u>84</u> <u>Existed</u> 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 OIL TEMPERATURE SENSOR | |
| Check the continuity between EOT sensor harness connector and ECM harness connector. <u>EOT sensor</u> <u>ECM</u> <u>Continuity</u> <u>Connector</u> <u>Terminal</u> <u>Connector</u> <u>Terminal</u> <u>F38</u> <u>2</u> <u>F102</u> <u>84</u> <u>Existed</u> 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 OIL TEMPERATURE SENSOR Refer to <u>EC-282, "Component Inspection"</u>. | |
| 3. Check the continuity between EOT sensor harness connector and ECM harness connector. <u>EOT sensor</u> <u>ECM</u> <u>Continuity</u> <u>Connector</u> <u>Terminal</u> <u>Connector</u> <u>Terminal</u> <u>Continuity</u> <u>F38</u> <u>2</u> <u>F102</u> <u>84</u> <u>Existed</u> 4. Also check harness for short to ground and short to power. <u>s 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 OIL TEMPERATURE SENSOR Refer to <u>EC-282, "Component Inspection"</u>. <u>s the inspection result normal?</u> YES >> GO TO 5. | |
| EOT sensor ECM Continuity Connector Terminal Connector Terminal F38 2 F102 84 Existed 4. Also check harness for short to ground and short to power. Image: Sthe inspection result normal? YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. 4. CHECK ENGINE OIL TEMPERATURE SENSOR Refer to EC-282, "Component Inspection". Image: Sthe inspection result normal? YES >> GO TO 5. NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View". | |
| 3. Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor ECM Connector Terminal Connector Terminal F38 2 F102 84 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. 4. CHECK ENGINE OIL TEMPERATURE SENSOR Refer to EC-282, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View". 5. CHECK INTERMITTENT INCIDENT | |
| 3. Check the continuity between EOT sensor harness connector and ECM harness connector. <u>EOT sensor</u> <u>ECM</u> <u>Continuity</u> <u>Connector</u> <u>Terminal</u> <u>Connector</u> <u>Terminal</u> <u>Continuity</u> <u>F38</u> <u>2</u> <u>F102</u> <u>84</u> <u>Existed</u> 4. 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 OIL TEMPERATURE SENSOR Refer to <u>EC-282, "Component Inspection"</u>. <u>Is the inspection result normal?</u> YES >> GO TO 5. | |
| 3. Check the continuity between EOT sensor harness connector and ECM harness connector. <u>EOT sensor</u> <u>ECM</u> <u>Continuity</u> <u>Connector</u> <u>Terminal</u> <u>Connector</u> <u>Terminal</u> <u>Continuity</u> <u>F38</u> <u>2</u> <u>F102</u> <u>84</u> <u>Existed</u> 4. 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 OIL TEMPERATURE SENSOR Refer to <u>EC-282</u>, "<u>Component Inspection</u>". <u>Is the inspection result normal?</u> YES >> GO TO 5. NO >> Replace engine oil temperature sensor. Refer to <u>EM-44</u>, "<u>Exploded View</u>". 5. CHECK INTERMITTENT INCIDENT | |
| 3. Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor ECM Connector Terminal F38 2 F102 84 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES > GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. 4. CHECK ENGINE OIL TEMPERATURE SENSOR Refer to EC-282, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View". 5.CHECK INTERMITTENT INCIDENT Refer to GI-45, "Intermittent Incident". | |
| 3. Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor ECM Connector Terminal F38 2 F102 84 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. 4. CHECK ENGINE OIL TEMPERATURE SENSOR Refer to EC-282, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View". 5. CHECK INTERMITTENT INCIDENT Refer to GI-45. "Intermittent Incident". >> INSPECTION END | |

2. Disconnect engine oil temperature sensor harness connector.

3. Remove engine oil temperature sensor. Refer to EM-44, "Exploded View".

P0197, P0198 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

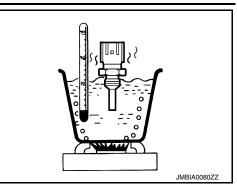
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

| 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. Refer to <u>EM-44.</u> <u>"Exploded View"</u>.



P0222, P0223, P2132, P2133 TP SENSOR

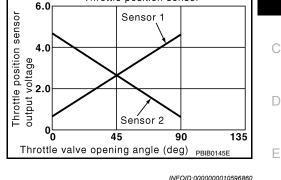
< DTC/CIRCUIT DIAGNOSIS >

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 throttle valve opening angle in response to driving conditions via the throttle control motor.



Throttle position sensor

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-378, "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. ${\ensuremath{\mathbb N}}$

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to EC-285. "Diagnosis Procedure".
- NO >> INSPECTION END

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P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

INFOID:000000010596861

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.

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

| DTC | Electr | ic throttle cont | Ground | Voltage (V) | |
|--------------|--------|------------------|----------|-------------|-------------|
| DIC | Bank | Connector | Terminal | Ground | voltage (v) |
| P0222, P0223 | 1 | F6 | 6 | Ground | Approx. 5 |
| P2132, P2133 | 2 | F27 | 1 | Ground | |

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|--------------|------------------------------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0222, P0223 | 1 | F6 | 3 | F101 | 40 | Existed |
| P2132, P2133 | 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 1 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 | | | ECM | | Continuity |
|--------------|------------------------------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0222, P0223 | 1 | F6 | 4 | F101 | 30 | Existed |
| P2132, P2133 | 2 | F27 | 2 | FIUI | 31 | 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 THROTTLE POSITION SENSOR

Refer to EC-286, "Component Inspection".

P0222, P0223, P2132, P2133 TP SENSOR

| | | 2, PUZZ3, | , P2132, P213 | 53 IP SENS | UR | [VQ37VHR] |
|-------------------|---------------------------------------------------|------------------|---------------------|-----------------------------------|----------------------------------|------------------------|
| | RCUIT DIAGNOSIS > | | | | | |
| | <u>ection result normal?</u> > GO TO 7. | | | | | |
| | > GO TO 6. | | | | | |
| 6.REPLA | CE ELECTRIC THROT | TLE CONT | ROL ACTUATOR | | | |
| 1. Repla | ce malfunctioning election | ric throttle co | ontrol actuator. Re | efer to <u>EM-29,</u> " | Removal and Ins | stallation". |
| 2. Go to | EC-286, "Special Repa | ir Requireme | <u>ent"</u> . | | | |
| > | > INSPECTION END | | | | | |
| _ | | DENT | | | | |
| | I-45, "Intermittent Incide | | | | | |
| | <u> </u> | <u></u> . | | | | |
| > | > INSPECTION END | | | | | |
| Compor | ent Inspection | | | | | INFOID:000000010596862 |
| | (THROTTLE POSITIO | | | | | |
| | | IN SEINSUR | | | | |
| 2. Recor | gnition switch OFF. nnect all harness conne | | | | | |
| | m <u>EC-20, "THROTTLE</u> gnition switch ON. | VALVE CLC | DSED POSITION | LEARNING : D | escription". | |
| | elector lever to D positio | n. | | | | |
| 6. Check | the voltage between E | CM harness | connector termir | nals under the f | ollowing conditio | ins. |
| | ECM | | | | | |
| | + | _ | Cond | ition | Voltage (V) | |
| Connector | Terminal | Terminal | | | voluge (v) | |
| | | 40 | | Fully released | More than 0.36 | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | 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 | |
| | 34 [TP sensor 2 (bank 1)] | 40 | | Fully released | Less than 4.75 | |
| | | | - | Fully depressed Fully released | More than 0.36 Less than 4.75 | |
| | 35 [TP sensor 2 (bank 2)] | 48 | | Fully depressed | More than 0.36 | |
| Is the insp | ection result normal? | | | r any approcedu | | |
| YES > | > INSPECTION END | | | | | |
| _ | > GO TO 2. | | | | | |
| | CE ELECTRIC THROT | | | | | |
| | ce malfunctioning electi EC-286, "Special Repa | | | efer to <u>EM-29, "</u> | Removal and Ins | stallation". |
| 2. 00.10 | | | <u>ont</u> . | | | |
| > | > INSPECTION END | | | | | |
| Special | Repair Requireme | nt | | | | INFOID:000000010596863 |
| | • • | | | | | |
| | ORM THROTTLE VALVE | | | | | |
| Refer to <u>E</u> | <u>C-20, "THROTTLE VAL</u> | <u>VE CLOSEI</u> | D POSITION LEA | RNING : Descr | iption" | |
| | > GO TO 2. | | | | | |
| | - 50 10 2. | | | | | |

2.PERFORM IDLE AIR VOLUME LEARNING

< DTC/CIRCUIT DIAGNOSIS >

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

>> END

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic

INFOID:000000010596864

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input signal to ECM | ECM function | |
|----------------------------------|---------------------|-------------------------------|--|
| Crankshaft position sensor (POS) | Engine speed | On board diagnosis of misfire | |

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)

On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.

When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.

When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off. If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink. When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain illuminating.

If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.

2. Two Trip Detection Logic (Exhaust quality deterioration)

For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP H 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 | J |
| 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 | k |
| P0304 | No. 4 cylinder misfire detected | No. 4 cylinder misfires. | The ignition signal circuit is open or shorted | |
| P0305 | No. 5 cylinder misfire detected | No. 5 cylinder misfires. | Lack of fuel Signal plate | |
| P0306 | No. 6 cylinder misfire detected | No. 6 cylinder misfires. | A/F sensor 1 Incorrect PCV hose connection | 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.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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

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P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

YES >> Go to <u>EC-289</u>, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.

Hold the accelerator pedal as steady as possible.

Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.

CAUTION:

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

| Engine speed | Engine speed in the freeze frame data ±400 rpm | |
|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--|
| Vehicle speedVehicle speed in the freeze frame data \pm 10 km/h (6 MPH) | | |
| 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). | |
| 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). | |

Driving time varies according to the engine speed in the freeze frame data.

| Engine speed | Time |
|---------------------|---------------------------|
| Around 1,000 rpm | Approximately 10 minutes |
| Around 2,000 rpm | Approximately 5 minutes |
| More than 3,000 rpm | Approximately 3.5 minutes |

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-289, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- 1. Start engine and run it at idle speed.
- 2. Listen for the sound of the intake air leak.
- 3. Check PCV hose connection.

Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 2.

2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 3.
- YES-2 >> Without CONSULT: GO TO 4.
- NO >> Repair or replace it.

3.PERFORM POWER BALANCE TEST

With CONSULT

1. Start engine.

2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.

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< DTC/CIRCUIT DIAGNOSIS >

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-506, "Diagnosis Procedure"</u>.



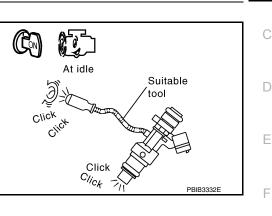
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5. CHECK FUNCTION OF IGNITION COIL-I

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.
- After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

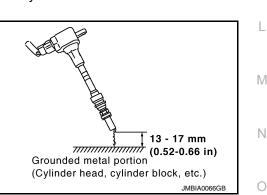
CAUTION:

- Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

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



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[VQ37VHR]

6.CHECK FUNCTION OF IGNITION COIL-II

- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

YES >> GO TO 7.

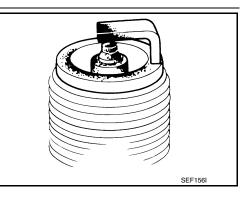
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-516, "Diagnosis Procedure".

7.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). (Refer to <u>EM-23, "Removal and Installation"</u>.) For spark plug type, refer to <u>EM-24, "Inspection"</u>.
- NO >> Repair or clean spark plug. Then GO TO 8.



8. CHECK FUNCTION OF IGNITION COIL-III

- 1. Reconnect the initial spark plugs.
- 2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace spark plug(s) with standard type one(s). (Refer to <u>EM-23</u>, "<u>Removal and Installation</u>".) For spark plug type, refer to <u>EM-24</u>, "<u>Inspection</u>".

9.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-16, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.

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

10.CHECK FUEL PRESSURE

1. Install all removed parts.

- 2. Release fuel pressure to zero. Refer to EC-628, "Inspection".
- 3. Install fuel pressure gauge and check fuel pressure. Refer to EC-628, "Inspection".

At idle: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to <u>FL-6, "Removal and Installation"</u>.

NO >> Repair or replace.

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12.CHECK IDLE SPEED AND IGNITION TIMING For procedure, refer to <u>EC-14</u>, "<u>BASIC INSPECTION</u> : <u>Special Repair Requirement</u>". For specification, refer to <u>EC-631</u>, "<u>Idle Speed</u>" and <u>EC-631</u>, "<u>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 ECM | | | CM | Continuity |
|--------|------------------|----------|-----------|----------|------------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F123 | E122 | | 57 | Existed |
| I | 1 125 | 2 | F102 | 61 | |
| 2 F124 | 1 | FIUZ | 65 | Existed | |
| 2 | F124 | 2 | 2 | 66 | + |

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

| | A/F sensor | Ground | Continuity | | |
|------|--------------|----------|------------|-------------|--|
| Bank | Connector | Terminal | Ground | Continuity | |
| 1 | F123 F124 | 1 | Ground | Not existed | |
| | | 2 | | | |
| 2 | | 1 | | | |
| 2 | | 2 | | | |

| | | ECM | | Ground | Continuity |
|---|------|-----------|----------|----------|-------------|
| - | Bank | Connector | Terminal | Cround | |
| - | 1 | | 57 | - Ground | Not existed |
| | 1 | F102 | 61 | | |
| - | 2 | FIUZ | 65 | | |
| 2 | 2 | | 66 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.

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

14.CHECK A/F SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace (malfunctioning) A/F sensor 1. Refer to EM-34, "Exploded View".

15.CHECK MASS AIR FLOW SENSOR

With CONSULT

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT. For specification, refer to <u>EC-631, "Mass Air Flow Sensor"</u>.

With GST

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Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to EC-631, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 16.

>> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or NO ground. Refer to EC-195, "Diagnosis Procedure".

16.CHECK SYMPTOM TABLE

Check items on the rough idle symptom in EC-616, "Symptom Table".

Is the inspection result normal?

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

17.ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set. Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-143. "On Board Diagnosis Function" or EC-146, "CONSULT Function".

>> GO TO 18.

18. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

< 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

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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. | | E | | | | |
| 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.) | F | | | | |
| P0332 | Knock sensor (bank 2) circuit low input | An excessively low voltage from the sensor is sent to ECM. | Knock sensor | | | | | |
| P0333 | 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.

Κ >> GO TO 2. 2.PERFORM DTC CONFIRMATION PROCEDURE 1. Start engine and run it for at least 5 seconds at idle speed. L Check 1st trip DTC. 2. Is 1st trip DTC detected? YFS >> Go to EC-294, "Diagnosis Procedure". M NO >> INSPECTION END Diagnosis Procedure INFOID:000000010596868 Ν 1. CHECK GROUND CONNECTION Turn ignition switch OFF. 1. Ο Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 2. Ρ 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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P0327, P0328, P0332, P0333 KS

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| DTC | Knock sensor | | | ECM | | Continuity |
|--------------|--------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0327, P0328 | 1 | F203 | 2 | F102 | 72 | Existed |
| P0332, P0333 | 2 | F202 | 2 | 1102 | 12 | LAISICU |

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

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F9, F201

Harness for open or short between knock sensor and ECM

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

4. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | Knock sensor | | | ECM | | Continuity | |
|--------------|--------------|-----------|----------|-----------|----------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0327, P0328 | 1 | F203 | 1 | F102 | 73 | Existed | |
| P0332, P0333 | 2 | F202 | 1 | 1102 | 69 | LAISIEU | |

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F9, F201

Harness for open or short between ECM and knock sensor

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

6.CHECK KNOCK SENSOR

Refer to EC-295, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning knock sensor. Refer to <u>EM-122</u>, "Exploded View".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK KNOCK SENSOR

1. Turn ignition switch OFF.

- 2. Disconnect knock sensor harness connector.
- 3. Check resistance between knock sensor terminals as per the following. **NOTE:**



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P0327, P0328, P0332, P0333 KS

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It is necessary to use an ohmmeter which can measure more than 10 M Ω . А Terminals Resistance (kΩ) 1 and 2 Approx. 532 - 588 [at 20°C (68°F)] EC **CAUTION:** Do not use any knock sensors that have been dropped or physically damaged. Use only new ones. Is the inspection result normal? С YES >> INSPECTION END NO >> Replace malfunctioning knock sensor. Refer to EM-122, "Exploded View". D

< 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.

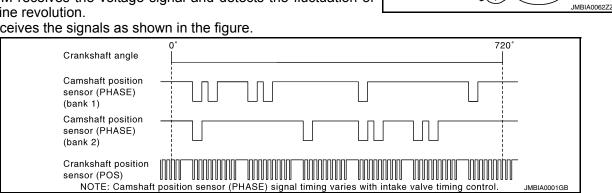
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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.



DTC Logic

INFOID:000000010596871

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 Brake booster pressure sensor Signal plate |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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 10.5 V with ignition switch ON.



< DTC/CIRCUIT DIAGNOSIS >

| >> GO TO 2. 2.PERFORM DTC CONFIRMATION PROCEDURE | А |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds. Check 1st trip DTC. | EC |
| Is 1st trip DTC detected? YES >> Go to EC-298, "Diagnosis Procedure". NO >> INSPECTION END | С |
| Diagnosis Procedure | D |
| 1. CHECK GROUND CONNECTION | |
| Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u>. <u>Is the inspection result normal?</u> | E |
| YES >> GO TO 2. | F |
| NO >> Repair or replace ground connection. 2.CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I | G |
| Disconnect crankshaft position (CKP) sensor (POS) harness connector. Turn ignition switch ON. Check the voltage between CKP sensor (POS) harness connector and ground. | Н |
| CKP sensor (POS) Ground Voltage (V) | |
| Connector Terminal F2 1 Ground Approx. 5 | I |
| Is the inspection result normal? | |
| YES >> GO TO 8. NO >> GO TO 3. | J |
| 3. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II 1. Turn ignition switch ON. | K |
| Disconnect ECM harness connector. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector. | L |
| CKP sensor (POS) ECM Continuity | |
| Connector Terminal Connector Terminal | \mathbb{M} |
| F2 1 F101 46 Existed Is the inspection result normal? | |
| YES >> GO TO 4. | Ν |
| NO >> Repair open circuit. | |
| 4.CHECK SENSOR POWER SUPPLY CIRCUIT | 0 |
| 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 | I | |

Ρ

< DTC/CIRCUIT DIAGNOSIS >

| ECM | | Sensor | | | |
|-----------|-------------------------|-------------------------------------|-----------------------|----------|--|
| Connector | Connector Terminal Name | | Connector | Terminal | |
| | 103 A | APP sensor | E112 (Without ICC) | 6 | |
| M107 | 105 | | E116 (With ICC) | 3 | |
| | | EVAP control system pressure sensor | B252 | 3 | |
| | 107 | 107 Refrigerant pressure sensor | E77 | 3 | |

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK COMPONENTS

Check the following.

• EVAP control system pressure sensor (Refer to EC-334, "Component Inspection".)

• Refrigerant pressure sensor (Refer to <u>EC-529, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

7.Replace accelerator pedal assembly

1. Replace accelerator pedal assembly. Refer to <u>ACC-3, "Removal and Installation"</u>.

2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

8.CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sens | or (POS) | EC | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F2 | 2 | F101 | 47 | Existed |

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

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sens | or (POS) | EC | CM | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F2 | 3 | F101 | 37 | Existed |

2. Also check harness for short to ground and short to power. <u>Is the inspection result normal?</u>

| P0335 CKP SENSOR (POS) | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| YES >> GO TO 10. NO >> Repair open circuit, short to ground or short to power in harness or connectors 10.CHECK CRANKSHAFT POSITION SENSOR (POS) | 5. A |
| Refer to EC-300, "Component Inspection". | EC |
| Is the inspection result normal? | |
| YES >> GO TO 11. NO >> Replace crankshaft position sensor (POS). Refer to <u>EM-122, "Exploded View"</u> 11. CHECK GEAR TOOTH | . С |
| Visually check for chipping signal plate gear tooth. | |
| Is the inspection result normal? | D |
| YES >> GO TO 12. NO >> Replace the signal plate. Refer to <u>EM-122, "Exploded View"</u> . 12. CHECK INTERMITTENT INCIDENT | E |
| Refer to GI-45, "Intermittent Incident". | |
| >> INSPECTION END | F |
| Component Inspection | INFOID:000000010596873 |
| 1.CHECK CRANKSHAFT POSITION SENSOR (POS)-I | |
| Turn ignition switch OFF. Loosen the fixing bolt of the sensor. Disconnect crankshaft position sensor (POS) harness connector. Remove the sensor. Refer to <u>EM-122</u>, "<u>Exploded View</u>". | Н |
| 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> 122, "Exploded View". | J |
| TZZ, Exploded view. | к |
| | JMBIA0063ZZ |
| 2.CHECK CRANKSHAFT POSITION SENSOR (POS)-II | |
| Check resistance between crankshaft position sensor (POS) terminals as follows. | M |
| Terminals (Polarity) Resistance (Ω) | NI |
| <u>1 (+) - 2 (-)</u> | Ν |
| $\frac{1 (+) - 3 (-)}{2 (+) - 2 (+)} = \text{Except 0 or } \infty \text{ [at 25°C (77°F)]}$ | |
| 2 (+) - 3 (-) Is the inspection result normal? | 0 |
| YES >> INSPECTION END | |
| NO >> Replace crankshaft position sensor (POS). Refer to <u>EM-122, "Exploded View"</u> | P |
| | |

< 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.

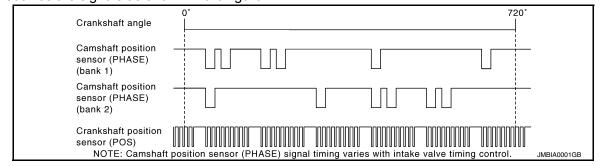
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes. ECM receives the signals as shown in the figure.



DTC Logic

INFOID:000000010596875

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DTC DETECTION LOGIC

NOTE:

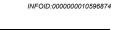
If DTC P0340 or P0345 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-378, "DTC Logic"</u>.

| 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 during engine running. The cylinder No. signal is not in the normal pattern during engine running. | Harness or connectors [CMP sensor (PHASE) (bank 1) circuit is open or shorted.] Camshaft position sensor (PHASE) (bank 1) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery |
| P0345 | Camshaft position sen- sor (PHASE) (bank 2) circuit | | Harness or connectors [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] Camshaft position sensor (PHASE) (bank 2) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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



| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Turn ignition switch OFF and wait at least 10 Turn ignition switch ON. |) seconds. |
| 3. Turn ignition switch OFF and wait at least 10 |) seconds. |
| TESTING CONDITION: Before performing the following procedure of | confirm that battom voltage is more than 10.5 V with igni |
| tion switch ON. | confirm that battery voltage is more than 10.5 V with igni- |
| | |
| >> GO TO 2. | |
| 2. PERFORM DTC CONFIRMATION PROCEDU | JRE-I |
| 1. Start engine and let it idle for at least 5 second | |
| If engine does not start, crank engine for at le 2. Check 1st trip DTC. | east 2 seconds. |
| <u>Is 1st trip DTC detected?</u> | |
| YES >> Go to EC-302, "Diagnosis Procedure | 2". |
| NO >> GO TO 3. | |
| 3. PERFORM DTC CONFIRMATION PROCEDU | JRE-II |
| 1. Maintaining engine speed at more than 800 | rpm for at least 5 seconds. |
| 2. Check 1st trip DTC. | |
| <u>Is 1st trip DTC detected?</u> YES >> Go to <u>EC-302</u> , "Diagnosis Procedure | 2" |
| NO >> INSPECTION END | <u>2</u> . |
| Diagnosis Procedure | INFOID:000000010596876 |
| 1.CHECK STARTING SYSTEM | |
| Turn ignition switch to START position. | |
| Does the engine turn over? Does the starter mote | or operate? |
| YES >> GO TO 2. | |
| NO >> Check starting system. (Refer to <u>EC</u> . 2.CHECK GROUND CONNECTION | - <u>9, "Work Flow"</u> .) |
| | |
| Turn ignition switch OFF. Check ground connection M95. Refer to Gro | und Inspection in GI-48. "Circuit Inspection". |
| Is the inspection result normal? | <u> </u> |
| YES >> GO TO 3. | |
| NO >> Repair or replace ground connection | |
| 3. CHECK CAMSHAFT POSITION (CMP) SENS | SOR (PHASE) POWER SUPPLY CIRCUIT |
| Disconnect camshaft position (CMP) sensor Turn ignition switch ON. | (PHASE) harness connector. |
| Turn ignition switch ON. Check the voltage between CMP sensor (PF | IASE) harness connector and ground. |
| Ç X | , |
| DTC CMP sensor (PHASE) Ground | Voltage (V) |
| Bank Connector Terminal | |
| P0340 1 F5 1 Ground | Approx. 5 |
| P0345 2 F18 1 | |
| Is the inspection result normal? | |
| YES >> GO TO 5. NO >> GO TO 4. | |
| 4. DETECT MALFUNCTIONING PART | |
| Check the following. | |
| Harness connectors F109, F110 | |
| Harness for open or short between CMP sense | or (PHASE) and ECM |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

5.check CMP sensor (Phase) ground circuit for open and short

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

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

| DTC | CI | MP sensor (Pl | HASE) | EC | Continuity | |
|-------|------|---------------|----------|-----------|------------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0340 | 1 | F5 | 2 | F102 | 96 | Existed |
| P0345 | 2 | F18 | 2 | F IUZ | 92 | 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 F109, F110

Harness for open or short between CMP sensor (PHASE) and ECM

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

7.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

| DTC | CI | MP sensor (Pl | HASE) | ECM | | Continuity | |
|-------|------|---------------|----------|-----------|----------|------------|--|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0340 | 1 | F5 | 3 | F102 | 59 | Existed | |
| P0345 | 2 | F18 | 3 | 1 102 | 63 | LAISIEU | |

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

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F109, F110

Harness for open or short between CMP sensor (PHASE) and ECM

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

9.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-304, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-51, "Exploded View".

10.CHECK CAMSHAFT (INTAKE)

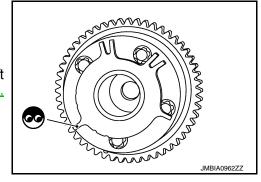
Check the following.

< DTC/CIRCUIT DIAGNOSIS >

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

Is the inspection result normal?

YES >> GO TO 11. NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to <u>EM-51</u>, "Exploded View".



[VQ37VHR]

INFOID:000000010596877

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11.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

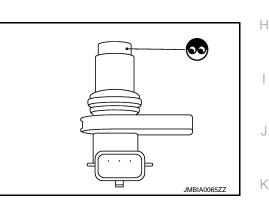
Component Inspection

1.CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

- 1. Turn ignition switch OFF.
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor (PHASE) harness connector.
- 4. Remove the sensor. Refer to EM-51, "Exploded View".
- 5. Visually check the sensor for chipping.

Is the inspection result normal?

- YES >> GO TO 2. NO >> Replace
 - >> Replace malfunctioning camshaft position sensor (PHASE). Refer to <u>EM-51, "Exploded View"</u>.



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

| Check resista | ance camshaft position sensor (PH | ASE) terminals as follows. | L |
|----------------|----------------------------------------------------|------------------------------------------------------------------|----|
| Terminals (Po | blarity) Resistance (Ω) | - | |
| 1 (+) - 2 (| (-) | - | M |
| 1 (+) - 3 (| (-) Except 0 or ∞ [at 25°C (77°F)] | | |
| 2 (+) - 3 (| (-) | | N |
| Is the inspect | tion result normal? | - | IN |
| | NSPECTION END Replace malfunctioning camshaft p | osition sensor (PHASE). Refer to <u>EM-51, "Exploded View"</u> . | 0 |

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< DTC/CIRCUIT DIAGNOSIS >

P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

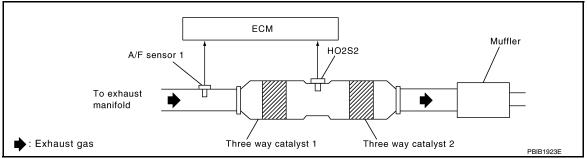
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[VQ37VHR]

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 |
| 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 |

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.

Revision: February 2015



| FUHZU, FUHJU TIINEL WAT CATALIST I UNCTION | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| 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 Open engine hood. |)°C (158°F). A |
| Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT Rev engine up to about 2,000 rpm and hold it for 3 consecutive minutes then release t pedal completely. | |
| 12. Check the indication of "CATALYST". | |
| Which is displayed on CONSULT screen? | |
| CMPLT >> GO TO 6. INCMP >> GO TO 4. | С |
| 4.PERFORM DTC CONFIRMATION PROCEDURE-II | D |
| Wait 5 seconds at idle. Rev engine up to about 2,000 rpm and maintain it until "INCMP" of "CATALYST" changes 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 | F |
| | |
| Stop engine and cool it down to less than 70°C (158°F). Perform DTC CONFIRMATION PROCEDURE again. | G |
| >> GO TO 3. | |
| 6.PERFORM DTC CONFIRMATION PROCEDURE-III | Н |
| Check 1st trip DTC. | |
| Is 1st trip DTC detected? | I |
| YES >> Go to <u>EC-307, "Diagnosis Procedure"</u> . NO >> INSPECTION END | |
| 7.PERFORM COMPONENT FUNCTION CHECK | J |
| Perform component function check. Refer to <u>EC-306</u> , "Component Function Check". | |
| NOTE: Use component function check to check the overall function of the three way catalyst (manifol check, a 1st trip DTC might not be confirmed. | ld). During this K |
| Is the inspection result normal? | |
| YES >> INSPECTION END NO >> Go to EC-307, "Diagnosis Procedure". | L |
| Component Function Check | INFOID:000000010596879 |
| 1.PERFORM COMPONENT FUNCTION CHECK | |
| Without CONSULT | N |
| Start engine and warm it up to the normal operating temperature. Turn ignition switch OFF and wait at least 10 seconds. | |
| Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute Let engine idle for 1 minute. | under no load. O |
| Open engine hood. Check the voltage between ECM harness connector terminals under the following condition | n. P |

< DTC/CIRCUIT DIAGNOSIS >

ECM DTC Condition + Voltage _ Connector Terminal Terminal 76 P0420 [HO2S2 The voltage fluctuation cycle takes more (bank 1)] Keeping engine speed at 2,500 rpm F102 84 than 5 seconds. constant under no load 80 • 1 cycle: $0.6 - 1.0 \rightarrow 0 - 0.3 \rightarrow 0.6 - 1.0$ P0430 [HO2S2 (bank 2)]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-307, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000010596880

1.CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dents.

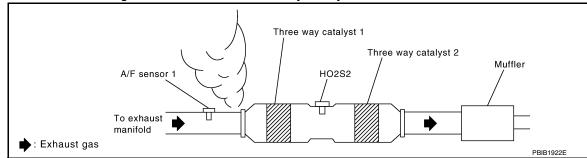
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2. CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before the three way catalyst 1.



Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

3.CHECK INTAKE AIR LEAK

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

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to <u>EC-14, "BASIC INSPECTION : Special Repair Requirement"</u>. For specification, refer to <u>EC-631, "Idle Speed"</u> and <u>EC-631, "Ignition Timing"</u>.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK FUEL INJECTORS

1. Stop engine and then turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals as per the following.

< DTC/CIRCUIT DIAGNOSIS >

| ECM | | | | | |
|----------------------------------|------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| + | | - | Voltage | | |
| ctor Terminal Connector Terminal | | Terminal | | | |
| 81 | | | | | |
| 82 | 1407 | 128 | | | |
| 85 | | | Pattonyvoltago | | |
| 86 | | | Battery voltage | | |
| 89 | | | | | |
| 90 | | | | | |
| | + Terminal 81 82 85 86 89 | + Connector 81 82 85 86 89 | + Connector Terminal Terminal Connector Terminal 81 82 85 128 85 86 89 128 | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform <u>EC-506</u>, "Diagnosis Procedure".

O.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

- 1. Turn ignition switch OFF.
- 2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to <u>EM-23, "Removal and Installation"</u>.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

• Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.

• It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

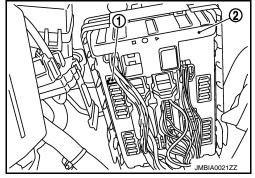
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

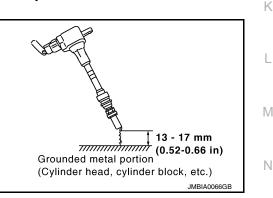
Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.





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EC-307

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

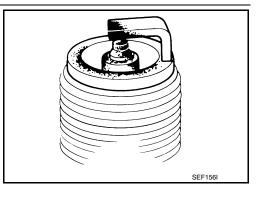
- YES >> GO TO 8.
- NO >> Check ignition coil, power transistor and their circuits. Refer to EC-516, "Diagnosis Procedure".

8.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-24, "Inspection"</u>.
- NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

- 1. Reconnect the initial spark plugs.
- 2. Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-23, "Removal</u> and Installation".
- **10.**CHECK FUEL INJECTOR
- 1. Turn ignition switch OFF.
- Remove fuel injector assembly. Refer to <u>EM-38</u>, "<u>Removal and Installation</u>".
 Keep fuel hose and all fuel injectors connected to fue
- Keep fuel hose and all fuel injectors connected to fuel tube.
- 3. Disconnect all ignition coil harness connectors.
- 4. Reconnect all fuel injector harness connectors disconnected.
- 5. Turn ignition switch ON.
- 6. Check that fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

- YES >> Replace the fuel injector(s) from which fuel is dripping. Refer to <u>EM-38</u>, "<u>Removal and Installa-</u> tion".
- NO >> GO TO 11.

11.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace three way catalyst assembly. Refer to EM-34, "Removal and Installation".
- NO >> Repair or replace harness or connector.

< DTC/CIRCUIT DIAGNOSIS >

P0441 EVAP CONTROL SYSTEM

DTC Logic

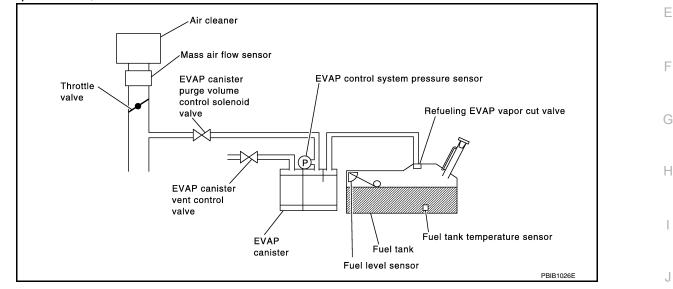
DTC DETECTION LOGIC

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.

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< DTC/CIRCUIT DIAGNOSIS >

2. Turn ignition switch ON.

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

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and let it idle for at least 70 seconds.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CON-SULT.
- 7. Touch "START".

Is "COMPLETED" displayed on CONSULT screen?

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

4.PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

| Selector lever | Suitable position |
|----------------|-----------------------------|
| VHCL SPEED SE | 32 - 120 km/h (20 - 75 mph) |
| ENG SPEED | 500 - 3,000 rpm |
| B/FUEL SCHDL | 1.3 - 9.0 msec |
| COOLAN TEMP/S | More than 0°C (32°F) |

CAUTION:

Always drive vehicle at a safe speed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-312, "Diagnosis Procedure".

6.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-311, "Component Function Check".

NOTE:

Use component function check to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-312, "Diagnosis Procedure".

Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Lift up drive wheels.

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| | | - | 1 EVAP C | ONTROL SY | (STEM | [VQ37VHF | 21 |
|-------------------------|-------------------------|----------------------------------|-------------------|-------------------|-------------------|--------------------------|------------|
| < DTC/CIR 2. Start e | | Switch OFF) and | d warm it un t | o normal operati | ing temperature | | ' 1 |
| 3. Turn ig | | ch OFF and wait a | | | ing temperature. | | A |
| 5. Turn ig | nition swite | ch OFF and wait a | | conds. | | | |
| | | wait at least 70 se | | torminals as no | or the following | | E |
| 7. Set VO | | bes to ECM harn | | terminais as pe | i the following. | | |
| | | ECM | | | | | |
| | | + | | _ | | | (|
| Connector | | Terminal | | Terminal | | | |
| M107 | (EVAP cont | 102 rol system pressure s | sensor signal) | 112 | | | |
| 8. Check | | rol system press | | lue at idle speed | and note it. | | |
| | | intain the followin | | | | | E |
| Air condition | ner switch | ON | | | - | | |
| Headlamp s | witch | ON | | | - | | F |
| Rear window | w defogger sw | vitch ON | | | - | | |
| Engine spee | ed | Approx. 3,00 | 0 rpm | | - | | C |
| Gear positio | n | Any position | other than P, N c | or R | - | | |
| | | control system pro | | value stays 0.1 | V less than the v | value at idle speed (mea | a- ⊦ |
| Is the inspe | • • | | iu. | | | | Γ |
| | > INSPECT | | | | | | |
| | | -312, "Diagnosis | Procedure". | | | | I |
| Diagnosi | is Procec | lure | | | | INFOID:000000010596 | 5883 |
| | | | | | | | |
| | nition switc | - | | | | | |
| 2. Check | EVAP cani | ster for cracks. | | | | | k |
| • | ection resul | | | | | | |
| | | ISULT: GO TO 2. ONSULT: GO TO |) 3 | | | | |
| | | EVAP canister. Re | | "Removal and I | nstallation". | | l |
| 2. снеск | PURGE FI | LOW | | | | | |
| (P)With CO | NSULT | | | | | | N |
| 1. Discon | nect vacuu | Im hose connecte | ed to EVAP ca | anister purge vo | lume control sole | enoid valve at EVAP se | er- |
| vice po | | at it idla | | | | | |
| | ngine and l "PURG VC | DL CONT/V" in "A | CTIVE TEST | ' mode with COI | NSULT. | | Ν |
| 4. Touch | | | | | | and check vacuum exis | st- |
| ence. | | | | | | | (|
| PURG V | | Vacuum | | | | | |
| 100 | | Existed | | | | | _ |
| 0% | | Not existed | | | | | F |
| | ection resul | | | | | | |
| - | > GO TO 7. | | | | | | |
| | > GO TO 4. | | | | | | |
| 3.снеск | PURGE FI | LOW | | | | | |
| NO >> | > GO TO 4. | | | | | | |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine.
- Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to <u>EC-97</u>, "System Diagram".
- 4. Start engine and let it idle.
- Do not depress accelerator pedal even slightly.
- 5. Check vacuum gauge indication before 60 seconds passed after starting engine.

Vacuum should not exist.

6. Revving engine up to 2,000rpm after 100 seconds passed after starting engine.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 4.

4.CHECK EVAP PURGE LINE

- 1. Turn ignition switch OFF.
- Check EVAP purge line for improper connection or disconnection. Refer to <u>EC-97, "System Diagram"</u>.

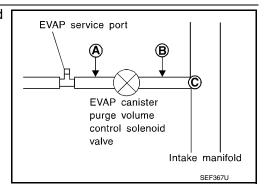
Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair it.

5.CHECK EVAP PURGE HOSE AND PURGE PORT

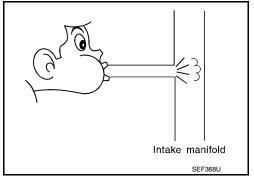
- Disconnect purge hoses connected to EVAP service port A and EVAP canister purge volume control solenoid valve B.
- 2. Blow air into each hose and EVAP purge port **C**.



3. Check that air flows freely.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 6.
- YES-2 >> Without CONSULT: GO TO 7.
- NO >> Repair or clean hoses and/or purge port.



6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Start engine.

2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| NO >> GO TO 7. | |
| 7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE | ŀ |
| Refer to EC-318, "Component Inspection". | |
| Is the inspection result normal? | E |
| YES >> GO TO 8. NO >> Replace EVAP canister purge volume control solenoid valve. Refer to <u>FL-14</u> , "Hydr | aulic Lavout" |
| 8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR | <u>adiie Edybur</u> . |
| Disconnect EVAP control system pressure sensor harness connector. | |
| Check connectors for water. | |
| Water should not exist. | Ε |
| | |
| <u>Is the inspection result normal?</u> YES >> GO TO 9. | E |
| NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u> . | |
| 9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION | F |
| Refer to EC-335, "DTC Logic" for DTC P0452, EC-340, "DTC Logic" for DTC P0453. | |
| Is the inspection result normal? | |
| YES >> GO TO 10. NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View". | (|
| NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u> . 10. CHECK RUBBER TUBE FOR CLOGGING | |
| | ŀ |
| Disconnect rubber tube connected to EVAP canister vent control valve. 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 <u>EC-325, "Component Inspection"</u> . | |
| <u>Is the inspection result normal?</u> YES >> GO TO 12. | ł |
| YES >> GO TO 12. NO >> Replace EVAP canister vent control valve. Refer to <u>FL-15, "Exploded View"</u> . | |
| 12. CHECK EVAP PURGE LINE | |
| Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. | I |
| Refer to <u>EC-97, "System Diagram"</u> . | |
| <u>Is the inspection result normal?</u> YES >> GO TO 13. | Ν |
| NO >> Replace it. | |
| 13.CLEAN EVAP PURGE LINE | 1 |
| Clean EVAP purge line (pipe and rubber tube) using air blower. | |
| | (|
| >> GO TO 14. | (|
| 14.CHECK INTERMITTENT INCIDENT | |
| Refer to GI-45. "Intermittent Incident". | F |
| | |

>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

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.

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DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0443 | EVAP canister purge volume control solenoid valve | The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | EVAP control system pressure sensor EVAP canister purge volume control solenoid valve (The valve is stuck open.) EVAP canister vent control valve EVAP canister Hoses (Hoses are connected incorrectly or clogged.) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

Do you have CONSULT

YES >> GO TO 2.

NO >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

- T. 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.
- Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 7. Touch "START".
- 8. Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take approximately 10 seconds.)

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

9. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

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EC-314

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|------------|------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | <u>ıre"</u> . | osis Proc | | G >> Go to EC- |
| | | DURE | ON PRO | CONFIRM | PERFORM DTC CO |
| ł |). | | | | Vith GST Start engine and w Turn ignition switc |
| | | 10 secor | vait at lea | ritch ON. ritch OFF a d let it idle | Turn ignition switc Turn ignition switc Start engine and le |
| | | | | ayed? | Check 1st trip DTC |
| | | <u>ire"</u> . | <u>osis Proc</u> | | ES >> Go to <u>EC-</u> D >> INSPECTI |
| 0010596886 | INFOID:000000010596 | | | edure | agnosis Proced |
| CUIT | LENOID VALVE POWER SUPPLY CIRCUIT | IE CONT | RGE VOL | ANISTER | CHECK EVAP CAN |
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| | lve harness connector. | ontrol sc | ge volum | | Disconnect EVAP Turn ignition switc |
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| or and | ontrol solenoid valve harness connector an | , paigo | | ige beimet | Check the voltage |
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| | he control solenoid valve and IPDM E/R r in harness or connectors. | nister pu | PART PART en EVAP | olume contro sult normal 3. 2. JNCTIONIN ors E106, M ors M116, F or short be | ground. AP canister purge volue Connector F7 The inspection result ES >> GO TO 3. D >> GO TO 2. DETECT MALFUNG eck the following. arness connectors arness for open or >> Repair ope |
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| CUIT | he control solenoid valve and IPDM E/R r in harness or connectors. | nister pu d or shor | PART PART PART PART PART PART PART PART | olume contro sult normal 3. 2. JNCTIONIN ors E106, M ors M116, F or short be open circui ANISTER HORT itch OFF. M harness nuity betwo | ground. AP canister purge volue Connector F7 The inspection result ES >> GO TO 3. D >> GO TO 2. DETECT MALFUNG eck the following. arness connectors arness connectors arness for open or >> Repair ope CHECK EVAP CAN R OPEN AND SHO Turn ignition switc Disconnect ECM h Check the continu |
| CUIT | ne control solenoid valve and IPDM E/R r in harness or connectors. LENOID VALVE OUTPUT SIGNAL CIRCUI | nister pu d or shor | PART PART PART PART PART PART PART PART | olume contro sult normal 3. 2. JNCTIONIN ors E106, M ors M116, F or short be open circui ANISTER HORT itch OFF. M harness nuity betwo | ground. AP canister purge volue Connector F7 The inspection result ES >> GO TO 3. D >> GO TO 2. DETECT MALFUNG eck the following. arness connectors arness connectors arness for open or >> Repair ope CHECK EVAP CAN R OPEN AND SHO Turn ignition switc Disconnect ECM f |
| CUIT | he control solenoid valve and IPDM E/R r in harness or connectors. LENOID VALVE OUTPUT SIGNAL CIRCUI | nister pu d or shor | PART PART PART Nort to gro RGE VOL Nector. EVAP ca | olume contro sult normal 3. 2. JNCTIONIN ors E106, M ors M116, F or short be open circui ANISTER HORT itch OFF. M harness nuity betwo onnector. | ground. AP canister purge volue Connector F7 The inspection result ES >> GO TO 3. D >> GO TO 2. DETECT MALFUNG eck the following. arness connectors arness connectors arness for open or >> Repair ope CHECK EVAP CAN R OPEN AND SHO Turn ignition switc Disconnect ECM h Check the continu |
| CUIT | ne control solenoid valve and IPDM E/R r in harness or connectors. LENOID VALVE OUTPUT SIGNAL CIRCUI | nister pu d or shor E CON | PART PART PART Nort to gro RGE VOL Nector. EVAP ca | olume contro sult normal 3. 2. JNCTIONIN ors E106, M ors M116, F or short be open circui ANISTER HORT titch OFF. M harness nuity betwo onnector. | ground. AP canister purge volue Connector F7 The inspection result ES >> GO TO 3. D >> GO TO 2. DETECT MALFUNG eck the following. arness connectors arness connectors arness for open or >> Repair ope CHECK EVAP CAN R OPEN AND SHO Turn ignition switc Disconnect ECM f Check the continu ECM harness con |

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

4.DETECT MALFUNCTIONING PART

Check the following.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

Harness connectors F104, F105

• Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u>.

 $\mathbf{6}$.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334. "Component Inspection".

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 7.

YES-2 >> Without CONSULT: GO TO 8.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15</u>, "Exploded View".

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Start engine.
- 4. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 9.

NO >> GO TO 8.

8.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-318, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

9.CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Clean the rubber tube using an air blower.

10.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-15</u>, "Exploded View".

11.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

[VQ37VHR]

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-16</u>, "<u>Removal and Installation</u>".

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

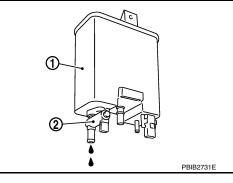
< DTC/CIRCUIT DIAGNOSIS >

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.



12.CHECK EVAP CANISTER

| attached. | | ind EVAP control system pressure sensor | E |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------|
| The weight should be less that | ın 2.2 kg (4.9 lb). | | |
| Is the inspection result normal? | | | |
| YES >> GO TO 14. NO >> GO TO 13. | | | F |
| 13. DETECT MALFUNCTION | NG PART | | |
| Check the following. | | | G |
| EVAP canister for damage EVAP hose between EVAP ca | nister and vehicle frame for clogging | or poor connection | |
| | | | Н |
| >> Repair hose or repla | ace EVAP canister. Refer to <u>FL-16.</u> " | Removal and Installation". | 11 |
| 14.CHECK INTERMITTENT I | | | |
| Refer to <u>GI-45, "Intermittent Inc</u> | | | |
| Refer to <u>OF-43, Intermittent inc</u> | <u>ucht</u> . | | |
| >> INSPECTION END | | | J |
| Component Inspection | | | |
| Component inspection | | INFOID:000000010596887 | |
| | URGE VOLUME CONTROL SOLEN | | K |
| | URGE VOLUME CONTROL SOLEN | | K |
| 1. CHECK EVAP CANISTER P With CONSULT 1. Turn ignition switch OFF. | | | K |
| 1. CHECK EVAP CANISTER P With CONSULT 1. Turn ignition switch OFF. 2. Reconnect all harness conr | nectors disconnected. | OID VALVE | K |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge host Start engine. | nectors disconnected. ses connected to EVAP canister pure | OID VALVE | L |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge hor Start engine. Select "PURG VOL CONT/" | nectors disconnected. ses connected to EVAP canister purg /" in "ACTIVE TEST" mode with CO | OID VALVE ge volume control solenoid valve. NSULT. | K L M |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge hor Start engine. Select "PURG VOL CONT/" Touch "Qd" and "Qu" on (" | nectors disconnected. ses connected to EVAP canister purg V" in "ACTIVE TEST" mode with CO CONSULT screen to adjust "PURG | OID VALVE ge volume control solenoid valve. NSULT. | L |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge host Start engine. Select "PURG VOL CONT/" Touch "Qd" and "Qu" on O VOL C/V" opening and chr canister purge volume control | nectors disconnected. ses connected to EVAP canister purg /" in "ACTIVE TEST" mode with CO | OID VALVE ge volume control solenoid valve. NSULT. | L |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge host Start engine. Select "PURG VOL CONT/" Touch "Qd" and "Qu" on QUC C/V" opening and chu | nectors disconnected. ses connected to EVAP canister purg /" in "ACTIVE TEST" mode with COI CONSULT screen to adjust "PURG eck air passage continuity of EVAP | OID VALVE ge volume control solenoid valve. NSULT. | L |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge host Start engine. Select "PURG VOL CONT/" Touch "Qd" and "Qu" on O VOL C/V" opening and chr canister purge volume contractions. | nectors disconnected. ses connected to EVAP canister purg /" in "ACTIVE TEST" mode with COI CONSULT screen to adjust "PURG eck air passage continuity of EVAP rol solenoid valve under the following | OID VALVE ge volume control solenoid valve. NSULT. | L |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge host Start engine. Select "PURG VOL CONT/" Touch "Qd" and "Qu" on Q VOL C/V" opening and chr canister purge volume contr conditions. | nectors disconnected. ses connected to EVAP canister purg V" in "ACTIVE TEST" mode with COI CONSULT screen to adjust "PURG eck air passage continuity of EVAP rol solenoid valve under the following Air passage continuity | OID VALVE ge volume control solenoid valve. NSULT. | L |
| CHECK EVAP CANISTER P With CONSULT Turn ignition switch OFF. Reconnect all harness conr Disconnect EVAP purge host Start engine. Select "PURG VOL CONT/" Touch "Qd" and "Qu" on O VOL C/V" opening and chr canister purge volume contractions. | nectors disconnected. ses connected to EVAP canister purg /" in "ACTIVE TEST" mode with COI CONSULT screen to adjust "PURG eck air passage continuity of EVAP rol solenoid valve under the following | OID VALVE ge volume control solenoid valve. NSULT. | L M |
| 1.CHECK EVAP CANISTER P With CONSULT 1. Turn ignition switch OFF. 2. Reconnect all harness conr 3. Disconnect EVAP purge hor 4. Start engine. 5. Select "PURG VOL CONT/ 6. Touch "Qd" and "Qu" on Q VOL C/V" opening and ch canister purge volume contr condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) | OID VALVE ge volume control solenoid valve. NSULT. | L M |

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.



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[VQ37VHR]

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P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE [VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|-----------------------------------------------------|--------------------------------------------|
| 12V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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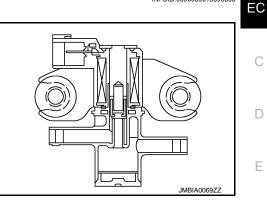
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P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

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.



INFOID:000000010596889

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | G |
|---------|-------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 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 | Н |
| 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 | ΤO | 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 <u>EC-320, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000010596890

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.

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| EVAP canister purge vol- ume control solenoid valve | | | Ground | Voltage |
|--------------------------------------------------------|------|----------------|-----------------|---------|
| Connector Terminal | | | | |
| F7 1 | | Ground | Battery voltage | |
| Is the ir | ispe | ction result r | 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.

 $\mathbf{3}$.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 vol- ume control solenoid valve | | ECM | | Continuity |
|--------------------------------------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | |
| F7 | 2 | F101 | 21 | Existed |

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

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 5. YES-2 >> Without CONSULT: GO TO 6.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F104, F105

• Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

5. Check evap canister purge volume control solenoid value operation

With CONSULT

- I. Reconnect all harness connectors disconnected.
- 2. Start engine.
- 3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 7.

NO >> GO TO 6.

6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-322, "Component Inspection".

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

| | VALVE | |
|-----------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------|
| < DTC/CIRCUIT DIAGNOSIS | > | [VQ37VHR] |
| Is the inspection result normal? | | |
| - | | olenoid valve. Refer to <u>FL-14, "Hydraulic Layout"</u> . |
| CHECK INTERMITTENT INC | | |
| Refer to <u>GI-45, "Intermittent Inc</u> | <u>dent"</u> . | |
| >> INSPECTION END | | |
| Component Inspection | | INFOID:000000010596891 |
| 1.CHECK EVAP CANISTER P | URGE VOLUME CONTROI | _ SOLENOID VALVE |
| | | |
| Turn ignition switch OFF. Reconnect all harness conr | ectors disconnected | |
| 3. Disconnect EVAP purge ho | | ister purge volume control solenoid valve. |
| Start engine. Select "PURG VOL CONT/ | V" in "ACTIVE TEST" mode | with CONSULT. |
| | CONSULT screen to adjus eck air passage continuity | |
| canister purge volume cont | rol solenoid valve under the | |
| conditions. | | FOR |
| Condition | Air passage continuity | |
| (PURG VOL C/V value) 100% | between (A) and (B) | |
| 0% | Existed Not existed | |
| | | JMBIA0068ZZ |
| - | | |
| Without CONSULT | | |
| 2. Disconnect EVAP canister | | id valve harness connector. ister purge volume control solenoid valve. |
| Check air passage continu conditions. | ty of EVAP canister purge | volume control solenoid valve under the following |
| conditions. | | |
| Condition | Air passage continuity between (A) and (B) | - |
| 12V direct current supply between | | _ |
| terminals 1 and 2 | Existed | _ |
| No supply | Not existed | _ |
| s the inspection result normal? YES >> INSPECTION END | | |
| | | olenoid valve. Refer to <u>FL-14, "Hydraulic Layout"</u> . |
| | | |
| | | |
| | | |
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| | | |

P0447 EVAP CANISTER VENT CONTROL 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.

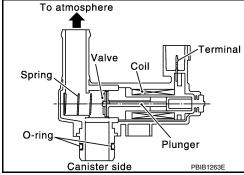
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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



INFOID:000000010596893

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|----------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 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 |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and wait at least 8 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-323, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT

Turn ignition switch OFF and then ON.

2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

EC-322

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[VQ37VHR]

INFOID:000000010596892

P0447 EVAP CANISTER VENT CONTROL VALVE

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Touch "ON/OFF" on CONSULT screen. Check for operating sound of the valve. | А |
| Clicking sound should be heard. | |
| Is the inspection result normal? | EC |
| YES >> GO TO 7. | |
| NO >> GO TO 3. | |
| 3.CHECK EVAP CANISTER VENT CONTROL VALV | /E POWER SUPPLY CIRCUIT |
| 1. Turn ignition switch OFF. | |
| Disconnect EVAP canister vent control valve harr Turn ignition switch ON. | D |
| 4. Check the voltage between EVAP canister vent c | ontrol valve harness connector and ground. |
| | Е |
| EVAP canister vent con- trol valve Ground Voltage | |
| Connector Terminal Ground Voltage | |
| B253 1 Ground Battery voltage | F |
| Is the inspection result normal? | |
| YES >> GO TO 5. | G |
| NO >> GO TO 4. | |
| 4.DETECT MALFUNCTIONING PART | |
| Check the following. | Н |
| Harness connectors E13, F40 Harness connectors F103, M116 | |
| Harness connectors M117, B201 | 1 |
| Harness for open or short between EVAP canister v | ent control valve and IPDM E/R |
| >> Repair open circuit, short to ground or sh | ort to now or in harnoss or connectors |
| | E OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| | |
| Turn ignition switch OFF. Disconnect ECM harness connector. | K |
| | control valve harness connector and ECM harness con- |
| nector. | L |
| EVAP canister vent | |
| control valve ECM Continuity | |
| Connector Terminal Connector Terminal | M |
| B253 2 M107 121 Existed | |
| 4. Also check harness for short to ground and short | to power. N |
| Is the inspection result normal? | |
| YES >> GO TO 7. NO >> GO TO 6. | |
| 6. DETECT MALFUNCTIONING PART | 0 |
| Check the following. | |
| Harness connectors B201, M117 | P |
| Harness for open or short between EVAP canister v | ent control valve and ECM |
| | |
| >> Repair open circuit, short to ground or sh | ort to power in harness or connectors. |
| 1 .CHECK RUBBER TUBE FOR CLOGGING | |
| 1. Disconnect rubber tube connected to EVAP canis | ster vent control valve. |

2. Check the rubber tube for clogging.

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean the rubber tube using an air blower.

8.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-16, "Removal and Installation"</u>.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

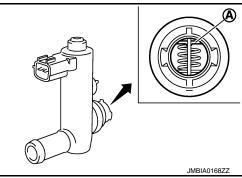
INFOID:000000010596895

1.CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister. Refer to FL-16, "Removal and Installation"
- 3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to <u>FL-</u> <u>16, "Removal and Installation"</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 |

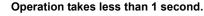
Operation takes less than 1 second.

Without CONSULT

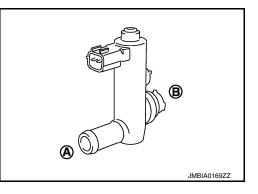
- T. Disconnect EVAP canister vent control valve harness connector.
- 2. Check air passage continuity and operation delay time under the following conditions.

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 assand | |



Is the inspection result normal?



< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- 3. Check air passage continuity and operation delay time. Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--------------------------------------------|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

| Condition | Air passage continuity between (A) and (B) |
|------------------------------------------------------|--------------------------------------------|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |
| Operation takes less than 1 se | cond. |

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-16</u>, "Removal and Installation".

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< 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.

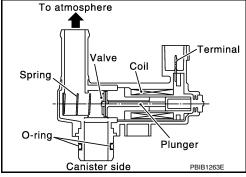
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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



INFOID:000000010596897

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0448 | EVAP canister vent con- trol valve close | EVAP canister vent control valve remains closed under specified driving conditions. | EVAP canister vent control valve EVAP control system pressure sensor and the circuit Blocked rubber tube to EVAP canister vent control valve EVAP canister is saturated with water |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

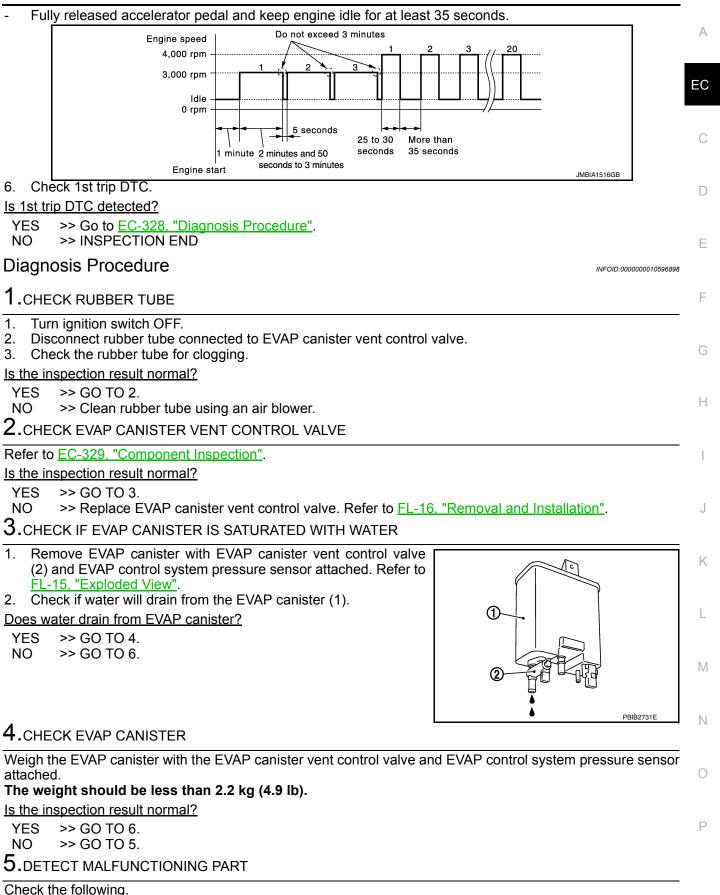
2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and let it idle for at least 1 minute.
- 4. Repeat next procedures five times.
- Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes. **Do not exceed 2 minutes.**
- Fully released accelerator pedal and keep engine idle for about 5 seconds.
- 5. Repeat next procedure 27 times.
- Quickly increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 25 to 30 seconds.

INFOID:000000010596896

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



• EVAP canister for damage

• EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

< DTC/CIRCUIT DIAGNOSIS >

>> Repair hose or replace EVAP canister. Refer to FL-16. "Removal and Installation".

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u>.

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15. "Exploded View"</u>.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

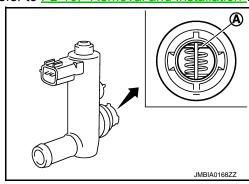
Component Inspection

1.CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister. Refer to FL-16, "Removal and Installation"
- 3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to <u>FL-</u> <u>16, "Removal and Installation"</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.

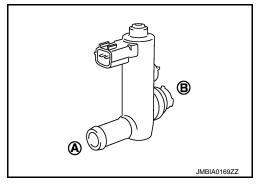
| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--------------------------------------------|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

- 1. Disconnect EVAP canister vent control valve harness connector.
- Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

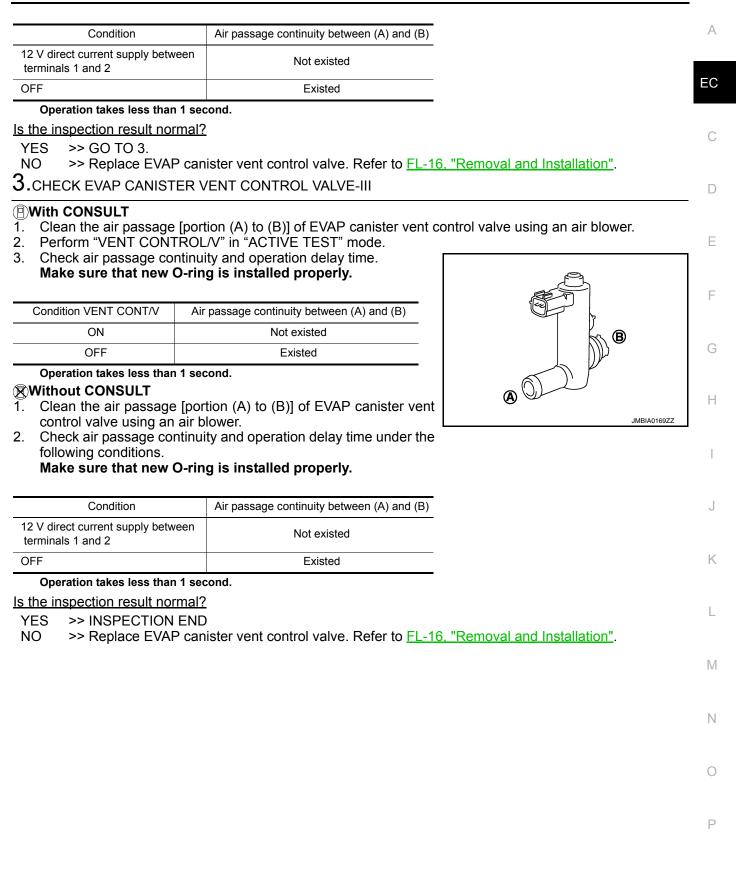


[VQ37VHR]

INFOID:000000010596899

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

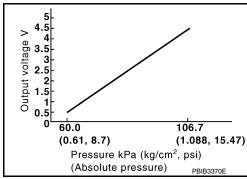


< DTC/CIRCUIT DIAGNOSIS >

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

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[VQ37VHR]

INFOID:000000010596900

| 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 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

- (I) With CONSULT
- 1. Start engine and let it idle for at least 40 seconds. **NOTE:**
- Do not depress accelerator pedal even slightly.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-332, "Diagnosis Procedure".

NO >> GO TO 3.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| 3.PERFORM DTC CONFIRMATION PROCEDURE-2 With CONSULT Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE". 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". NOTE: 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: Never turn ignition switch ON during 90 minutes. Turn ignition switch ON Select "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 again. 2. GO TO 1. 4. PERFORM DTC CONFIRMATION PROCEDURE again. 2. GO TO 1. 4. PERFORM DTC CONFIRMATION PROCEDURE-3 [®] With CONSULT Check 1st trip DTC INSPECTION END 5.PERFORM DTC CONFIRMATION PROCEDURE-4 [®] With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: Note: Note: Note: | |
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| Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE". 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". Turn ignition switch OFF and wait at least 90 minutes. NOTE: Never turn ignition switch ON during 90 minutes. Turn ignition switch ON Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ECM". 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. GO TO 1. PERFORM DTC CONFIRMATION PROCEDURE-3 With CONSULT Check 1st trip DTC. Is 1st trip DTC detected? YES ⇒ Proceed to EC-332. "Diagnosis Procedure". NO ⇒ INSPECTION END SPERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO ⇒ GO TO 6. MUTC CONFIRMATION PROCEDURE-4 With GST Let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO ⇒ GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
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| Turn ignition switch OFF and wait at least 90 minutes. NOTE: Never turn ignition switch ON during 90 minutes. Turn ignition switch ON. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ECM". 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. PERFORM DTC CONFIRMATION PROCEDURE-3 With CONSULT Check that trip DTC. a sta trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> INSPECTION END PERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Start inp DTC. Start inp DTC. Mether Strip DTC. Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Sent engine and let it idle for at least 40 seconds. NOTE: NO >> GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| Turn ignition switch ON. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ECM". 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. PERFORM DTC CONFIRMATION PROCEDURE-3 With CONSULT wheck 1st trip DTC. a 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> INSPECTION END PERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. a 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | - |
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| YET ⇒> 1. Perform DTC CONFIRMATION PROCEDURE again. 2. GO TO 1. PERFORM DTC CONFIRMATION PROCEDURE-3 With CONSULT Theck 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> INSPECTION END PERFORM DTC CONFIRMATION PROCEDURE-4 With GST . Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. 2. Check 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO ⇒> GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-5 With GST . Let it idle for at least 2 hours. . Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| With CONSULT Check 1st trip DTC. <u>s 1st trip DTC detected?</u> YES >> Proceed to <u>EC-332</u>. "Diagnosis Procedure". NO >> INSPECTION END D.PERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. <u>s 1st trip DTC detected?</u> YES >> Proceed to <u>EC-332</u>. "Diagnosis Procedure". NO >> GO TO 6. D.PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| Scheck 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> INSPECTION END D.PERFORM DTC CONFIRMATION PROCEDURE-4 With GST . Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. 2. Check 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. D.PERFORM DTC CONFIRMATION PROCEDURE-5 With GST . Let it idle for at least 2 hours. . Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| <u>s 1st trip DTC detected?</u> YES >> Proceed to <u>EC-332</u>, "Diagnosis Procedure". NO >> INSPECTION END D.PERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. <u>s 1st trip DTC detected?</u> YES >> Proceed to <u>EC-332</u>, "Diagnosis Procedure". NO >> GO TO 6. D.PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| NO >> INSPECTION END D.PERFORM DTC CONFIRMATION PROCEDURE-4 With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. D.PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| With GST Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
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| NOTE: Do not depress accelerator pedal even slightly. 2. Check 1st trip DTC. s 1st trip DTC detected? YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. D.PERFORM DTC CONFIRMATION PROCEDURE-5 With GST . Let it idle for at least 2 hours. . Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| 2. Check 1st trip DTC. <u>s 1st trip DTC detected?</u> YES >> Proceed to <u>EC-332. "Diagnosis Procedure"</u>. NO >> GO TO 6. D.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: | |
| YES >> Proceed to EC-332. "Diagnosis Procedure". NO >> GO TO 6. DERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. | |
| NO >> GO TO 6. DEPERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| With GST 1. Let it idle for at least 2 hours. 2. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| Turn ignition switch OFF and wait at least 90 minutes. NOTE: | |
| | |
| Never turn ignition switch ON during 90 minutes. | |
| Turn ignition switch ON. Check 1st trip DTC. | |
| s 1st trip DTC detected? | |
| YES >> Proceed to <u>EC-332, "Diagnosis Procedure"</u> . NO >> INSPECTION END | |
| NO >> INSPECTION END Diagnosis Procedure | 110596902 |
| 1. CHECK GROUND CONNECTION | |
| 1. Turn ignition switch OFF. | |
| 2. Check ground connection M95. Refer to Ground Inspection in <u>GI-48. "Circuit Inspection"</u> . | |
| 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 | |

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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.

 ${\bf 3.}$ CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| | trol system e sensor | Ground | Voltage (V) |
|-----------|-------------------------|--------|-------------|
| Connector | Terminal | | |
| B252 | 3 | Ground | Approx. 5 |
| | | | |

Is the inspection result normal?

YES >> GO TO 8. >> GO TO 4.

NO

4.CHECK SENSOR POWER SUPPLY CIRCUIT

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

| EC | CM | Sensor | | | |
|-----------|----------|-------------------------------------|-----------------------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 | |
| FIUI | 46 | CKP sensor (POS) | F2 | 1 | |
| M107 | 103 | APP sensor | E112 (Without ICC) | 6 | |
| | | | E116 (With ICC) | 3 | |
| | 107 | EVAP control system pressure sensor | B252 | 3 | |
| | | Refrigerant pressure sensor | E77 | 3 | |

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK COMPONENTS

Check the following.

Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)

Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".

Go to EC-479, "Special Repair Requirement". 2.

| < DTC/CIF | | SIEVA | P CONTROL SYSTEM | | |
|----------------------------------|--------------------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|
| | RCUIT DIA | GNOSIS > | > | [V | Q37VHR] |
| • | > INSPECT | | | | |
| 8.CHECK | EVAP CO | NTROL SY | STEM PRESSURE SENSOR | | A |
| Refer to EC | <u>C-334, "Cor</u> | mponent Ir | nspection". | | |
| Is the inspe | | | | | EC |
| | > GO TO 9. | | ral avatam procedure concer. Dei | for to EL 15 "Exploded View" | |
| 9.CHECK | - | | rol system pressure sensor. Re | er to <u>FL-15, Exploded view</u> . | |
| | | | | | С |
| Refer to GI | I-45, "Intern | nittent Inci | <u>dent"</u> . | | |
| | > INSPECT | | | | D |
| | | - | | | |
| Compon | ent Inspe | ection | | INFOI | D:000000010596903 |
| 1. CHECK | | NTROL SY | STEM PRESSURE SENSOR | | E |
| 2. Removing <u>View</u> ". Alway | s replace (| ontrol syst D-ring wit l | em pressure sensor with its h | arness connector. Refer to <u>FL-15,</u> | "Exploded F |
| | | | /AP control system pressure se | | G |
| 4. Turn ig | gnition swite | ch ÓN anc | /AP control system pressure se | nsor. ECM harness connector terminals | under the G |
| 4. Turn ig | gnition swite | ch ÓN anc | /AP control system pressure se I check output voltage between Condition | ECM harness connector terminals | under the |
| 4. Turn ig | gnition swite ng condition ECM | ch ÓN anc | /AP control system pressure se I check output voltage between | | under the |
| 4. Turn ig followin | ECM Ferminal | ch ÓN and ns. – Terminal | /AP control system pressure se I check output voltage between Condition [Applied vacuum kPa (kg/cm ² , psi)] | ECM harness connector terminals | under the |
| 4. Turn ig followin | ng condition ECM + | ch ÓN anc ns. – | /AP control system pressure se I check output voltage between Condition | ECM harness connector terminals | under the |

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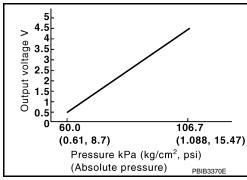
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P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

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

INFOID:000000010596905

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0452 | EVAP control system pressure sensor low in- put | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Refrigerant pressure sensor Brake booster pressure sensor 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.

Revision: February 2015

EC-334

[VQ37VHR]

INFOID:000000010596904

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[VQ37VHR]

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With GST

- Start engine and warm it up to normal operating temperature.
 Set voltmeter probes to ECM harness connector terminals as per the following.

| | | | ECM | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------|-------------------------|
| Connector | | + | | - | |
| Connector | | Terminal | | Terminal | |
| M107 | (Fuel tank te | 106 emperature s | sensor signal) | 128 (ECM ground) | |
| . Turn ig . Turn ig | nition switc | h OFF an h ON. | s less than 4.: d wait at least d wait at least | 10 seconds. | |
| Start e Check | | vait at leas C. | st 20 seconds | | |
| YES >> | | 336. "Diag | gnosis Proced | lure". | |
| iagnosi | is Proced | ure | | | INFOID:000000010596906 |
| • | GROUND | | TION | | |
| | nition switc ground con | | 195. Refer to 0 | Ground Inspection in <u>GI-48, "Circ</u> | uit Inspection". |
| | ection result | | | | |
| | > GO TO 2. | | | | |
| | | | ound connect | tion. | |
| | CONNECT | | | | |
| . Discor | | | stem pressur | e sensor harness connector. er. | |
| | | | | | |
| . Check | ter should | not exist. | | | |
| . Check Wa | ter should | | | | |
| Check Wa the inspe YES >> | ection result > GO TO 3. | normal? | | | |
| . Check Wa <u>s the inspe</u> YES >: NO >: | ection result > GO TO 3. > Repair or ı | <u>normal?</u> replace ha | arness connec | | |
| . Check Wa s the inspe YES > NO > | ection result > GO TO 3. > Repair or ı | <u>normal?</u> replace ha | arness connec | ctor. SURE SENSOR POWER SUPP | 'LY CIRCUIT-I |
| . Check Wa sthe inspe YES >> NO >> CHECK . Turn ig | ection result > GO TO 3. > Repair or i CEVAP CON gnition switc | normal? replace ha ITROL SY | arness connec /STEM PRES | | |
| . Check Wa sthe inspe YES > NO > CHECK . CHECK . Turn ig . Check | ection result > GO TO 3. > Repair or i CEVAP CON gnition switc | normal? replace ha ITROL SY h ON. between | arness connec /STEM PRES EVAP control | SURE SENSOR POWER SUPP | |
| . Check Wa sthe inspe YES > NO > CHECK . CHECK . Turn ig . Check | ection result > GO TO 3. > Repair or r & EVAP CON gnition switc the voltage | normal? replace ha ITROL SY | arness connec /STEM PRES | SURE SENSOR POWER SUPP | |
| . Check Wa sthe inspervent YES >> NO >> CHECK . Turn ig . Check | ection result > GO TO 3. > Repair or i CEVAP CON gnition switc the voltage htrol system re sensor | normal? replace ha ITROL SY h ON. between | arness connec /STEM PRES EVAP control | SURE SENSOR POWER SUPP | |
| Check Wa Sthe inspective YES >= NO >= CHECK CHECK Turn ig Check EVAP cor pressur Connector B252 | ection result > GO TO 3. > Repair or r EVAP CON gnition switc the voltage htrol system re sensor Terminal | replace ha ITROL SN h ON. between Ground | Arness connect STEM PRES EVAP control Voltage (V) | SURE SENSOR POWER SUPP | |
| . Check Wa Sthe inspe YES > NO > CHECK . Turn ig . CHECK . Turn ig . Check EVAP cor pressur Connector B252 Sthe inspe YES > | ection result > GO TO 3. > Repair or r EVAP CON anition switch the voltage the voltage Terminal 3 ection result > GO TO 10 | replace ha TROL S h ON. between Ground Ground | Arness connect STEM PRES EVAP control Voltage (V) | SURE SENSOR POWER SUPP | |
| . Check Wa sthe inspe YES >> NO >> CHECK . Turn ig . Check EVAP cor pressur Connector B252 sthe inspe YES >> NO >> | ection result > GO TO 3. > Repair or i EVAP CON gnition switc the voltage ntrol system re sensor Terminal 3 ection result > GO TO 10 > GO TO 4. | replace ha ITROL SN h ON. between Ground Ground | Arness connect STEM PRES EVAP control Voltage (V) Approx. 5 | SURE SENSOR POWER SUPP system pressure sensor harness | s connector and ground. |
| . Check Wa sthe inspe YES >> NO >> CHECK . Turn ig . Check EVAP cor pressur Connector B252 sthe inspe YES >> NO >> | ection result > GO TO 3. > Repair or i EVAP CON gnition switc the voltage ntrol system re sensor Terminal 3 ection result > GO TO 10 > GO TO 4. | replace ha ITROL SN h ON. between Ground Ground | Arness connect STEM PRES EVAP control Voltage (V) Approx. 5 | SURE SENSOR POWER SUPP | s connector and ground. |

3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

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| | EVAP control system pressure sensor | | ECM | |
|-----------|----------------------------------------|-----------|----------|---------|
| Connector | Terminal | Connector | Terminal | |
| B252 | 3 | M107 | 107 | Existed |

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M117, B201

• Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6.CHECK SENSOR POWER SUPPLY CIRCUIT

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

| ECM | | Sensor | | | |
|--------------------|----------|-------------------------------------|-----------------------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 | |
| 46 | | CKP sensor (POS) | F2 | 1 | |
| 103 M107 107 | 102 ADD | APP sensor | E112 (Without ICC) | 6 | |
| | 105 | | E116 (With ICC) | 3 | |
| | | EVAP control system pressure sensor | B252 | 3 | |
| | 107 | 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 <u>EC-300, "Component Inspection"</u>.)

Refrigerant pressure sensor (Refer to <u>EC-529, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 9.

9.replace accelerator pedal assembly

1. Replace accelerator pedal assembly. Refer to <u>ACC-3</u>, "Removal and Installation".

2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

10.check evap control system pressure sensor ground circuit for open and

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| SHORT 1. Turn ig | nition swi | | - | | |
|----------------------------------------------|------------------------------|---------------------------|-----------------|-------------|------------------------------------------------------|
| 3. Check | | / harness (nuity betw | | | ystem pressure sensor harness connector and ECM har- |
| EVAP contr pressure | - | EC | СМ | Continuity | |
| Connector | Terminal | Connector | Terminal | | |
| B252 | 1 | M107 | 112 | Existed | art to power |
| Is the inspe | | | • | | ort to power. |
| YES >> | • GO TO • GO TO | 12. 11. | | т | I |
| Check the • • Harness | following. connecto | rs B201, M | 117 | | system pressure sensor and ECM |
| • Hamess | | | | | |
| | | | | - | short to power in harness or connectors. |
| 12.CHEC SHORT | K EVAP | CONTROI | SYSTEN | M PRESSU | IRE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND |
| | onnector. | - | | | ystem pressure sensor harness connector and ECM har- |
| pressure | sensor | EC | | Continuity | |
| Connector B252 | Terminal 2 | Connector M107 | Terminal 102 | Existed | |
| | | | | | ort to power. |
| Is the inspe | | | 2 | | |
| YES >> NO >> | • GO TO • GO TO | | | | |
| 13.DETE | | | IING PAR | т | |
| Check the | following. | | | | |
| Harness Harness | | | | AP control | system pressure sensor and ECM |
| namess | | | | | |
| | • | • | - | • | short to power in harness or connectors. |
| 14.снес | K EVAP | CONTROL | SYSTEM | I PRESSU | RE SENSOR |
| Refer to EC | | | | <u>ı"</u> . | (|
| Is the inspective YES >> | <u>ection res</u> • GO TO | | 2 | | |
| | | | ntrol syste | m pressure | e sensor. Refer to <u>FL-15, "Exploded View"</u> . |
| 15.снес | K INTER | MITTENT | INCIDEN | т | |
| Refer to GI | -45, "Inte | rmittent Ind | cident". | | |

Refer to <u>GI-45, "Intermittent Incident"</u>.

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

Component Inspection

[VQ37VHR]

INFOID:000000010596907

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Remove EVAP control system pressure sensor with its harness connector. Refer to <u>FL-15</u>, "<u>Exploded</u> <u>View</u>".

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 | 100 | 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.
- 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

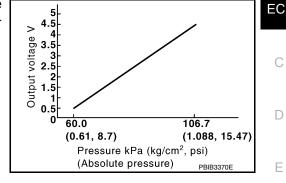
NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15</u>, "Exploded View".

< 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

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 shorted.) (Brake booster pressure sensor circuit is EVAP control system An excessively high voltage from the sensor is shorted) P0453 pressure sensor high insent to ECM. EVAP control system pressure sensor put Crankshaft position sensor (POS) · Accelerator pedal position sensor · Refrigerant pressure sensor · Brake booster pressure sensor · EVAP canister vent control valve Κ EVAP canister Rubber hose from EVAP canister vent control valve to vehicle frame 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.

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

- T. 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.

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< DTC/CIRCUIT DIAGNOSIS >

7. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).

- 8. Start engine and wait at least 20 seconds.
- 9. Check 1st trip DTC.

With GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Set voltmeter probes to ECM harness connector terminals as per the following.

| | ECM | | | | |
|-----------|----------------------------------------------|---------------------|--|--|--|
| Connector | + | - | | | |
| Connector | Terminal | Terminal | | | |
| M107 | 106 (Fuel tank temperature sensor signal) | 128 (ECM ground) | | | |

- 3. Make sure that the voltage is less than 4.2 V.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- 6. Turn ignition switch OFF and wait at least 10 seconds.
- 7. Start engine and wait at least 20 seconds.
- 8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-341, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

 ${\it 3.}$ CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| EVAP control system | Ground | Voltage (V) | |
|---------------------|--------|-------------|-----------|
| Connector | Ciouna | voltage (v) | |
| B252 | 3 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 4.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

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3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control system | n pressure sensor | EC | М | Continuity |
|---------------------|-------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B252 | 3 | M107 | 107 | Existed |

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M117, B201
- · Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6.CHECK SENSOR POWER SUPPLY CIRCUIT

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

| EC | М | Sensor | | |
|-------------|------------|-------------------------------------|-----------------------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 |
| FIUI | 46 | CKP sensor (POS) | F2 | 1 |
| | 102 | | E112 (Without ICC) | 6 |
| M107 | 103 | APP sensor | E116 (With ICC) | 3 |
| | 107 | EVAP control system pressure sensor | B252 | 3 |
| | 111 | Refrigerant pressure sensor | E77 | 3 |
| Is the insp | ection res | sult normal? | | 1 |

YES >> GO TO 7.

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

7.CHECK COMPONENTS

Check the following.

Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)

Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

8. CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 20.

NO >> GO TO 9.

9.Replace accelerator pedal assembly

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".

Go to EC-479, "Special Repair Requirement". 2.

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< DTC/CIRCUIT DIAGNOSIS >

10. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM har-3 ness connector.

| EVAP control system | EC | M | Continuity | |
|---------------------|--------------------|------|------------|------------|
| Connector | Connector Terminal | | Terminal | Continuity |
| B252 | 1 | M107 | 112 | Existed |

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

Is the inspection result normal?

>> GO TO 12. YES

NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B201, M117

Harness for open or short between EVAP control system pressure sensor and ECM

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

12. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control syster | EC | М | Continuity | |
|---------------------|----|-----------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| B252 | 2 | M107 | 102 | Existed |

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

Is the inspection result normal?

YES >> GO TO 14. >> GO TO 13.

NO

13. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B201, M117

Harness for open or short between EVAP control system pressure sensor and ECM

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

14.CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

15. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.

>> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation". NO

< DTC/CIRCUIT DIAGNOSIS >

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Refer to EC-344, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15. "Exploded View"</u>.

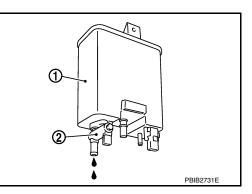
17. Check if evap canister is saturated with water

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-16</u>, "<u>Removal and Installation</u>".
- 2. Check if water will drain from the EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from EVAP canister?

- YES >> GO TO 18.
- NO >> GO TO 20.



18.CHECK EVAP CANISTER

| Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached. The weight should be less than 2.2 kg (4.9 lb). | Н |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Is the inspection result normal? | |
| YES >> GO TO 20. NO >> GO TO 19. | I |
| 19. DETECT MALFUNCTIONING PART | |
| Check the following. | J |
| EVAP canister for damage EVAP hose between EVAP canister and vehicle frame for clogging or poor connection | |
| | Κ |
| >> Repair hose or replace EVAP canister. Refer to <u>FL-16. "Removal and Installation"</u> . | |
| 20. CHECK INTERMITTENT INCIDENT | I |
| Refer to GI-45, "Intermittent Incident". | |
| >> INSPECTION END | M |
| Component Inspection | |
| 1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR | Ν |
| Turn ignition switch OFF. Remove EVAP control system pressure sensor with its harness connector. Refer to <u>FL-15</u>, "<u>Exploded</u> <u>View</u>". | 0 |
| Always replace O-ring with a new one. Install a vacuum pump to EVAP control system pressure sensor. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions. | Ρ |

< DTC/CIRCUIT DIAGNOSIS >

| 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 | |
| 101 | 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-15, "Exploded View"</u>.

< DTC/CIRCUIT DIAGNOSIS >

P0456 EVAP CONTROL SYSTEM

DTC Logic

DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.

If ECM judges that there are no leaks, the diagnosis will be OK.

Air cleaner Mass air flow sensor EVAP canister EVAP control system pressure sensor Throttle purge volume valve control solenoid Refueling EVAP vapor cut valve valve ٦Ю EVAP canister vent control valve Fuel tank temperature sensor EVAP Fuel tank canister Fuel level sensor PBIB1026E

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0456 | Evaporative emission control system very small leak (negative pressure check) | EVAP system has a very small leak. EVAP system does not operate properly. | Incorrect fuel tank vacuum relief valve Incorrect fuel filler cap used Fuel filler cap remains open or fails to close. Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line (pipe and rubber tube) leaks EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve. EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit EVAP canister vent control valve is missing or damaged EVAP canister is saturated with water EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks Fuel level sensor and the circuit Foreign matter caught in EVAP canister purge volume control solenoid valve |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC CONFIRMATION PROCEDURE

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< DTC/CIRCUIT DIAGNOSIS >

1.PRECONDITIONING

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

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

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

- 1. Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode with CONSULT.
- 2. Start engine and wait at idle until "OFF" of "EVAP DIAG READY" changes to "ON". **NOTE:**

It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".

3. Turn ignition switch OFF and wait at least 90 minutes. **NOTE:**

Never turn ignition switch ON during 90 minutes.

- 4. Turn ignition switch ON and select "EVAP LEAK DIAG" in "DATA MONITOR" mode with CONSULT.
- 5. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 3.

YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3.PERFORM COMPONENT FUNCTION CHECK-II

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-347, "Diagnosis Procedure".
- NO >> INSPECTION END

4.PERFORM DTC CONFIRMATION PROCEDURE

With GST

- 1. Start engine and wait engine idle for at least 2 hours.
- 2. Turn ignition switch OFF and wait at least 90 minutes. **NOTE:**

Never turn ignition switch ON during 90 minutes.

- 3. Turn ignition switch ON.
- 4. Check 1st trip DTC.
- Is 1st trip DTC detected?

YES >> Go to EC-347, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000010596913

- 1.CHECK FUEL FILLER CAP DESIGN
- 1. Turn ignition switch OFF.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| < DTC/CIRCUIT DIAGNOSIS > | |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 2. Check for genuine NISSAN fuel filler cap design. | |
| Is the inspection result normal? | A |
| YES >> GO TO 2. | |
| NO >> Replace with genuine NISSAN fuel filler cap. Refer to FL-11, "Exploded View". | EC |
| | |
| | |
| | NISSAN |
| | |
| | SEF915U |
| 2. CHECK FUEL FILLER CAP INSTALLATION | D |
| Check that the cap is tightened properly by rotating the cap clockwise. | |
| Is the inspection result normal? | E |
| YES >> GO TO 3. | breade using air blower. Then retichten |
| NO >> Open fuel filler cap, then clean cap and fuel filler neck th until ratcheting sound is heard. | - |
| 3. CHECK FUEL FILLER CAP FUNCTION | F |
| Check for air releasing sound while opening the fuel filler cap. | |
| Is the inspection result normal? | G |
| YES >> GO TO 5. | |
| NO >> GO TO 4. | |
| 4. CHECK FUEL TANK VACUUM RELIEF VALVE | Н |
| Refer to EC-525, "Component Inspection". | |
| Is the inspection result normal? | I. |
| YES >> GO TO 5. | |
| NO >> Replace fuel filler cap with a genuine one. Refer to <u>FL-11</u> , | "Exploded View". |
| 5.CHECK FOR EVAP LEAK | J |
| Refer to <u>EC-629, "Inspection"</u> . | |
| Is there any leak in EVAP line? | K |
| YES >> Repair or replace. | |
| NO $>>$ GO TO 6. | |
| 6.CHECK EVAP CANISTER VENT CONTROL VALVE | L |
| Check the following. | |
| EVAP canister vent control valve is installed properly. Refer to <u>FL-16</u>, "<u>Removal and Installation</u>". | Μ |
| • EVAP canister vent control valve. | 1 1 1 |
| Refer to FL-16, "Removal and Installation". | |
| Is the inspection result normal? | Ν |
| YES >> GO TO 7. | |
| NO >> Repair or replace EVAP canister vent control valve and Installation". | U-ring. Reter to <u>FL-16, "Removal and</u> |
| 7. CHECK IF EVAP CANISTER IS SATURATED WITH WATER | 0 |
| I TOHEOR II EVAL CANISTER IS SATURATED WITH WATER | |
| | |

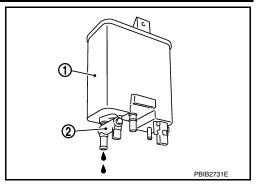
< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached. Refer to <u>FL-16, "Removal and Installation"</u>.
- 2. Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

- YES >> GO TO 8.
- NO-1 >> With CONSULT: GO TO 10.
- NO-2 >> Without CONSULT: GO TO 11.



8. CHECK EVAP CANISTER

Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 10. YES-2 >> Without CONSULT: GO TO 11. NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

10. Check evap canister purge volume control solenoid value operation

With CONSULT

- 1. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
- 2. Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- 4. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
- 5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

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

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

- T. Start engine and warm it up to normal operating temperature.
- 2. Stop engine.
- Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

Is the inspection result normal?

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

12.CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-97, "System Diagram".

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| P0456 EVAP CONTROL SYSTEM | [VQ37VHR] |
|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| < DTC/CIRCUIT DIAGNOSIS > | |
| Is the inspection result normal? YES >> GO TO 13. | А |
| NO >> Repair or reconnect the hose. | |
| 13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE | |
| Refer to EC-318, "Component Inspection". | EC |
| Is the inspection result normal? | |
| YES >> GO TO 14. | С |
| NO >> Replace EVAP canister purge volume control solenoid valve. Refer to <u>FL-14, "Hydr</u> | <u>aulic Layout"</u> . |
| 14.CHECK FUEL TANK TEMPERATURE SENSOR | D |
| Refer to <u>EC-273, "Component Inspection"</u> . <u>Is the inspection result normal?</u> | D |
| YES >> GO TO 15. | |
| NO >> Replace fuel level sensor unit. Refer to <u>FL-6, "Removal and Installation"</u> . | E |
| 15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR | |
| Refer to EC-334, "Component Inspection". | F |
| Is the inspection result normal? | |
| YES >> GO TO 16. | |
| NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u> . 16. CHECK EVAP PURGE LINE | G |
| | |
| Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper Refer to <u>EC-97, "System Diagram"</u> . | connection. H |
| Is the inspection result normal? | |
| YES >> GO TO 17. | 1 |
| NO >> Repair or reconnect the hose. | |
| 17.CLEAN EVAP PURGE LINE | |
| Clean EVAP purge line (pipe and rubber tube) using air blower. | J |
| >> GO TO 18. | |
| 18. CHECK EVAP/ORVR LINE | K |
| Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness | and improper |
| connection. For location, refer to $\underline{\text{EC-522}}$, "Description". | |
| Is the inspection result normal? | |
| YES >> GO TO 19. NO >> Repair or replace hoses and tubes. | |
| NO >> Repair or replace hoses and tubes. 19.CHECK RECIRCULATION LINE | Μ |
| | |
| Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, improper connection. | N |
| Is the inspection result normal? | |
| YES >> GO TO 20. | 0 |
| NO >> Repair or replace hose, tube or filler tube. | 0 |
| 20.CHECK REFUELING EVAP VAPOR CUT VALVE | |
| Refer to EC-525, "Component Inspection". | Р |
| <u>Is the inspection result normal?</u> YES >> GO TO 21. | |
| NO >> Replace refueling EVAP vapor cut valve with fuel tank. | |
| 21. CHECK FUEL LEVEL SENSOR | |
| Refer to <u>MWI-60, "Component Inspection"</u> . | |
| Is the inspection result normal? | |
| | |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 22.

NO >> Replace fuel level sensor unit. Refer to <u>FL-6</u>, "Removal and Installation".

22.CHECK INTERMITTENT INCIDENT

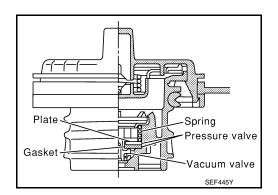
Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK FUEL TANK VACUUM RELIEF VALVE

- 1. Turn ignition switch OFF.
- 2. Remove fuel filler cap. Refer to FL-11, "Exploded View".
- 3. Wipe clean valve housing.



Vacuum/Pressure gauge

4. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi) Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

Is the inspection result normal?

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

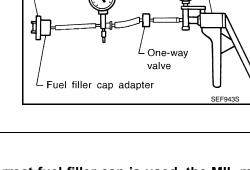
2.REPLACE FUEL FILLER CAP

Replace fuel filler cap. Refer to FL-11, "Exploded View".

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END



Fuel filler

cap

INFOID:000000010596914

Vacuum/

Pressure

pump

P0460 FUEL LEVEL SENSOR

< 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

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-377, "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 | G |
|---------|---------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 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 | Η |

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 M 1. Start engine and wait maximum of 2 consecutive minutes. 2. Check 1st trip DTC. Is 1st trip DTC detected? Ν >> Go to EC-352, "Diagnosis Procedure". YES NO >> INSPECTION END Diagnosis Procedure INFOID:000000010596917 **1.**CHECK DTC WITH "UNIFIED METER AND A/C AMP." Refer to MWI-42, "CONSULT Function (METER/M&A)". P Is the inspection result normal? YES >> GO TO 2. NO >> Go to MWI-58, "Component Function Check". 2.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

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INFOID:000000010596916

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>> INSPECTION END

P0461 FUEL LEVEL SENSOR

< 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

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-377, "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 peen driven.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | G |
|---------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| P0461 | Fuel level sensor circuit range/performance | The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long 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 | Н |

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-354, "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 <u>EC-355, "Diagnosis Procedure"</u>.

Component Function Check

INFOID:000000010596920

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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 lmp gal) in advance.

1. Prepare a fuel container and a spare hose.

INFOID:000000010596918

INFOID:000000010596919



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P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

- 2. Release fuel pressure from fuel line, refer to <u>EC-628. "Inspection"</u>.
- 3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- 5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
- 6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT.
- 7. Check "FUEL LEVEL SE" output voltage and note it.
- 8. Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
- 9. Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
- 10. Check "FUEL LEVEL SE" output voltage and note it.
- 11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
- 12. Check "FUEL LEVEL SE" output voltage and note it.
- 13. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12.
- Is the inspection result normal?
- YES >> INSPECTION END
- NO >> Go to <u>EC-355. "Diagnosis Procedure"</u>.

3. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

- 1. Prepare a fuel container and a spare hose.
- 2. Release fuel pressure from fuel line. Refer to EC-628, "Inspection".
- 3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-6. "Removal and Installation".
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- 5. Turn ignition switch ON.
- 6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
- 7. Confirm that the fuel gauge indication varies.
- 8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
- 9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-355, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000010596921

1.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to <u>MWI-58</u>, "Component Function Check".

2. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

< 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:000000010596923

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-377, "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 M Turn ignition switch ON and wait at least 5 seconds. 1. Check 1st trip DTC. 2. Ν Is 1st trip DTC detected? YES >> Go to EC-356, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure INFOID:000000010596924 **1.**CHECK DTC WITH "UNIFIED METER AND A/C AMP." P Refer to MWI-42, "CONSULT Function (METER/M&A)". Is the inspection result normal? YES >> GO TO 2. NO >> Go to MWI-58, "Component Function Check". 2.CHECK INTERMITTENT INCIDENT Refer to GI-45, "Intermittent Incident".

Revision: February 2015

INFOID:000000010596922

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>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P0500 VSS

Description

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

DTC Logic

INFOID:000000010596926

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-377, "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 | F |

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 normal 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-358. "Diagnosis Procedure"</u>

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.

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P0500 VSS

< DTC/CIRCUIT DIAGNOSIS >

NO >> Perform trouble shooting relevant to DTC indicated.

 $2. {\sf CHECK} \ {\sf DTC} \ {\sf with} \ {\sf ABS} \ {\sf aCTUATOR} \ {\sf AND} \ {\sf ELECTRIC} \ {\sf UNIT} \ ({\sf CONTROL} \ {\sf UNIT})$

Check DTC with ABS actuator and electric unit (control unit). Refer to BRC-30, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble shooting relevant to DTC indicated.

3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform trouble shooting relevant to DTC indicated.

4.CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to TM-82, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace or replace error-detected parts.

5.CHECK WHEEL SENSOR

Check wheel sensor. Refer to BRC-56, "Diagnosis Procedure".

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to <u>GI-45, "Intermittent Incident"</u>.
- NO >> Replace or replace error-detected parts.

P0506 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

P0506 ISC SYSTEM

Description

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:000000010596929

DTC DETECTION LOGIC

NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

| | 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 |
| OTC CON | FIRMATION PROC | EDURE | |
| 1.PRECO | NDITIONING | | |
| pefore cond | ducting the next test. | has been previously conducted, alwa | iys perform the following procedure |
| | nition switch ON. nition switch OFF and | l wait at least 10 seconds. | |
| If the idle s | peed is out of the sp | pecified value, perform <u>EC-21, "IDLE /</u> | AIR VOLUME LEARNING : Descrip- |
| | re conducting DTC C | Confirmation Procedure. | |
| | | ing procedure, confirm that battery vertices the temperature above -10°C(14°F). | oltage is more than 11 V at idle. |
| Always p | enomine test at a | | |
| >> | GO TO 2. | | |
| 2.PERFO | RM DTC CONFIRMA | TION PROCEDURE | |
| | | | |
| | | to normal operating temperature. | |
| 2. Turn ig | nition switch OFF and | to normal operating temperature. I wait at least 10 seconds. | |
| 2. Turn ig 3. Turn ig 4. Turn ig | nition switch OFF and nition switch ON. nition switch OFF and | l wait at least 10 seconds. I wait at least 10 seconds. | |
| Turn ig Turn ig Turn ig Restart | nition switch OFF and nition switch ON. nition switch OFF and engine and run it for | l wait at least 10 seconds. | |
| Turn ig Turn ig Turn ig Turn ig Restart Check | nition switch OFF and nition switch ON. nition switch OFF and | l wait at least 10 seconds. I wait at least 10 seconds. | |
| Turn ig Turn ig Turn ig Turn ig Restard Restard Check <u>Is 1st trip D</u> YES >> | nition switch OFF and nition switch ON. nition switch OFF and engine and run it for 1st trip DTC. <u>TC detected?</u> Go to <u>EC-360, "Diag</u> | l wait at least 10 seconds. I wait at least 10 seconds. at least 1 minute at idle speed. | |
| 2. Turn ig 3. Turn ig 4. Turn ig 5. Restart 6. Check <u>Is 1st trip D</u> YES >> NO >> | nition switch OFF and nition switch ON. nition switch OFF and engine and run it for 1st trip DTC. <u>TC detected?</u> | l wait at least 10 seconds. I wait at least 10 seconds. at least 1 minute at idle speed. | INFOID:000000010596930 |
| 2. Turn ig 3. Turn ig 4. Turn ig 5. Restart 6. Check Is 1st trip D YES >> NO >> Diagnosi | nition switch OFF and nition switch ON. nition switch OFF and engine and run it for 1st trip DTC. <u>TC detected?</u> Go to <u>EC-360, "Diag</u> NSPECTION END | l wait at least 10 seconds. I wait at least 10 seconds. at least 1 minute at idle speed. | INFOID:000000010596930 |

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

Is intake air leak detected?

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< DTC/CIRCUIT DIAGNOSIS >

YES >> Discover air leak location and repair.

NO >> GO TO 2.

2.REPLACE ECM

- 1. Stop engine.
- Replace ECM. Refer to <u>EC-39, "Component Parts Location"</u>.
 Go to <u>EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description"</u>.

>> INSPECTION END

P0507 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

P0507 ISC SYSTEM

Description

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:000000010596932

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 CON | FIRMATION PROCI | EDURE | | | | |
| 1.PRECO | NDITIONING | | | | | |
| before cond 1. Turn ig 2. Turn ig 3. Turn ig If the idle s tion", befo | ducting the next test. nition switch OFF and nition switch ON. nition switch OFF and speed is out of the sp re conducting DTC (| has been previously conducted, alwa wait at least 10 seconds. wait at least 10 seconds. becified value, perform <u>EC-21, "IDLE /</u> Confirmation Procedure. | | | | |
| Before p | 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. RM DTC CONFIRMA | TION PROCEDURE | | | | |
| Turn ig Turn ig Turn ig Start er | nition switch OFF and nition switch ON. nition switch OFF and | to normal operating temperature. I wait at least 10 seconds. I wait at least 10 seconds. Ieast 1 minute at idle speed. | | | | |
| Is 1st trip DTC detected? YES >> Go to EC-362, "Diagnosis Procedure". NO >> INSPECTION END | | | | | | |
| Diagnosis Procedure | | | | | | |
| 1.снеск | PCV HOSE CONNEC | CTION | | | | |
| Is the inspe | at PCV hose is connect <u>ection result normal?</u> • GO TO 2. | cted correctly. | | | | |

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P0507 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

NO >> Repair or replace. $2. {\sf CHECK} \text{ INTAKE AIR LEAK}$

1. Start engine and let it idle.

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

Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 3.

3.REPLACE ECM

- 1. Stop engine.
- Replace ECM. Refer to <u>EC-39</u>, "Component Parts Location".
 Go to <u>EC-17</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P050A, P050B, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

P050A, P050B, 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 Description

INFOID:000000011003092

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause | | | | |
|----------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--|--|--|--|
| P050A | COLD START CONTROL (Cold start idle air control system performance) | ECM does not control engine idle speed properly when engine is started with pre- warming up condition. | | | | | |
| P050B | COLD START CONTROL (Cold start ignition timing performance) | ECM does not control ignition timing prop- erly when engine is started with pre-warm- ing up condition. | Lack of intake air volume Fuel injection system ECM | | | | |
| P050E | COLD START CONTROL (Cold start engine exhaust temperature too low) | The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition. | | | | | |
| FAIL-SAI | | | | | | | |
| Not applie | | | | | | | |
| | NFIRMATION PROCEDURE | | | | | | |
| 1. CHEC | K DTC PRIORITY | | | | | | |
| If DTC PC | 50A, P050B, or P050E is displayed with) for other DTC. | other DTC, first perform the confirm | ation procedure (trouble | | | | |
| - | ble DTC detected? | | | | | | |
| | >> Perform diagnosis of applicable. Refe | r to <u>EC-576, "DTC_Index"</u> . | | | | | |
| - | >> GO TO 2. | | | | | | |
| Z .PREC | ONDITIONING | | | | | | |
| | confirmation Procedure has been previ | ously conducted, always perform t | the following procedure | | | | |
| | nducting the next test. ignition switch OFF and wait at least 10 s | seconds. | | | | | |
| 2. Turn | ignition switch ON. | | | | | | |
| | ignition switch OFF and wait at least 10 s CONDITION: | seconds. | | | | | |
| | erforming the following procedure, co | onfirm that battery voltage is more | than 11 V at idle. | | | | |
| | | | | | | | |
| ; | >> GO TO 3. | | | | | | |
| 3.PERF | ORM DTC CONFIRMATION PROCEDU | RE-I | | | | | |
| With C | ONSULT | | | | | | |
| 1. Turn | ignition switch OFF and wait at least 10 | seconds. | | | | | |
| | • | | | | | | |
| | k the indication of "COOLAN TEMP/S". | | | | | | |
| With G | | | | | | | |
| | e procedure "With CONSULT" above. ue of "COOLAN TEMP/S" between 4° <u>C (</u> | 30°E) and 36°C (07°E)? | | | | | |
| | >> GO TO 4. | | | | | | |
| | it is below 4°C (39°F)]>>Warm up the e (39°F) or more. Retry from step 1. | engine until the value of "COOLAN | TEMP/S" reaches 4°C | | | | |

INFOID:000000011003091

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P050A, P050B, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

- 1. Set the select lever in N range.
- 2. Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between -10°C (14°F) and 40°C (104°F) for more than 15 seconds.
- 3. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Go to EC-365, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000011003093

1.CHECK DTC PRIORITY

If DTC P050A, P050B, or P050E is displayed with other DTC, first perform the confirmation procedure (trouble diagnosis) for other DTC.

Is applicable DTC detected?

- YES >> Perform diagnosis of applicable. Refer to <u>EC-576, "DTC Index"</u>.
- NO >> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

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

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 3.
- NO >> Follow the instruction of Idle Air Volume Learning.

$\mathbf{3}$.CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace malfunctioning part

4.CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-262, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Go to <u>EC-263, "Diagnosis Procedure"</u> for DTC P0171, P0174.

5.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-364, "DTC Description"</u>.

Is the 1st trip DTC P050A, P050B, or P050E displayed again?

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

6.REPLACE ECM

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

P050A, P050B, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] >> INSPECTION END

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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-185, "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 <u>LU-7, "Inspection"</u>.

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-368. "Diagnosis Procedure"</u> NO >> INSPECTION END

Diagnosis Procedure

[VQ37VHR]

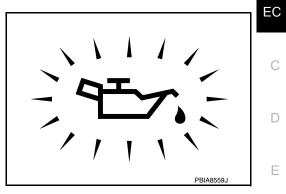
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1.CHECK OIL PRESSURE WARNING LAMP

- 1. Start engine.
- Check oil pressure warning lamp and confirm it is not illuminated.
- Is oil pressure warning lamp illuminated?
- YES >> Go to LU-7, "Inspection".
- NO >> GO TO 2.



2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-177, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-51</u>, "<u>Exploded</u> <u>View</u>".

3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-300, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS). Refer to EM-122. "Exploded View".

4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-304, "Component Inspection".

Is the inspection result normal?

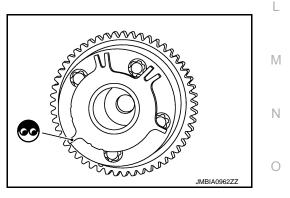
YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to <u>EM-51, "Exploded View"</u>.

5.CHECK CAMSHAFT (INTAKE)

Check the following.

- · Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end
- Is the inspection result normal?
- YES >> GO TO 6.
- NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to <u>EM-51</u>. <u>"Exploded View"</u>.



6. CHECK TIMING CHAIN INSTALLATION

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

YES >> Check timing chain installation. Refer to EM-52, "Removal and Installation".

7. CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-105, "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-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010596939

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 | $^\infty$ (Continuity should not exist) | |

Is the inspection result normal?

YES >> GO TO 2.

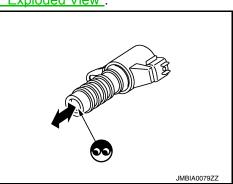
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <u>EM-51</u>, "<u>Exploded</u> <u>View</u>".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- 1. Remove intake valve timing control solenoid valve. Refer to EM-51, "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:
 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-51</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 power steering load.

This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

DTC Logic

INFOID:000000010596941

DTC DETECTION LOGIC

NOTE: If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-378, "DTC Logic"</u>.

| DTC CONF 1.PRECON | Power steering pressure sensor circuit IRMATION PROCE DITIONING firmation Procedure | | Harness or connectors (The sensor circuit is open or shorted) Power steering pressure sensor | |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|
| 1.PRECON | DITIONING firmation Procedure | | | |
| | firmation Procedure | has been providually conducted alw | | |
| If DTC Cont | | has been providually conducted alw | | |
| Turn igni Turn igni Turn igni | ition switch ON. ition switch OFF and | wait at least 10 seconds. wait at least 10 seconds. | | |
| >> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE | | | | |
| _ | gine and let it idle for | | | |
| | st trip DTC. | | | |
| <u>Is 1st trip DT</u> | C detected? | | | |
| | Go to <u>EC-370, "Diagr</u> INSPECTION END | nosis Procedure". | | |
| Diagnosis | Procedure | | INFOID:000000010596942 | |

1. CHECK GROUND CONNECTION

| Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u>. | N | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---|--|--|--|
| 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.

2. Turn ignition switch ON.

3. Check the voltage between PSP sensor harness connector and ground.

| PSP : | sensor | Ground | Voltage (V) |
|--------------------|--------|--------|-------------|
| Connector Terminal | | Ciouna | voltage (v) |
| F35 | 3 | Ground | Approx. 5 |

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[VQ37VHR]

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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-371, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Replace PSP sensor. Refer to <u>ST-52, "2WD : Exploded View"</u> (2WD models) or <u>ST-53, "AWD :</u> <u>Exploded View"</u> (AWD models).

6. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010596943

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 | Being turned | 0.5 - 4.5 | |
| 1 102 | 07 | 90 | Steering wheel | Not being turned | 0.4 - 0.8 | |

| [VQ | 37V | 'HR] |
|-----|-----|------|
|-----|-----|------|

| Is the ir | nspection result normal? | |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| YES | >> INSPECTION END | А |
| NO | >> Replace power steering pressure sensor. Refer to <u>ST-52, "2WD : Exploded View"</u> (2WD models) or <u>ST-53, "AWD : Exploded View"</u> (AWD models). | |
| | or <u>31-33, AWD : Exploded View</u> (AWD models). | EC |
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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 DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| P0603 | ECM power supply cir- cuit | ECM back up RAM system does not function properly. | Harness or connectors [ECM power supply (back up) circuit is open or shorted.] ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Turn ignition switch OFF and wait at least 5 minutes.
- 3. Turn ignition switch ON and wait at least 10 seconds.
- 4. Repeat steps 2 and 3 for five times.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-373, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK ECM POWER SUPPLY

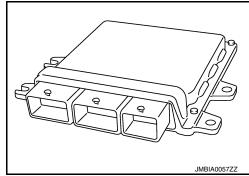
1. Turn ignition switch OFF.

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- 2. Disconnect ECM harness connector.
- 3. Check the voltage between ECM harness connector terminals as per the following.



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P0603 ECM POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| ECM | | | | | A |
|--------------------------|---------------------------------|-----------------------------|-------------|---------------------------------------------------|-----|
| + _ | | _ | Voltage | | |
| Connector | Terminal | Connector | Terminal | | EC |
| F102 | 93 | M107 | 128 | Battery voltage | |
| ls the inspe | ction result | t normal? | | | |
| | GO TO 3. | | | | C |
| - | GO TO 2. | | | | |
| | | CTIONING | PARI | | - [|
| Check the f | | E13 E40 | | | |
| • 15 A fuse | (No. 50) | | | | |
| | | connector E7 short betwe | | ad batton | 1 |
| i lamess i | | Short betwe | | iu ballery | |
| >> | Repair or | replace hari | ness or cor | inectors. | I |
| _ | | | | | |
| | | nittent Incide | | | |
| | ction result | | | | (|
| | GO TO 4. | | | | |
| | • | replace har | | | l |
| +.PERFOR | RM DTC C | ONFIRMAT | ION PROC | EDURE | |
| 1. Turn ig 2. Erase [| nition switc | h ON. | | | |
| 3. Perfori | n DTC Co | nfirmation | Procedure | | |
| | <u>2-373, "DT(</u> | - | | | |
| | <u>IP DTC P06</u> ∙ GO TO 5. | 603 displaye | ed again? | | , |
| - | INSPECT | | | | |
| 5.REPLAC | | | | | I |
| 1. Replac | | | | | _ |
| | | DITIONAL S | SERVICE V | VHEN REPLACING CONTROL UNIT (ECM) : Description". | |
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| >> | INSPECT | ION END | | | |
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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 | | Possible cause |
|---------|------------------------|-------------------------|-----------------------------------------------|----------------|
| | | A) | ECM calculation function is malfunctioning. | |
| P0605 | Engine control module | B) | ECM EEP-ROM system is malfunctioning. | • ECM |
| | | C) | ECM self shut-off function is malfunctioning. | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

- 1. Turn ignition switch ON.
- 2. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> Go to EC-376, "Diagnosis Procedure".
- NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- 3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-376. "Diagnosis Procedure".

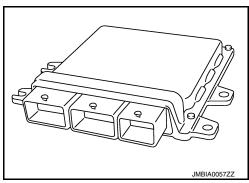
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- 3. Repeat step 2 for 32 times.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

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| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|
| YES >> Go to <u>EC-376. "Diagnosis Procedure"</u> . NO >> INSPECTION END | | А |
| Diagnosis Procedure | INFOID:000000010596953 | |
| 1.INSPECTION START | | EC |
| Turn ignition switch ON. Erase DTC. | I | |
| Perform DTC Confirmation Procedure. See <u>EC-375, "DTC Logic"</u>. | | С |
| Is the 1st trip DTC P0605 displayed again? | | D |
| YES >> GO TO 2. NO >> INSPECTION END | | D |
| 2.REPLACE ECM | | E |
| Replace ECM. Refer to <u>EC-39, "Component Parts Location"</u>. Go to <u>EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Desc</u> | cription". | |
| >> INSPECTION END | | F |
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P0607 ECM

Description

INFOID:000000010596954

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:000000010596955

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 CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

2. Check DTC.

Is DTC detected?

YES >> Go to <u>EC-377, "Diagnosis Procedure"</u>. 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>.
- 4. Check DTC.

Is the DTC P0607 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".

2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

INFOID:000000010596956

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

P0643 SENSOR POWER SUPPLY

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0643 | Sensor power supply circuit short | ECM detects that the voltage of power source for sensor is excessively low or high. | Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 1) circuit is shorted.] [Manifold absolute pressure (MAP) sensor circuit is shorted.] (PSP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 2) circuit is shorted.] [Battery current sensor circuit is shorted.] Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE) (bank 1) Manifold absolute pressure (MAP) sensor Power steering pressure sensor Camshaft position sensor (PHASE) (bank 2) Battery current sensor |
| | FIRMATION PROC | EDURE | |
| 1.PRECC | ONDITIONING | | |
| | | | |
| | | e has been previously co | onducted, always perform the following procedure |
| before con 1. Turn ig 2. Turn ig | nducting the next test. gnition switch OFF an gnition switch ON. | d wait at least 10 seconds | аланан алан алан алан алан алан алан ал |
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| before con 1. Turn ig 2. Turn ig 3. Turn ig TESTING Before pe 2.PERFC | aducting the next test. gnition switch OFF an gnition switch ON. gnition switch OFF an CONDITION: rforming the followin > GO TO 2. DRM DTC CONFIRMA | d wait at least 10 seconds d wait at least 10 seconds ng procedure, confirm th TION PROCEDURE | аланан алан алан алан алан алан алан ал |
| before con 1. Turn ig 2. Turn ig 3. Turn ig TESTING Before pe 2. PERFC 1. Start e 2. Check Is DTC de | aducting the next test. gnition switch OFF an gnition switch ON. gnition switch OFF an CONDITION: rforming the followin > GO TO 2. ORM DTC CONFIRMA engine and let it idle for a DTC. tected? | d wait at least 10 seconds d wait at least 10 seconds ng procedure, confirm th TION PROCEDURE or 1 second. | аланан алан алан алан алан алан алан ал |
| 2. PERFC 1. Turn ig 2. Turn ig TESTING Before pe 2. PERFC 1. Start e 2. Check (s DTC de YES > | aducting the next test. gnition switch OFF an gnition switch ON. gnition switch OFF an CONDITION: rforming the followin > GO TO 2. ORM DTC CONFIRMA engine and let it idle for a DTC. | d wait at least 10 seconds d wait at least 10 seconds ng procedure, confirm th TION PROCEDURE or 1 second. | аланан алан алан алан алан алан алан ал |
| 2. PERFC 2. Turn ig 3. Turn ig TESTING Before pe 2. PERFC 1. Start e 2. Check <u>s DTC de</u> YES > NO > | aducting the next test. gnition switch OFF an gnition switch OFF an CONDITION: rforming the followin > GO TO 2. ORM DTC CONFIRMA engine and let it idle for c DTC. tected? > Go to <u>EC-378, "Diac</u> | d wait at least 10 seconds d wait at least 10 seconds ng procedure, confirm th TION PROCEDURE or 1 second. | аланан алан алан алан алан алан алан ал |
| before con 1. Turn ig 2. Turn ig TESTING Before pe 2. PERFC 1. Start e 2. Check <u>IS DTC de</u> YES > NO > Diagnos | aducting the next test. gnition switch OFF an gnition switch OFF an CONDITION: rforming the followin > GO TO 2. DRM DTC CONFIRMA engine and let it idle for a DTC. <u>tected?</u> > Go to <u>EC-378, "Diac</u> > INSPECTION END | d wait at least 10 seconds d wait at least 10 seconds ng procedure, confirm th TION PROCEDURE or 1 second. | hat battery voltage is more than 10 V at idle. |

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between APP sensor harness connector and ground.

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P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

| APP se | ensor | Ground | Voltage (V) |
|---------------------------------------------|---------------------------------|--------|-------------|
| Connector | Terminal | Giouna | voltage (v) |
| E112 (Without ICC) E116 (With ICC) | E112 (Without ICC) E116 5 | | Approx. 5 |
| | | | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

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

| ECM | | Sensor | | |
|-----------|----------|----------------------------------------------|---------------------------------------------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 43 | | Electric throttle control actuator (bank 2) | F27 | 1 |
| FIUI | 44 | Electric throttle control actuator (bank 1) | F6 | 6 |
| | | CMP sensor (PHASE) (bank 1) | F5 | 1 |
| | 60 | Manifold absolute pressure (MAP) sen- sor | F50 | 1 |
| F102 | | PSP sensor | F35 | 3 |
| | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 |
| | 04 | Battery current sensor | E21 | 1 |
| M107 | 99 | APP sensor | E112 (Without ICC) E116 (With ICC) | 5 |

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK COMPONENTS

Check the following.

- Camshaft position sensor (PHASE) (bank 1) (Refer to EC-304, "Component Inspection".)
- Power steering pressure sensor (Refer to <u>EC-371, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-304, "Component Inspection".)
- Battery current sensor (Refer to <u>EC-427, "Component Inspection"</u>.)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK TP SENSOR

Refer to EC-214. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator. Refer to EM-29, "Removal and Installation".

Go to EC-214, "Special Repair Requirement".

>> INSPECTION END

P0643 SENSOR POWER SUPPLY

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|--------------------------------------------------------------------------------------------|-----------|----|
| 7.CHECK APP SENSOR | | А |
| Refer to EC-478. "Component Inspection". | | A |
| Is the inspection result normal? | | |
| YES >> GO TO 9. NO >> GO TO 8. | | EC |
| 8.REPLACE ACCELERATOR PEDAL ASSEMBLY | _ | |
| 1. Replace accelerator pedal assembly. Refer to <u>ACC-3</u> , "Removal and Installation". | | С |
| 2. Go to EC-479, "Special Repair Requirement". | | |
| >> INSPECTION END | | D |
| 9. CHECK INTERMITTENT INCIDENT | | |
| Refer to GI-45. "Intermittent Incident". | | Ε |
| | | |
| >> INSPECTION END | | F |
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P0850 PNP SWITCH

Description

INFOID:000000010596959

[VQ37VHR]

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM. ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:000000010596960

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| P0850 | Park/neutral position switch | The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started. | Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] TCM |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

>> GO TO 3.

3. CHECK PNP SIGNAL

With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

| Position (Selector lever) | Known-good signal |
|---------------------------|-------------------|
| N or P position | ON |
| Except above position | OFF |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to EC-382, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Maintain the following conditions for at least 50 consecutive seconds. CAUTION:

Always drive vehicle at a safe speed.

| ENG SPEED | 1,400 - 6,375 rpm |
|---------------|------------------------|
| COOLAN TEMP/S | More than 70°C (158°F) |

P0850 PNP SWITCH

| < DTC/CIRCUIT DIAGNOSI | S > | | • | | [VQ37VHR] |
|--------------------------------------------------------|-----------------|---------------------|-----------------------------------------|-----------------------|-------------------------|
| B/FUEL SCHDL | 2.0 - 31.8 m | sec | | | |
| VHCL SPEED SE | More than 6 | 4 km/h (40 mph) | | | |
| Selector lever | Suitable pos | sition | | | |
| 4. Check 1st trip DTC. | | | | | |
| Is 1st trip DTC detected? | | | | | |
| YES >> Go to EC-382. "E NO >> INSPECTION EN | | ocedure". | | | |
| 5.PERFORM COMPONENT | | | | | |
| | | | Component Fun | ation Chook" | |
| Perform component function NOTE: | | 10 <u>EC-302, 1</u> | | ICTION CHECK. | |
| Use component function chee | | | e park/neutral p | position (PNP) signal | circuit. During this |
| check, a 1st trip DTC might n | | ned. | | | |
| Is the inspection result norma YES >> INSPECTION EN | | | | | |
| NO >> Go to <u>EC-382, "E</u> | | ocedure". | | | |
| Component Function C | Check | | | | INFOID:00000001059696 |
| | | | | | |
| 1.PERFORM COMPONENT | FUNCTION | I CHECK | | | |
| 1. Turn ignition switch ON. | | | | | |
| 2. Check the voltage betwe | en ECM hari | ness connecto | or terminals und | er the following cond | itions. |
| ECM | | | | | |
| + _ | Con | dition | Voltage (V) | | |
| Connector Terminal Terminal | | | · • • • • • • • • • • • • • • • • • • • | | |
| | | P or N | Battery voltage | | |
| M107 109 128 | Selector lever | Except above | Approx. 0 | | |
| Is the inspection result norma | al? | | | | |
| YES >> INSPECTION EN | | | | | |
| NO >> Go to <u>EC-382, "E</u> | Diagnosis Pro | <u>ocedure"</u> . | | | |
| Diagnosis Procedure | | | | | INFOID:0000000105969 |
| 1. CHECK DTC WITH TCM | | | | | |
| | True officially | | | | |
| Refer to TM-63, "CONSULT I | | | | | |
| Is the inspection result norma YES >> GO TO 2. | <u>al (</u> | | | | |
| NO >> Repair or replace |) . | | | | |
| 2. CHECK STARTING SYST | EM | | | | |
| Turn ignition switch OFF, ther | n turn it to ST | ART. | | | |
| Does starter motor operate? | | | | | |
| YES >> GO TO 3. | | | | | |
| | BCM. Refer | to <u>BCS-40, '</u> | SIGNAL BUFF | ER : CONSULT Fund | <u>ction (BCM - SIG</u> |
| 3. CHECK PNP SWITCH INI | PUT SIGNAL | | R OPEN AND | SHORT | |
| 1. Turn ignition switch OFF. | | | | | |
| 2. Disconnect A/T assembly | y harness co | nnector. | | | |
| 3 Disconnect ECM barness | | | | | |

Disconnect ECM harness connector.

4. Check the continuity between A/T assembly harness connector and ECM harness connector.

P0850 PNP SWITCH

| A/T ass | embly | EC | Continuity | |
|-----------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F51 | 9 | M107 | 109 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F40, E13

Harness connectors E106, M6

• Harness for open or short between A/T assembly and ECM

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

 $5. {\sf check intermittent incident}$

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P100A, P100B VVEL SYSTEM

DTC Logic

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-397, "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-188</u>, "<u>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 | E |

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 engin | e. |
|----|-------------|----|
| | | |

- 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 <u>EC-384, "Diagnosis Procedure"</u>.

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

Turn ignition switch OFF.
 Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "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.

INFOID:000000010596964

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< DTC/CIRCUIT DIAGNOSIS >

| DTC No. | V | VEL control mode | ule | VVEL actu | ator motor | Continuity | | | | | | |
|---------|------|------------------|----------|-----------|------------|-------------|----|----|----|-----|---|-------------|
| DIC NO. | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | | | | |
| | | | 12 | | 1 | Existed | | | | | | |
| P100A | 1 | E14 | 12 | F48 | 2 | Not existed | | | | | | |
| FIUUA | I | | | 25 | 25 | 25 | 25 | 25 | 25 | 140 | 1 | Not existed |
| | | | 25 | 5 | 2 | Existed | | | | | | |
| | | | | | 1 | Existed | | | | | | |
| P100B 2 | 2 | 2 | 2 | F49 | 2 | Not existed | | | | | | |
| | Z | | 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 F40, E13

Harness for open or short between VVEL actuator motor and VVEL control module

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

4.CHECK VVEL ACTUATOR MOTOR

Refer to EC-386, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".

2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace.

7.REPLACE VVEL CONTROL MODULE

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

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-384, "DTC Logic"</u>.

Is the DTC P100A or P100B displayed again?

YES >> GO TO 9.

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| < DTC/CIRCUIT DIAGNOSIS | \$> | [VQ37VHR] |
|------------------------------------------------------------|-------------------------------------------------------------------------|------------------------|
| NO >> INSPECTION EN | D | |
| 9. CHECK VVEL ACTUATOR | SUB ASSEMBLY | |
| | Inspection (VVEL ACTUATOR SUB ASSEMBLY)". | |
| Is the inspection result normal | <u>?</u> | |
| YES >> GO TO 11. NO >> GO TO 10. | | |
| 10.REPLACE VVEL ACTUA | TOR SUB ASSEMBLY | |
| | Ib assembly. Refer to EM-95, "Exploded View". | |
| 2. Go to <u>EC-387, "Special Re</u> | epair Requirement". | |
| | | |
| >> INSPECTION EN | | |
| 11.CHECK VVEL LADDER | | |
| Refer to <u>EM-105, "Inspection"</u> . | | |
| <u>ls the inspection result normal</u> YES >> GO TO 13. | <u>′</u> | |
| NO >> GO TO 12. | | |
| 12.REPLACE CYLINDER H | EAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATO | OR SUB ASSEMBLY |
| | /EL ladder assembly and VVEL actuator sub assembly. | Refer to EM-113, "Dis- |
| assembly and Assembly" 2. Go to EC-387, "Special Re | and <u>EM-95, "Exploded View"</u> . | |
| | | |
| >> INSPECTION EN | C | |
| 13. CHECK INTERMITTENT | INCIDENT | |
| Refer to GI-45, "Intermittent In | cident". | |
| | | |
| >> INSPECTION EN | | |
| Component Inspection (| (VVEL ACTUATOR MOTOR) | INFOID:000000010596965 |
| 1.CHECK VVEL ACTUATOR | MOTOR | |
| 1. Turn ignition switch OFF. | | |
| | r motor harness connector. NVEL actuator motor terminals as follows. | |
| | | |
| VVEL actuator motor | | |
| Terminal | Resistance | |
| 1 and 2 | 16 Ω or less | |
| is the inspection result normal | — | |
| YES >> INSPECTION EN NO >> GO TO 2. | D | |
| 2.REPLACE VVEL ACTUATO | OR SUB ASSEMBLY | |
| | Ib assembly. Refer to EM-95, "Exploded View". | |
| 2. Go to <u>EC-387, "Special Re</u> | | |
| | | |
| >> INSPECTION EN | | |
| Component Inspection (| (VVEL ACTUATOR SUB ASSEMBLY) | INFOID:000000010596966 |
| 1.CHECK VVEL ACTUATOR | SUB ASSEMBLY | |
| 1. Turn ignition switch OFF. | | |
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< DTC/CIRCUIT DIAGNOSIS >

- 2. Remove VVEL actuator sub assembly. Refer to <u>EM-95, "Exploded View"</u>.
- 3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".

2. Go to EC-387. "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000010596967

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

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

>> END

[VQ37VHR]

P1087, P1088 VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

P1087, P1088 VVEL SYSTEM

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093. Perform the trouble diagnosis for DTC P1090 or P1093. Refer to <u>EC-393, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| P1087 | VVEL small event angle malfunction (bank 1) | | Harness or connectors (VVEL actuator motor circuit is | 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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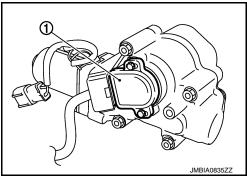
[VQ37VHR]

< 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]

INFOID:000000010596969

INFOID:000000010596970

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-465</u>, "<u>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-389, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

EC-388

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| < DTC/CIRCU | • | | CONTRU | JL SHAFT | POSITION | N SENSUR [VQ37 | VHR] |
|---------------------------------|-----------------------|-------------------------------|----------------|-----------------|--------------|-----------------------|---------|
| Is the inspecti | on result norr | mal? | | | | | |
| | O TO 2. | | | | | | A |
| - | | ce ground cor | | | | | |
| 2.VVEL CON | NTROL SHAF | T POSITION S | SENSOR PO | WER SUPPL | Y CIRCUIT | | FO |
| | | rol shaft position | on sensor ha | rness connect | tor. | | EC |
| | ion switch ON | | ntral aboft no | aition concort | harnaaa aann | actor and ground | |
| 3. Check the | e vollage belv | | ntroi snait po | SILION SENSOR | namess conn | ector and ground. | С |
| | VVEL c | ontrol shaft positi | on sensor | | | _ | |
| DTC No. | Bank | Connector | Terminal | - Ground | Voltage (V |) | D |
| | | | 3 | | | | D |
| P1089 | 1 | F46 | 6 | | | | |
| | | | 3 | - Ground | Approx. 5 | | E |
| P1092 | 2 | F47 | 6 | | | | |
| Is the inspecti | on result norr | nal? | | | | | _ |
| | O TO 4. | | | | | | F |
| NO >> G | O TO 3. | | | | | | |
| 3.DETECT N | IALFUNCTIC | NING PART | | | | | G |
| Check the foll | owing. | | | | | | |
| Harness cor | | | | e | | _, , , , , , | |
| Harness for | open or shor | t between VVE | L control sha | aft position se | nsor and VVE | EL control module | Н |
| | | | | | | | |
| | | rcuit, short to g | - | • | | | |
| | | | SITION SEN | SOR GROUN | | OR OPEN AND SHO | ۲I ' |
| | ion switch OF | | | 4 a | | | |
| | | rol module har etween VVEI | | | sor harness | connector and VVEL of | control |
| | arness conne | | | | | | |
| | | | | | | | K |
| DTC No. | VVEL co | ntrol shaft positio | n sensor | VVEL cont | rol module | Continuity | TX. |
| | Bank | Connector | Terminal | Connector | Terminal | | |
| P1089 | 1 | F46 | 2 | | 4 | | L |
| | 5 | E14 | 17 | Existed | | | |
| P1092 | 2 | F47 | 2 | | 6 | Existed | |
| 1 1032 | 2 | 1 47 | 5 | | 19 | | M |
| 4. Also chec | k harness for | short to grour | nd and power | : | | | |
| Is the inspecti | <u>on result norr</u> | <u>mal?</u> | | | | | Ν |
| | O TO 6. | | | | | | |
| _ | O TO 5. | | | | | | |
| 5.DETECT N | IALFUNCTIC | NING PART | | | | | 0 |
| Check the foll | | | | | | | |
| Harness cor | | | | off position on | noor and \// | I control modulo | D |
| | open or short | | | an position se | | EL control module | Р |
| >> D | enair onen ci | rcuit, short to g | around or ehe | ort to nower in | harness or o | onnectors | |
| • | | | - | • | | R OPEN AND SHORT | |
| | NIRUL SHAF | FUSITIONS | JENJUK INF | OT SIGNAL | | | |

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 | | | t position sensor VVEL control module | | Continuity |
|---------|------------------------------------|-----------|----------|---------------------------------------|----------|------------|
| DIC NO. | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1089 | 1 | F46 | 1 | | 3 | |
| F 1009 | I | 4 | E14 | 16 | Existed | |
| P1092 | 2 | F47 | 1 | E14 | 5 | Existed |
| P 1092 | 2 | F47 | 4 | | 18 | |

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

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F40, E13

· Harness for open or short between VVEL control shaft position sensor and VVEL control module

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

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

9.REPLACE VVEL CONTROL MODULE

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

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-389, "DTC Logic"</u>.

Is the DTC P1089 or P1092 displayed again?

- YES >> GO TO 11.
- NO >> INSPECTION END

11.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".

2. Go to EC-391, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000010596972

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

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< DTC/CIRCUIT DIAGNOSIS >

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

>> END

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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-397</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-393, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.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.

INFOID:0000000010596975

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P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | VVEL control module | | VVEL actuator motor | | Continuity | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------|--------------|-----------------------------------------|------|
| DTC No. | Bank | Connector | Terminal | Connector | Terminal | - Continuity | |
| | | | 12 | | 1 | Existed | E |
| P1090 | 1 | | 12 | F48 | 2 | Not existed | |
| | 1 | | 25 | F40 | 1 | Not existed | |
| | | E14 | 25 | | 2 | Existed | |
| | | – E14 | | | 1 | Existed | |
| 54000 | | | 2 | F49 | 2 | Not existed | |
| P1093 | 2 | - | | | 1 | Not existed | |
| | | | 15 | | 2 | Existed | |
| YES >> G NO >> G DETECT N heck the foll Harness cor Harness for >> R | owing. nnectors F40 open or sho cepair open c /EL ACTUAT | ONING PART | ground or sho | ort to power in | harness or o | | |
| | ion result nor | | | | <u>JK)</u> . | | |
| YES >> G NO >> G REPLACE Replace | O TO 6. O TO 5. VVEL ACTL | | SSEMBLY ly. Refer to <u>E</u> | | | | |
| YES >> G NO >> G REPLACE Replace V Go to EC >> IN | O TO 6. O TO 5. VVEL ACTL VVEL actuate -396, "Specia | Mal? JATOR SUB As or sub assemble al Repair Requ END | SSEMBLY ly. Refer to <u>E</u> | | | | |
| (ES >> G NO >> G .REPLACE Replace N Go to <u>EC</u> >> IN | O TO 6. O TO 5. VVEL ACTL VVEL actuate -396, "Specia | mal? JATOR SUB As or sub assemble al Repair Requ | SSEMBLY ly. Refer to <u>E</u> | | | | |
| YES >> G NO >> G REPLACE Replace V Go to EC >> IN | O TO 6. O TO 5. VVEL ACTL VVEL actuate -396, "Specia | MATOR SUB AS or sub assemble al Repair Requires END IT INCIDENT | SSEMBLY ly. Refer to <u>E</u> | | | | |
| YES >> G NO >> G REPLACE Go to EC >> IN CHECK IN efer to GI-48 the inspecti YES >> G NO >> R | O TO 6. O TO 5. VVEL ACTL VVEL actuato -396, "Special SPECTION TERMITTEN 5, "Intermitten ion result nor O TO 7. Lepair or repla | IATOR SUB As or sub assemble al Repair Required END IT INCIDENT Int Incident". IT Incident". | SSEMBLY ly. Refer to <u>E</u> irement". | | | | |
| YES >> G NO >> G REPLACE Go to EC >> IN CHECK IN efer to GI-4 the inspection YES >> G NO >> R REPLACE | O TO 6. O TO 5. VVEL ACTL VVEL actuato -396, "Special SPECTION TERMITTEN 5, "Intermitten ion result nor O TO 7. depair or repla VVEL CON | Mal? JATOR SUB As or sub assemble al Repair Requires END IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT | SSEMBLY ly. Refer to <u>E</u> irement". | M-95. "Exploc | led View". | | |
| $\begin{array}{c} FES >> G\\ NO >> G\\ REPLACE\\ \hline Replace \\ Go to EC\\ \hline \\ So to EC\\ \hline \\ Fer to Gl-4C\\ \hline \\ Fer to Gl-4C\\ \hline \\ FES >> G\\ NO >> R\\ REPLACE\\ \hline \\ Replace \\ Go to EC\\ \hline \end{array}$ | O TO 6. O TO 5. VVEL ACTL VVEL actuato -396, "Special SPECTION TERMITTEN 5, "Intermitten ion result nor O TO 7. cepair or repla VVEL CONT | Mal? JATOR SUB As or sub assemble al Repair Require END IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT | E SSEMBLY Iv. Refer to <u>E</u> irement". | M-95. "Exploc | led View". | <u>.</u> <u>NIT (VVEL CONTROL MO</u> | |
| $\begin{array}{rcl} FES & >> G\\ NO & >> G\\ REPLACE\\ \hline Replace \\ Go to EC\\ \hline \\ So to EC\\ \hline \\ CHECK IN\\ efer to GI-4C\\ the inspection \\ FES & >> G\\ NO & >> R\\ REPLACE\\ \hline Replace \\ Go to EC\\ \hline \\ ULE) : De\\ \hline \\ \\ So G\\ \hline \end{array}$ | O TO 6. O TO 5. VVEL ACTL VVEL actuate -396, "Special SPECTION TERMITTEN 5, "Intermitten ion result nor GO TO 7. Lepair or repla VVEL CONT VVEL CONT VVEL control -18, "ADDIT escription". | IATOR SUB AS or sub assemble al Repair Requination END IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT | SSEMBLY ly. Refer to <u>El</u> irement". E E r to <u>EC-39, "C</u> <u>CE WHEN R</u> | M-95. "Exploc | led View". | | |
| YES $>>$ G NO $>>$ G REPLACE Replace V Go to EC >> IN CHECK IN efer to GI-45 the inspecti YES $>>$ G NO $>>$ R .REPLACE Replace V Go to EC ULE) : De | O TO 6. O TO 5. VVEL ACTL VVEL actuate -396, "Special SPECTION TERMITTEN 5, "Intermitten ion result nor GO TO 7. Lepair or repla VVEL CONT VVEL CONT VVEL control -18, "ADDIT escription". | Mal? JATOR SUB As or sub assemble al Repair Require END IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT | SSEMBLY ly. Refer to <u>El</u> irement". E E r to <u>EC-39, "C</u> <u>CE WHEN R</u> | M-95. "Exploc | led View". | | |
| YES >> G NO >> G REPLACE Replace V Go to EC >> IN CHECK IN efer to GI-4 the inspecti YES >> G NO >> R REPLACE Replace V Go to EC ULE) : De >> G | O TO 6. O TO 5. VVEL ACTL VVEL actuate -396, "Special SPECTION TERMITTEN 5, "Intermitten ion result nor O TO 7. depair or repla VVEL CONT VVEL CONT VVEL CONT SCIPTION. O TO 8. 1 DTC CONF ion switch O C. | IATOR SUB AS or sub assemble al Repair Requination END IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT IT INCIDENT INCID | SSEMBLY ly. Refer to <u>El</u> irement". E r to <u>EC-39, "C</u> <u>CE WHEN R</u> ROCEDURE | M-95. "Exploc | led View". | | |

P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

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

9.CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-395. "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EC-39. "Component Parts Location".

2. Go to EC-396, "Special Repair Requirement".

>> INSPECTION END

11.CHECK VVEL LADDER ASSEMBLY

Refer to EM-105, "Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. Replace cylinder head, vvel ladder assembly and vvel actuator sub assembly

Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly. Refer to <u>EM-113</u>, "<u>Disassembly and Assembly</u>" and <u>EM-95</u>, "<u>Exploded View</u>".

2. Go to EC-396. "Special Repair Requirement".

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:000000010596976

1. CHECK VVEL ACTUATOR MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor harness connector.
- 3. Check resistance between VVEL actuator motor terminals as follows.

| VVEL actuator motor | - Resistance | |
|---------------------|---------------------|--|
| Terminal | | |
| 1 and 2 | 16 Ω or less | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.Replace vvel actuator sub assembly

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".

2. Go to EC-396. "Special Repair Requirement".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:000000010596977

1.CHECK VVEL ACTUATOR SUB ASSEMBLY

P1090, P1093 VVEL ACTUATOR MOTOR

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----|
| Turn ignition switch OFF. Remove VVEL actuator sub assembly. Refer to <u>EM-95, "Exploded View"</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. Refer to EM-95, "Exploded View". | | С |
| Go to <u>EC-396</u>, "Special Repair Requirement". | | |
| >> INSPECTION END | | D |
| | | |
| Special Repair Requirement | INFOID:000000010596978 | Е |
| 1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT | | |
| Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description | <u> </u> | F |
| >> GO TO 2. | | 1 |
| 2. PERFORM IDLE AIR VOLUME LEARNING | | |
| Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description". | | G |
| | | |
| >> END | | Н |
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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:000000010596980

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-397, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000010596981

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 | Ground | voltage | |
| E16 | 1 | Ground | Battery voltage | |
| 210 | 5 | Giouna | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 2. [VQ37VHR]

INFOID:000000010596979

P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | iusit shout t | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------|
| | | | • | short to power PPLY CIRCU | | r connectors. |
| Disconne | ct VVEL con | trol module h | arness conn | ector. | | ector and VVEL control module |
| VVEL co | ontrol module | VV | EL actuator mot | or relay | | |
| Connector | Termina | al Conr | nector | Terminal | Continuity | |
| E14 | 23 | E | 16 | 2 | Existed | |
| | | - | ound and pov | ver. | | |
| | on result nor | mal? | | | | |
| | O TO 4. enair open c | ircuit short t | o around or s | short to power | r in harness o | r connectors |
| | • • | | - | IAL CIRCUIT | | |
| | | | | | | ector and VVEL control module |
| harness c | • | | | motor relay n | | |
| | | | | | | |
| | | | | | | |
| VV | EL control mod | ule | VVEL actua | tor motor relay | Continuity | |
| VV Bank | EL control mod | Terminal | Connector | tor motor relay Terminal | - Continuity | _ |
| Bank 1 | | | | - | - Continuity Existed | |
| Bank 1 2 | Connector E14 | Terminal 13 1 | Connector E16 | Terminal 3 | | |
| Bank 1 2 Also chec | Connector E14 k harness fo | Terminal 13 1 r short to gro | Connector | Terminal 3 | | |
| Bank 1 2 Also chec he inspecti | Connector E14 k harness fo on result nor | Terminal 13 1 r short to gro | Connector E16 | Terminal 3 | | |
| Bank 1 2 Also chec he inspecti ES >> G | Connector E14 k harness fo on result nor O TO 5. | Terminal 13 1 r short to gro mal? | E16 Dund and pov | Terminal 3 ver. | Existed | r connectors. |
| Bank 1 2 Also cheo he inspecti ES >> G O >> R | E14 E14 k harness fo on result nor O TO 5. epair open c | Terminal 13 1 r short to gro mal? | Connector E16 ound and pow | Terminal 3 | Existed | r connectors. |
| Bank 1 2 Also cheo he inspecti ES >> G O >> R CHECK VV | E14 E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT | Terminal 13 1 r short to gro mal? ircuit, short t | Connector E16 ound and pow o ground or s R RELAY | Terminal 3 ver. | Existed | r connectors. |
| Bank 1 2 Also check he inspection ES >> G D >> R CHECK VV fer to EC-3 | E14 E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOR | Connector E16 ound and pow o ground or s R RELAY | Terminal 3 ver. | Existed | r connectors. |
| Bank 1 2 Also check he inspection ES >> G O >> R CHECK VV Fer to EC-3 he inspection ES >> G | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. | Terminal 13 1 r short to gro mal? ircuit, short to rOR MOTOR nent Inspection mal? | Connector E16 ound and pov o ground or s R RELAY on". | Terminal 3 ver. | Existed | |
| Bank 1 2 Also check he inspection ES >> G O >> R CHECK VV fer to EC-3 he inspection ES >> G D >> R CHECK VV fer to EC-3 he inspection ES >> G O >> R | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOR nent Inspection mal? actuator mo | Connector E16 ound and pow o ground or s R RELAY on". | Terminal 3 ver. short to power | Existed | r connectors. |
| Bank 1 2 Also check he inspection ES >> G O >> R CHECK VV fer to EC-3 he inspection ES >> G O >> R CHECK VV fer to EC-3 he inspection ES >> G O >> R | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOR nent Inspection mal? actuator mo | Connector E16 ound and pov o ground or s R RELAY on". | Terminal 3 ver. short to power | Existed | |
| Bank 1 2 Also check he inspecti ES >> G O >> R CHECK VV fer to EC-3 he inspecti ES >> G O >> R CHECK AE Disconne | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI 3ORT CIRCU ct ECM harn | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOR Dent Inspection mal? actuator module JIT FOR OPI ess connected | Connector E16 ound and pow o ground or s RELAY on". otor relay. Re EN AND SHO or. | Terminal 3 ver. short to power fer to <u>EC-39,</u> DRT | Existed | Parts Location". |
| Bank 1 2 Also check he inspecti ES >> G D >> R CHECK VV fer to EC-3 he inspecti ES >> G D >> R CHECK AE Disconne | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI 3ORT CIRCU ct ECM harn | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOR Dent Inspection mal? actuator module JIT FOR OPI ess connected | Connector E16 ound and pow o ground or s RELAY on". otor relay. Re EN AND SHO or. | Terminal 3 ver. short to power fer to <u>EC-39,</u> DRT | Existed | |
| Bank 1 2 Also check he inspecti ES >> G D >> R CHECK VV fer to EC-3 he inspecti ES >> G D >> R CHECK AE Disconne Check the | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI 3ORT CIRCU ct ECM harn e continuity b | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOR Dent Inspection mal? actuator module JIT FOR OPI ess connected | Connector E16 Dund and pow o ground or s R RELAY ON". Dtor relay. Re EN AND SHO Dr. EL control mo | Terminal 3 ver. short to power fer to <u>EC-39,</u> DRT | Existed | Parts Location". |
| Bank 1 2 Also check he inspecti ES >> G O >> R CHECK VV fer to EC-3 he inspecti ES >> G O >> R CHECK AE Disconne Check the VVEL co | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI 30RT CIRCU ct ECM harn e continuity b | Terminal 13 1 r short to gro mal? ircuit, short to FOR MOTOR Dent Inspection mal? actuator modules connected between VVE | Connector E16 ound and pow o ground or s R RELAY on". Dtor relay. Re EN AND SHO or. EL control mo ECM | Terminal 3 ver. short to power fer to <u>EC-39,</u> DRT dule harness | Existed | Parts Location". |
| Bank 1 2 Also check he inspecti ES >> G O >> R CHECK VV fer to EC-3 he inspecti ES >> G O >> R CHECK AE Disconne Check the | Connector E14 k harness fo on result nor O TO 5. epair open c /EL ACTUAT 99, "Compor on result nor O TO 6. eplace VVEI 3ORT CIRCU ct ECM harn e continuity b | Terminal 13 1 r short to gro mal? ircuit, short t FOR MOTOF nent Inspection mal? L actuator mo JIT FOR OPI ess connecto between VVE | Connector E16 Dund and pow o ground or s R RELAY ON". Dtor relay. Re EN AND SHO Dr. EL control mo | Terminal 3 ver. short to power fer to <u>EC-39,</u> DRT | Existed Tin harness of Component Connector an | Parts Location". |

Check the following.

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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-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

9.REPLACE VVEL CONTROL MODULE

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

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-397, "DTC Logic"</u>.

Is the DTC P1091 displayed again?

- YES >> GO TO 11.
- NO >> INSPECTION END
- 11.REPLACE ECM
- 1. Replace ECM. Refer to EC-39, "Component Parts Location".
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".
 - >> INSPECTION END

Component Inspection

INFOID:000000010596982

[VQ37VHR]

1.CHECK VVEL ACTUATOR MOTOR RELAY

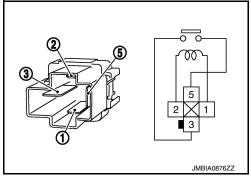
- 1. Turn ignition switch OFF.
- 2. Remove VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".
- Check the continuity between VVEL actuator motor relay terminals under the following conditions.

| Terminal | Condition | Continuity |
|----------|------------------------------------------------------|-------------|
| 3 and 5 | 12 V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace VVEL actuator motor relay. Refer to <u>EC-39</u>. "Component Parts Location".



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.) | D |
| 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 | E |

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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-401, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

Go to BRC-5, "Work Flow".

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INFOID:000000010596984

INFOID:000000010596985

INFOID-000000010596986

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-377, "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 | (|

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-402, "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-377, "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-9, "Draining"</u> and <u>LU-9, "Refilling"</u>.

- 1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to <u>MA-11</u>, <u>"Anti-Freeze Coolant Mixture Ratio"</u>.
- 2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-403, "Component Function Check".

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-404, "Diagnosis Procedure".

Component Function Check

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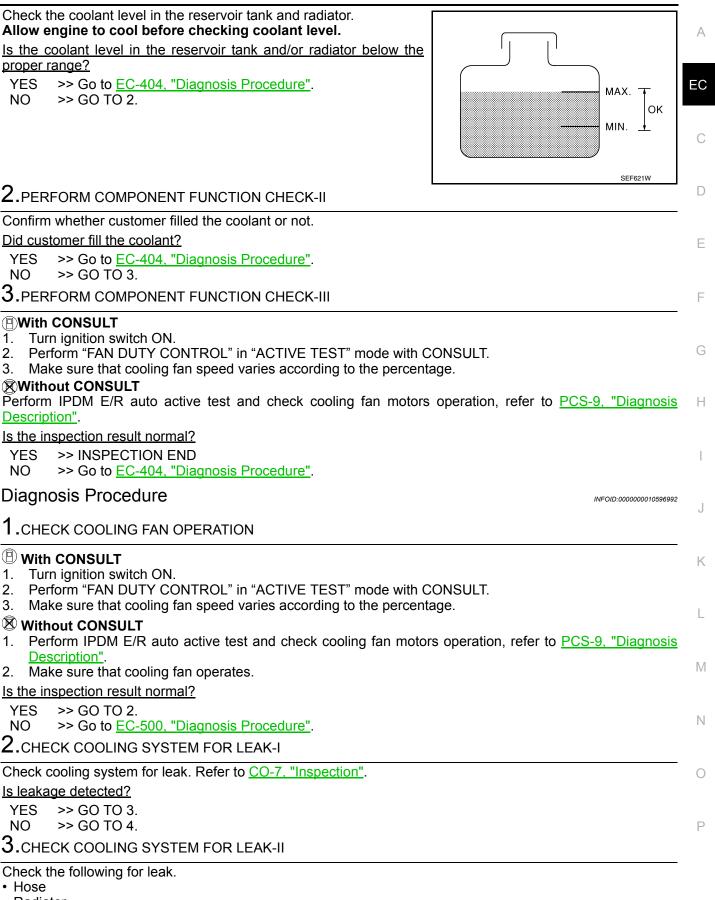
1.PERFORM COMPONENT FUNCTION CHECK-I

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 TANK CAP

Check radiator cap. Refer to <u>CO-11, "RADIATOR CAP : Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator tank cap. Refer to <u>CO-13, "Exploded View"</u>.

CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat. Refer to <u>CO-22, "Removal and Installation"</u>.

6.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-211, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor. Refer to <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 | nt Mixture Ratio" |
| | 3 | Coolant level | • Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | CO-7, "Inspection" |
| | 4 | Radiator cap | Pressure tester | 107 kPa (1.1 kg/cm ² , 16 psi) (Limit) | CO-11, "RADIATOR CAP : Inspection" |
| ON* ² | 5 | Coolant leaks | Visual | No leaks | CO-7, "Inspection" |
| ON* ² | 6 | Thermostat | Touch the upper and lower radiator hoses | Both hoses should be hot | CO-23, "Inspection" |
| ON* ¹ | 7 | Cooling fan | CONSULT | Operating | EC-500, "Component Function Check" |
| OFF | 8 | Combustion gas leak | Color checker chemical tester 4 Gas analyzer | Negative | _ |
| ON* ³ | 9 | Coolant temperature gauge | • Visual | Gauge less than 3/4 when driving | _ |
| | | Coolant overflow to 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-118, "Inspection" |
| | 12 | Cylinder block and pis- tons | • Visual | No scuffing on cylinder walls or piston | EM-131, "Inspection" |

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

< DTC/CIRCUIT DIAGNOSIS >

For more information, refer to CO-5, "Troubleshooting Chart".

>> INSPECTION END

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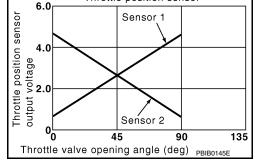
< DTC/CIRCUIT DIAGNOSIS >

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.



Throttle position sensor

DTC Logic

DTC DETECTION LOGIC

| 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-407, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct. Refer to EM-27, "Removal and Installation".

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[VQ37VHR]

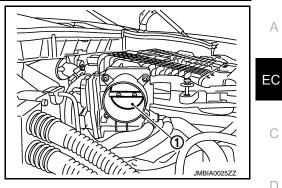
P1225, P1234 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Check if foreign matter is caught between the throttle valve (1) 3. and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".



2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
- 2. Go to EC-408. "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description"

>> GO TO 2. 2.perform idle air volume learning Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

[VQ37VHR]

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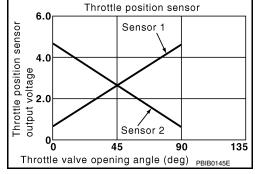
< DTC/CIRCUIT DIAGNOSIS >

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.

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Repeat steps 2 and 3 for 32 times.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to EC-415, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct. Refer to <u>EM-27, "Removal and Installation"</u>.

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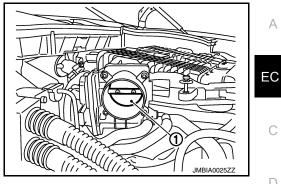
P1226, P1235 TP SENSOR

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



2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
- 2. Go to EC-410. "Special Repair Requirement".

>> INSPECTION END Special Repair Requirement

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description"

>> GO TO 2. 2.perform idle air volume learning Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

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P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

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[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:000000010597002

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-418, "DTC Logic"</u> or <u>EC-423, "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-411, "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-48. "Circuit Inspection"</u>.

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-410

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | E | CM | | | | | | |
|----------------------------------------------------|-------------------------------------------------|---------------------------------------------|------------------------|-------------------|-------------|-------------|------------|------------------|--|
| DTC | + | | | - | | Con | dition | Voltage (V) | |
| С | Connector | Terminal | Connec | ctor Term | nal | | | | |
| D1000 | E102 | 50 | | | | | OFF | Approx. 0 | |
| P1233 | F102 | 52 | M107 | 7 12 | | ion outitob | ON | Battery voltage | |
| P2101 | F101 | 3 | | / 120 | s ignit | tion switch | OFF | Approx. 0 | |
| P2101 | FIUI | 3 | | | | | ON | Battery voltage | |
| s the insp | pection re | sult norn | nal? | | | | | | |
| | >> GO TC | | | | | | | | |
| _ | >> GO TC | | | | | | | | |
| | | | | MOTOR F | RELAY P | OWER S | UPPLY CIRC | UIT | |
| | ignition so onnect EC | | | actor | | | | | |
| | | | | connector | E7. | | | | |
| | | | | | | connector | and ECM ha | rness connector. | |
| | | | | | | | | | |
| IPDI | M E/R | | ECM | Con | tinuity | | | | |
| Connector | r Termina | I Connec | tor Tern | ninal | | | | | |
| E7 | 70 | F101 | 2 | 5 Ex | sted | | | | |
| 5. Also d | check har | mess for | short to | ground ar | nd short to | o power. | | | |
| s the insp | | | <u>nal?</u> | | | | | | |
| | >> GO TC >> GO TC | | | | | | | | |
| 1.DETEC | | | | | | | | | |
| | | | NING PF | | | | | | |
| Check the Harness | | | F40 | | | | | | |
| Harness | s connect | ors F104 | , F105 | | | | | | |
| Harness | s for oper | or short | betweer | n ECM an | d IPDM E | E/R | | | |
| | | | | | | | | | |
| - | | • | | - | | | | or connectors. | |
|).CHEC | K THROI | TLE CO | NTROL | MOTOR F | RELAY IN | IPUT SIG | NAL CIRCU | T-II | |
| . Check | k the con | tinuity be | tween IF | PDM E/R | harness o | connector | and ECM ha | rness connector. | |
| | | | | | | | _ | | |
| | | IPDM E/ | | EC | | Continuit | y | | |
| DTC | | | | Connector | Terminal | | | | |
| | | nector T | erminal | 1 | | | | | |
| P1233 | 3 | E7 | | F102 | 52 | Existed | | | |
| | 3 | | 54 | F102 F101 | 52 3 | Existed | _ | | |
| P1233 P2101 2. Also c | 3 check har | E7 | 54 short to | | 3 | | _ | | |
| P1233 P2101 2. Also c s the insp | check har | E7 rness for sult norn | 54 short to | F101 | 3 | | _ | | |
| P1233 P2101 2. Also c s the insp YES > | check har bection re | E7 mess for sult norm | 54 short to | F101 | 3 | | _ | | |
| P1233 P2101 2. Also c s the insp YES > | check har pection re >> GO TC >> GO TC | E7 mess for sult norn) 7.) 6. | 54 short to nal? | F101 ground ar | 3 | | _ | | |

• Harness connectors E13, F40

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

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

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-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".

NO >> Repair or replace harness or connectors.

9. Check throttle control motor output signal circuit for open or short

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

| DTC | Electri | c throttle cont | rol actuator | ECM | | Continuity |
|---------|---------|-----------------|--------------|-----------|----------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| | | | 5 | | 49 | Existed |
| P1233 | 2 | F27 | 5 | F102 | 50 | Not existed |
| F 1233 | 2 | FZ1 | 6 | 1 102 | 49 | Not existed |
| | | | | | 50 | Existed |
| | 1 | | 1 | | 2 | Existed |
| P2101 | | F6 | | F101 | 4 | Not existed |
| F 2 101 | I | ΙΓΟ | 2 | 1 101 | 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

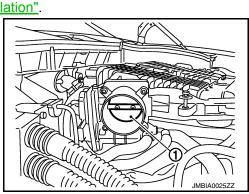
1. Remove the intake air duct. Refer to EM-27, "Removal and Installation".

2. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <u>EC-20</u>, "<u>THROTTLE</u> <u>VALVE CLOSED POSITION LEARNING</u> : <u>Description</u>".



11. CHECK THROTTLE CONTROL MOTOR

Refer to EC-414, "Component Inspection".

Is the inspection result normal?

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

Revision: February 2015

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION **IVQ37VHR1** < DTC/CIRCUIT DIAGNOSIS > 12. CHECK INTERMITTENT INCIDENT А Refer to GI-45, "Intermittent Incident". Is the inspection result normal? YES >> GO TO 13. EC NO >> Repair or replace harness or connectors. 13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunction electric throttle control actuator. Refer to EM-29, "Removal and Installation". Go to EC-414, "Special Repair Requirement". 2. D >> INSPECTION END Component Inspection INFOID:000000010597004 Ε 1. CHECK THROTTLE CONTROL MOTOR Turn ignition switch OFF. 1. Disconnect electric throttle control actuator harness connector. F 2. Check resistance between electric throttle control actuator terminals as per the following. 3 Electric throttle control actuator Resistance (Ω) Bank Terminals 1 1 and 2 Approx. 1 - 15 [at 25°C (77°F)] Н 2 5 and 6 Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation". 1. 2. Go to EC-414, "Special Repair Requirement". Κ >> INSPECTION END Special Repair Requirement INFOID:000000010597005 L 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description" Μ >> GO TO 2. 2.PERFORM IDLE AIR VOLUME LEARNING Ν Refer to EC-21. "IDLE AIR VOLUME LEARNING : Description" >> 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:000000010597007

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-415, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK THROTTLE 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.

INFOID:000000010597008

[VQ37VHR]

P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

А ECM Electric throttle control actuator DTC Continuity Bank Terminal Terminal Connector Connector 49 Existed EC 5 Not existed 50 P1236 2 F27 F102 49 Not existed 6 50 Existed 2 Existed 1 Not existed 4 P2118 F6 F101 1 D 2 Not existed 2 4 Existed Also check harness for short to ground and short to power. Е Is the inspection result normal? >> GO TO 3. YES NO >> Repair or replace. 3.CHECK THROTTLE CONTROL MOTOR Refer to EC-416, "Component Inspection". Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 5. Н 4.CHECK INTERMITTENT INCIDENT Refer to GI-45, "Intermittent Incident". Is the inspection result normal? YES >> GO TO 5. NO >> Repair or replace harness or connectors. ${f 5}.$ REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation". 2. Go to EC-417, "Special Repair Requirement". Κ >> INSPECTION END L **Component Inspection** INFOID:000000010597009 1. CHECK THROTTLE CONTROL MOTOR M Turn ignition switch OFF. 1. Disconnect electric throttle control actuator harness connector. 2. 3 Check resistance between electric throttle control actuator terminals as per the following. Ν Electric throttle control actuator Resistance (Ω) Bank Terminals 1 1 and 2 Approx. 1 - 15 [at 25°C (77°F)] 5 and 6 2 Ρ Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".

2. Go to EC-417, "Special Repair Requirement".

P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

>> INSPECTION END

Special Repair Requirement

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20. "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

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

>> END

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< 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:000000010597012

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | | DTC detecting condition | Possible cause | E |
|---------|---------------------------|----|---------------------------------------------------------------------------------------------------------------|------------------------------------|---|
| | Electric throttle control | A) | Electric throttle control actuator does not func- tion properly due to the return spring malfunc- tion. | | F |
| 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 | G |
| | Electric throttle control | A) | Electric throttle control actuator does not func- tion properly due to the return spring malfunc- tion. | | Н |
| P2119 | 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. | | I |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

| f DTC Confirmation Procedure has been previously conducted, always perform the following procedure | 3 |
|----------------------------------------------------------------------------------------------------|---|
| pefore conducting the next test. | |
| Turn invitien witch OFF and weit at least 40 accorde | |

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.

- 2. Shift selector lever to D position and wait at least 3 seconds.
- 3. Shift selector lever to P position.
- 4. Start engine and let it idle for 3 seconds.

Revision: February 2015

[VQ37VHR]

INFOID:0000000010597011

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P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

5. Check DTC.

Is DTC detected?

YES >> Go to <u>EC-419</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

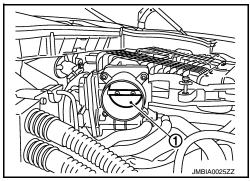
INFOID:000000010597013

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct. Refer to EM-27, "Removal and Installation".
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <u>EC-20</u>, "<u>THROTTLE</u> <u>VALVE CLOSED POSITION LEARNING : Description</u>".



2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
- 2. Go to EC-410, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2. Perform idle air volume learning

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

>> END

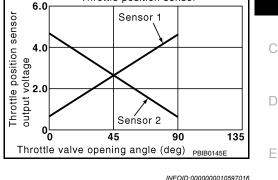
< DTC/CIRCUIT DIAGNOSIS >

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 throttle valve opening angle in response to driving conditions via the throttle control motor.



Throttle position sensor

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-378, "DTC Logic"</u>.

| 1 | - | ١. | |
|---|---|----|--|
| | - | | |

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EC

| 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.) | |
| 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.

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 <u>EC-420, "Diagnosis Procedure"</u>. 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-48, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

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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 | Giounu | 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 | CM | Continuity |
|-------|---------|-----------------|--------------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | F27 | 4 | F101 | 48 | Existed |
| P2135 | 1 | F6 | 3 | FIUI | 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

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

| DTC | Electri | c throttle cont | rol actuator | EC | CM | Continuity |
|--------|---------|-----------------|--------------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | F27 | 2 | | 31 | |
| F 1239 | 2 | Γ21 | 3 | F101 | 35 | Existed |
| P2135 | 1 | F6 | 4 | FIUI | 30 | Existed |
| F 2133 | I | 10 | 5 | | 34 | |

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-422, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

 $\mathbf{6}$.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".

P1239, P2135 TP SENSOR

| < DTC/CI | RCUIT DIAGNOSIS > | | | | | [VQ37VHR] |
|-----------------|-------------------------------------------------------|--------------------|----------------------|-----------------------------------|-------------------|------------------------|
| 2. <u>EC-42</u> | 22, "Special Repair Req | <u>uirement"</u> . | | | | |
| > | > INSPECTION END | | | | | |
| _ | K INTERMITTENT INCI | DENT | | | | = |
| Refer to G | I-45, "Intermittent Incide | <u>ent"</u> . | | | | |
| > | > INSPECTION END | | | | | |
| | nent Inspection | | | | | INFOID:000000010597018 |
| | ' K THROTTLE POSITIO | | | | | |
| | gnition switch OFF. | N SLNSOK | | | | |
| 2. Recor | nnect all harness conne rm <u>EC-20, "THROTTLE</u> | | | | locariation" | |
| 4. Turn i | gnition switch ON. | | <u>JSED FOSITION</u> | LEARINING . L | escription. | |
| | elector lever to D position the voltage between E | | s connector termir | hals under the f | ollowing conditio | ns. |
| | | | | | | |
| | ECM | | - | | | |
| Connector | + | - | Cond | ition | Voltage (V) | |
| | Terminal | Terminal | | Fully released | More than 0.36 | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | Fully released 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 | 24 ITD concer 2 (book 4) | 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 | |
| | | | | Fully depressed | More than 0.36 | |
| - | ection result normal? > INSPECTION END | | | | | |
| | \Rightarrow GO TO 2. | | | | | |
| 2.REPLA | CE ELECTRIC THROT | TLE CONTI | ROL ACTUATOR | | | |
| | ce malfunctioning elect | | | efer to <u>EM-29,</u> " | Removal and Ins | stallation". |
| 2. Go to | EC-422, "Special Repa | ir Requirem | <u>ent"</u> . | | | l |
| > | > INSPECTION END | | | | | |
| | Repair Requireme | nt | | | | |
| | | | | | | INFOID:000000010597019 |
| 1. PERFC | ORM THROTTLE VALVE | E CLOSED I | POSITION LEAR | NING | | |
| Refer to E | <u>C-20, "THROTTLE VAL</u> | VE CLOSEI | D POSITION LEA | RNING : Desci | ription" | |
| | > GO TO 2. | | | | | |
| • | DRM IDLE AIR VOLUMI | ELEARNIN | G | | | |
| Refer to E | C-21, "IDLE AIR VOLU | ME LEARNI | NG : Description" | | | |
| | | | - | | | |

>> END

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:000000010597020

[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:000000010597021

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-423. "Diagnosis Procedure".

NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

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

Is DTC detected?

- YES >> Go to <u>EC-423, "Diagnosis Procedure"</u>. NO >> INSPECTION END
- NO >> INSPECTION ENL

Diagnosis Procedure

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

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EC-422

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY CUIT DIAGNOSIS > [VQ37VHR]

< 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.

| IPDN | 1 E/R | E | СМ | Continuit | |
|-------------------------------------------|-------------------------|-------------|-------------|------------|------------------------------------------------|
| Connector | Terminal | Connector | Terminal | Continuity | |
| E7 | 70 | F101 | 25 | Existed | |
| | | | • | nd and sho | ort to power. |
| | ection res | | <u>?</u> | | |
| | > GO TO : > GO TO ; | | | | |
| 2.DETEC | | | IG PART | | |
| Check the | | | | | |
| Harness | connector | | | | |
| HarnessHarness | | | | M and IPD | M F/R |
| namess | | | | | |
| > | > Repair o | pen circui | t, short to | ground or | short to power in harness or connectors. |
| 3.CHECK | THROTT | LE CONT | ROL MOT | OR RELA | Y INPUT SIGNAL CIRCUIT |
| 1. Check | the contir | nuity betwe | en IPDM | E/R senso | r harness connector and ECM harness connector. |
| | | - | | | |
| DTC | IPDN | /IE/R | E | СМ | Continuity |
| | Connector | Terminal | Connector | Terminal | |
| P1290 | | | F102 | 52 | |
| P2100 | E7 | 54 | F101 | 3 | Existed |
| P2103 | | | F101 | 3 | |
| | | | F102 | 52 | |
| 2. Also c Is the insp | | | - | nu anu shi | ort to power. |
| | > GO TO { | | <u>-</u> | | |
| 4 | > GO TO 4 | | | | |
| 1. DETEC | T MALFU | NCTIONIN | IG PART | | |
| Check the | | | 0 | | |
| HarnessHarness | | | | M and IPD | M E/R |
| | | | | | |
| > | > Repair o | pen circui | t, short to | ground or | short to power in harness or connectors. |
| 5.CHECK | FUSE | | | | |
| | nnect 15 A 15 A fuse | | | PDM E/R. | |
| Is the insp | ection resi | ult normal' | <u>?</u> | | |
| | > GO TO (> Replace | | | | |
| 6.CHECK | INTERM | ITTENT IN | ICIDENT | | |
| Refer to G | I-45, "Inter | mittent In | cident". | | |
| Is the insp | | | | | |

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".

NO >> Repair or replace harness or connectors.

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P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

P1550 BATTERY CURRENT SENSOR

Description

INFOID:000000010597023

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-12. "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:000000010597024

DTC DETECTION LOGIC

NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to <u>EC-378,</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-425, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

INFOID:000000010597025

[VQ37VHR]

| Z .CHECK BATTERY | CURREN | T SENS | OR POWER SUPPLY CIRCUIT-I |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Disconnect batter | | sensor ha | arness connector. |
| Turn ignition switc Check the voltage | | battery o | current sensor harness connector and ground. |
| | between | buttery c | |
| Battery current sensor | Ground | Valtaga | |
| Connector Terminal | Ground | Voltage | (V) |
| E21 1 | Ground | Approx | к. 5 |
| is the inspection resul | | | |
| YES >> GO TO 4. NO >> GO TO 3. | | | |
| 3. DETECT MALFUN | | | |
| | CHONIN | GTART | |
| Check the following. Harness connectors | F40, E13 | | |
| Harness for open or | short bet | ween bat | tery current sensor and ECM |
| | | - b f - f | |
| · · · | - | | ground or short to power in harness connectors. |
| +.CHECK BATTERY | CURREN | II SENS | OR GROUND CIRCUIT FOR OPEN AND SHORT |
| Turn ignition switc Disconnect ECM | | onnocto- | |
| | | | y current sensor harness connector and ECM harness connector. |
| | ity setties | | |
| | | | |
| Battery current sensor | EC | M | |
| | EC Connector | M Terminal | Continuity |
| | | | - Continuity Existed |
| Connector Terminal E21 2 4. Also check harnes | Connector F102 ss for sho | Terminal 95 rt to grou | |
| Connector Terminal E21 2 4. Also check harnes Is the inspection result | Connector F102 ss for sho | Terminal 95 rt to grou | Existed |
| ConnectorTerminalE2124.Also check harnesIs the inspection resultYES>> GO TO 6. | F102 F102 Ss for sho t normal? | Terminal 95 rt to grou | Existed |
| ConnectorTerminalE2124.Also check harnesIs the inspection resultYES>> GO TO 6.NO>> GO TO 5. | Connector F102 ss for sho t normal? | Terminal 95 rt to grou | Existed |
| ConnectorTerminalE2124.Also check harnesIs the inspection resultYES>> GO TO 6.NO>> GO TO 5.5.DETECT MALFUN | Connector F102 ss for sho t normal? | Terminal 95 rt to grou | Existed |
| ConnectorTerminalE2124. Also check harnesIs the inspection resultYES>> GO TO 6.NO>> GO TO 5. 5. DETECT MALFUNCheck the following. | Connector F102 ss for sho t normal? CTIONIN | Terminal 95 rt to grou G PART | Existed |
| ConnectorTerminalE2124. Also check harnesIs the inspection resultYES>> GO TO 6.NO>> GO TO 5. 5. DETECT MALFUNCheck the following.Harness connectors | Connector F102 ss for sho <u>t normal?</u> CTIONING F40, E13 | Terminal 95 rt to grou G PART | Existed |
| ConnectorTerminalE2124.Also check harnesIs the inspection resultYES>> GO TO 6.NO>> GO TO 5.5.DETECT MALFUNCheck the following.Harness connectorsHarness for open or | Connector F102 ss for sho <u>t normal?</u> CTIONIN F40, E13 short bet | Terminal 95 rt to grou G PART | Existed nd and short to power. tery current sensor and ECM |
| Connector Terminal Connector E21 2 4. Also check harnes Is the inspection result YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUN Check the following. Harness connectors Harness for open or >> Repair op | Connector F102 ss for sho t normal? CTIONIN F40, E13 short betw en circuit, | Terminal 95 rt to grou G PART ween bat short to | Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. |
| Connector Terminal Connector E21 2 4. Also check harnes Is the inspection result YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUN Check the following. Harness connectors Harness for open or >> Repair op | Connector F102 ss for sho t normal? CTIONIN F40, E13 short betw en circuit, | Terminal 95 rt to grou G PART ween bat short to | Existed nd and short to power. tery current sensor and ECM |
| Connector Terminal Connector E21 2 4. Also check harnes Is the inspection result YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUN Check the following. Harness connectors Harness for open or >> Repair op 6.CHECK BATTERY | Connector F102 ss for sho t normal? CTIONIN F40, E13 short betw en circuit, CURREN | Terminal 95 rt to grou G PART ween bat short to IT SENS | Existed nd and short to power. tery current sensor and ECM ground or short to power in harness or connectors. |
| Connector Terminal Connector E21 2 4. Also check harnes Is the inspection result YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUN Check the following. Harness connectors Harness for open or >> Repair op 6.CHECK BATTERY 1. Check the continu | Connector F102 ss for sho t normal? CTIONING F40, E13 short between circuit, CURREN uity between | Terminal 95 rt to grou G PART ween bat short to IT SENS en batter | 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 |
| Connector Terminal Connector E21 2 4. Also check harnes Is the inspection result YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUN Check the following. Harness connectors Harness for open or >> Repair op 6.CHECK BATTERY 1. Check the continu Battery current sensor | Connector F102 ss for sho t normal? CTIONIN F40, E13 short betw en circuit, CURREN | Terminal 95 rt to grou G PART ween bat short to IT SENS en batter | 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. |
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| ConnectorTerminalE2124.Also check harnesIs the inspection resultYES>> GO TO 6.NO>> GO TO 5. 5. DETECT MALFUNCheck the following.Harness connectorsHarness for open or>> Repair op 6. CHECK BATTERY1.Check the continuBattery current sensorConnectorTerminalE2132.Also check harnes | Connector F102 ss for sho t normal? CTIONING F40, E13 short between en circuit, CURREN ity between ECI Connector F102 ss for sho | Terminal 95 rt to grou G PART ween bat short to IT SENS en batter M Terminal 91 | 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 |
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Check the following. • Harness connectors F40, E13

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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-427, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

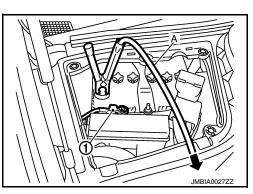
Component Inspection

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.



| 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 <u>CHG-12</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:000000010597028

DTC DETECTION LOGIC

NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-378, "DTC Logic"</u>.

| 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 | |
| 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.

2. Turn ignition switch ON.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V with ignition switch ON

Μ >> 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-428, "Diagnosis Procedure". >> INSPECTION END NO Diagnosis Procedure INFOID:000000010597029 P 1. CHECK GROUND CONNECTION Turn ignition switch OFF. 1.

2. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

[VQ37VHR]

INFOID:000000010597027

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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 cur | rent sensor | Ground | Voltage (V) | |
|-------------|--------------------|--------|-------------|--|
| Connector | Connector Terminal | | voltage (v) | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

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

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3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F40, E13

· Harness for open or short between battery current sensor and ECM

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

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery curr | ent 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 F40, E13

Harness for open or short between battery current sensor and ECM

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

6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery curr | ent 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.

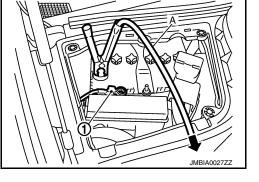
NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

| P1551, P1552 BATTERY CURRENT SENSOR | |
|---------------------------------------------------------------------------------------------------------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] | |
| Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM | А |
| >> Repair open circuit, short to ground or short to power in harness or connectors. | |
| 8. CHECK BATTERY CURRENT SENSOR | EC |
| Refer to EC-436, "Component Inspection". | |
| Is the inspection result normal? | С |
| YES >> GO TO 9. | |
| NO >> Replace battery negative cable assembly. | |
| | D |
| Refer to GI-45, "Intermittent Incident". | |
| >> INSPECTION END | Е |
| | 1 |
| 1.CHECK BATTERY CURRENT SENSOR | F |
| 1. Turn ignition switch OFF. | 0 |
| Reconnect harness connectors disconnected. Disconnect battery negative cable (1). | G |
| To body ground | Н |
| 4. Install jumper cable (A) between battery negative terminal and body ground. | |
| 5. Turn ignition switch ON. | |

- Turn ignition switch ON. 5.
- 6. Check the voltage between ECM harness connector terminals as per the following.



| 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:000000010597031

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-12. "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:000000010597032

DTC DETECTION LOGIC

NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to <u>EC-378,</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-431, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

INFOID:000000010597033

[VQ37VHR]

| 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 Connector Terminal Battery current sensor Connector Terminal Battery current sensor Check the following. • 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. 0. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness connector Connector Terminal | | TERY CURRE | NT SENSOF | R POWER SUPPLY CIRCUIT-I |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| 3. Check the voltage between battery current sensor harness connector and ground. Battery current sensor Ground Voltage (V) E21 1 Ground Approx.5 Sthe inspection result normal? YES > GO TO 3. DETECT MALFUNCTIONING PART Contensor Connector F40, E13 Harness connectors F40, E13 Harness connectors. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT . Turn ignition switch OFF. Disconnect ECM harness connector. Check the continuity between battery current sensor harness connector and ECM harness connector. . Disconnect ECM harness connector. Continuity Existed . Also check harness for short to ground and short to power. sthe inspection result normal? YES > GO TO 6. Ontinuity NO > GO TO 6. Disconnectors F40, E13 Harness connectors F40, E13 Harness connectors F40, E13 | | battery current | | |
| Battery current sensor Ground Voltage (V) E21 1 Ground Approx. 5 as the inspection result normal2 YES > So O TO 3. 3. DETECT MALFUNCTIONING PART Check the following. 1 Harness connectors F40, E13 + Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal Connector Terminal Connector F102 95 E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. s s. the inspection result normal? YES > SO TO 6. NO >> GO TO 6. NO >> Atmos for open or short between battery current sensor and ECM >> >> Repair ope | | | . hattanı avu | want as ware being a comparison and successed |
| Connector Terminal Ground Voltage (V) E21 1 Ground Approx.5 Is the inspection result normal? YES > 60 T0 3. 3. DETECT MALFUNCTIONING PART Check the following. • • Harness connectors F40, E13 • • • 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 E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. • • Is the inspection result normal? YES > 60 T0 5. • 5. DETECT MALFUNCTIONING PART | 3. Check the V | oltage betweel | n battery cur | rent sensor namess connector and ground. |
| Connector Terminal Ground Voltage (V) E21 1 Ground Approx.5 Is the inspection result normal? YES > 60 T0 3. 3. DETECT MALFUNCTIONING PART Check the following. • • Harness connectors F40, E13 • • • 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 E21 2 F102 95 Existed 4. Also check harness for short to ground and short to power. • • Is the inspection result normal? YES > 60 T0 5. • 5. DETECT MALFUNCTIONING PART | Batten/ current 6 | ansor | | |
| E21 1 Ground Approx.5 Is the inspection result normal? YES >> GO T0 4. NO >> 60 T0 3. 3. 3.DETECT MALFUNCTIONING PART Check the following. - Check the following. - - + 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 Connector Terminal Connector Terminal Connector Terminal Connector F102 95 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES YES > GO T0 5. 5.DETECT MALFUNCTIONING PART Check the following. - • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short | | Ground | Voltage (V |) |
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| NO >> GO TO 3. 3. DETECT MALFUNCTIONING PART Check the following. + 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 EOM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal Continuity Connector Terminal Connector Terminal Continuity 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. + Harness 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 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 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 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. | • | | <u>:</u> | |
| Check the following. Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal 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 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 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. | | | | |
| Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect ECM harness connector. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM connector Terminal Continuity Connector Terminal Connector Terminal Continuity A laso 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 for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor Terminal Connector Terminal Continuity E1 3 F102 91 Existed Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | 3. DETECT MA | LFUNCTIONIN | NG PART | |
| Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect ECM harness connector. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM connector Terminal Continuity Connector Terminal Connector Terminal Continuity A laso 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 for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor Terminal Connector Terminal Continuity E1 3 F102 91 Existed Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | Check the follow | ving. | | |
| >> 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 Connector Terminal Continuity So O TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART< | Harness conn | ectors F40, E1 | | |
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| 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 Connector Terminal Connector So O TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. + + Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness connectors. 6.CHECK BATTERY CURRENT SENSOR | | • | | • |
| 2. Disconnect ECM harness connector. 3. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector F40, E13 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector <t< td=""><td></td><td></td><td>NT SENSOR</td><th></th></t<> | | | NT SENSOR | |
| 3. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Continuity Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Continuity E21 2 F102 95 Existed A. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Continuity Connector Terminal Connector Terminal Connector Terminal Continuity 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | | | | |
| 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. Is the inspection of the sensor 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 Eattery current sensor Battery current sensor ECM Continuity Connector Terminal Connector Yes > GO TO 8. Settery current sensor for short to ground and short to power. | | | | urrent sensor barness connector and FCM barness connector |
| 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. | | ontinuity betwe | sen battery c | |
| ConnectorTerminalConnectorTerminalContinuityE212F10295Existed4. 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 PARTCheck the following.• Harness connectors F40, E13• Harness for open or short between battery current sensor and ECM>> Repair open circuit, short to ground or short to power in harness or connectors.6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT1. Check the continuity between battery current sensor harness connector and ECM harness connectorBattery current sensorECMConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalContinuityConnectorTerminalContinuity213F10291Existed2. Also check harness for short to ground and short to power.Is the inspection result normal?YES>> GO TO 8. | Battery current se | nsor E(| СМ | |
| 4. Also check harness for short to ground and short to power. is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F40, E13 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal 22. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | | | Terminal | Continuity |
| Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F40, E13 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal Connector Terminal Continuity 21 3 7102 91 Existed 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | E21 | F102 | 95 | Existed |
| Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F40, E13 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal Connector Terminal Continuity 21 3 7102 91 Existed 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | 4. Also check | harness for she | ort to ground | and short to power. |
| NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F40, E13 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector $\frac{Battery current sensor ECM}{Continuity}$ 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | | | - | |
| 5. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F40, E13 • Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. 6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal Connector Terminal 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. | YES >> GO | TO 6. | - | |
| Check the following. Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 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 Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | | | | |
| Harness connectors F40, E13 Harness for open or short between battery current sensor and ECM > Repair open circuit, short to ground or short to power in harness or connectors. 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 | 5. DETECT MA | LFUNCTIONIN | √G PART | |
| 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. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 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 Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | | | | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. 6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 3 F102 91 Existed 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | | | | - automatic and ECM |
| 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 3 F102 91 Existed 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | Harness conn | and an also when a | tween batter | y current sensor and ECM |
| 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 3 F102 91 Existed 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | Harness conn | en or short be | | |
| 1. Check the continuity between battery current sensor harness connector and ECM harness connector Battery current sensor ECM Connector Terminal 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. | Harness conn Harness for op | | t short to an | ound or short to nower in harness or connectors |
| Battery current sensor ECM Continuity Connector Terminal Connector Terminal E21 3 F102 91 Existed 2.< | Harness conn Harness for op >> Rep | air open circui | | • |
| Connector Terminal Connector Terminal E21 3 F102 91 Existed 2.< | Harness conn Harness for op >> Reg 6.CHECK BAT | air open circui TERY CURRE | NT SENSOF | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| Connector Terminal Connector Terminal E21 3 F102 91 Existed 2.< | Harness conn Harness for op >> Reg 6.CHECK BAT | air open circui TERY CURRE | NT SENSOF | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| 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. | Harness conn Harness for op >> Reg CHECK BAT Check the c | air open circui TERY CURRE ontinuity betwe | NT SENSOF | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 8. | Harness conn Harness for op S Rep CHECK BAT Check the o Battery current se | air open circui TERY CURRE ontinuity betwe | NT SENSOF | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| Is the inspection result normal? YES >> GO TO 8. | Harness conn Harness for op Seg CHECK BAT Check the o Battery current se Connector Terr | air open circui TERY CURRE ontinuity betweensor EC | NT SENSOF een battery c CM Terminal | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| YES >> GO TO 8. | Harness conn Harness for op S Rep C.CHECK BAT Check the c Battery current se Connector Terr E21 | air open circui TERY CURRE ontinuity betweensor nisor EC ninal Connector F102 | NT SENSOF een battery c CM Terminal 91 | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT current sensor harness connector and ECM harness connector. |
| | Harness conn Harness for op Seg CHECK BAT Check the o Battery current sec Connector Terr E21 Z. Also check | air open circui TERY CURRE ontinuity betweensor nsor EC ninal Connector F102 narness for she | NT SENSOF een battery c CM Terminal 91 ort to ground | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT current sensor harness connector and ECM harness connector. |
| | Harness conn Harness for op SRep C.CHECK BAT Check the c Battery current se Connector Terr E21 S. Also check Is the inspectior | air open circui TERY CURRE ontinuity between nsor EC ninal Connector F102 narness for shear result normal | NT SENSOF een battery c CM Terminal 91 ort to ground | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT current sensor harness connector and ECM harness connector. |
| | Harness conn Harness for op SRep C.CHECK BAT Check the op Battery current se Connector Terr E21 C. Also check Is the inspectior YES >> GO | air open circui TERY CURRE ontinuity betweensor ninal Connector Granness for shear result normal? TO 8. TO 7. | NT SENSOF een battery c CM Terminal 91 ort to ground ? | R INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |

Check the following.Harness connectors F40, E13

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-436, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

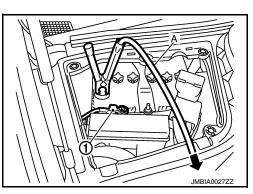
Component Inspection

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.



| 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.

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-12</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:000000010597036

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>378, "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 | |

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-434, "Component Function Check".

NOTE:

Use component function check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>EC-435, "Diagnosis Procedure"</u>.

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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[VQ37VHR]

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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 EC-435, "Diagnosis Procedure"

Diagnosis Procedure

INFOID:000000010597038

[VQ37VHR]

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

| Battery cur | rent 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 F40, E13

Harness for open or short between battery current sensor and ECM

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

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

| Battery curr | ent sensor | EC | CM | 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?

5.DETECT MALFUNCTIONING PART

Check the following.

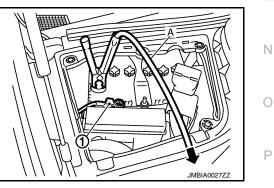
Revision: February 2015

| | | P1554 B | ATTERY | CURRENT SENSOR | |
|------------------------------------------------------------|---------------------------------------------|-------------------|--------------|-------------------------------------------------------------------------------|-----|
| < DTC/CIRCU | T DIAGNOS | IS > | | [VQ37VHR] | |
| Harness conrHarness for o | | | tery curren | t sensor and ECM A | L |
| • | | | - | short to power in harness or connectors. SIGNAL CIRCUIT FOR OPEN AND SHORT | ~ * |
| 1. Check the | continuity bet | ween batter | y current se | ensor harness connector and ECM harness connector. | |
| Battery current se | ensor | ECM | | C | |
| | minal Connec | | Continuity | | |
| E21 | 3 F102 | 91 | Existed | D | ł |
| 2. Also check | harness for | short to grou | nd and sho | ort to power. | |
| Is the inspection | <u>n result norm</u> | al? | | E | |
| |) TO 8.) TO 7. | | | _ | |
| 7. DETECT MA | - | | | | |
| | | | | F | |
| Check the follow Harness conr | | E13 | | | |
| | | | tery curren | t sensor and ECM G | Í |
| | nair anan air | wit abort to | around or a | abort to now or in bornoop or connectors | |
| 8.CHECK BAT | | | | short to power in harness or connectors. H | |
| Refer to EC-43 | 6. "Compone | nt Inspectior | <u>ı"</u> . | | |
| Is the inspection | | <u>al?</u> | | 1 | |
| YES >> GC NO >> Re |) TO 9. place battery | nogativa og | hla aaaamk | sha | |
| 9.CHECK INT | • • | - | | лу. | |
| Refer to <u>GI-45</u> , | | | | J | |
| itelei to <u>01-40,</u> | memment | <u>incident</u> . | | | |
| >> INS | SPECTION E | ND | | K | |
| Component | Inspectior | 1 | | INFOID:000000010597039 | |
| 1. СНЕСК ВАТ | TERY CURF | RENT SENS | OR | L | |
| 2. Reconnect | n switch OFF harness con battery nega | nectors disc | | M | |

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.

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 EC-77, "System Description" 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 EC-375, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| P1564 | ASCD steering switch | An excessively high voltage signal from the ASCD steering switch is sent to ECM. ECM detects that input signal from the ASCD steering switch is out of the specified range. ECM detects that the ASCD steering switch is stuck ON. | Harness or connectors (The switch circuit is open or shorted.) ASCD steering switch ECM |
| DTC CON | NFIRMATION PRO | DCEDURE | · |
| 1.PRECO | ONDITIONING | | |
| before cor 1. Turn i 2. Turn i | nducting the next te gnition switch OFF gnition switch ON. | | always perform the following procedure |
| > | > GO TO 2. | | |
| 2.PERFC | ORM DTC CONFIRI | MATION PROCEDURE | |
| Press Press Press | MAIN switch for at CANCEL switch fo | nd wait at least 10 seconds. least 10 seconds, then release it and w r at least 10 seconds, then release it ar ERATE switch for at least 10 seconds, | |
| 6. Check | CDTC. | h for at least 10 seconds, then release i | it and wait at least 10 seconds. |
| | | liagnosis Procedure". ID | |
| Diagnos | is Procedure | | INFOID:000000010597042 |
| 1. CHECK | GROUND CONNI | ECTION | |
| 2. Check | gnition switch OFF. ground connectior | n M95. Refer to Ground Inspection in <u>G</u> | I-48, "Circuit Inspection". |
| YES > | > GO TO 2. | around connection | |

- NO >> Repair or replace ground connection.
- 2. CHECK ASCD STEERING SWITCH CIRCUIT
- (P) With CONSULT

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| | |

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

- 1. Turn ignition switch ON.
- 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 | Conditior | ı | Indication |
|---------------|-----------------------|----------|------------|
| MAIN SW | MAIN switch | Pressed | ON |
| MAIN 3W | MAIN 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 |
| 3E1 3W | SET/COAST SWIICH | 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 |
| | | | CANCEL switch: Pressed | Approx. 1 |
| M107 | 101 (ASCD steering switch signal) | 108 | SET/COAST switch: Pressed | Approx. 2 |
| | | | RESUME/ACCELERATE switch: Pressed | Approx. 3 |
| | | | All ASCD steering switches: Released | Approx. 4 |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

3. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Disconnect combination switch harness connector M303.

4. Check the continuity between combination switch and ECM harness connector.

| Combination switch | ECM | | Continuity | |
|--------------------|-----------|----------|------------|--|
| Terminal | Connector | Terminal | 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.

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

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INFOID:000000010597043

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 | EC | M | Continuity | |
|--------------------|--------------|-------------|------------|---------------|
| Terminal | Connector | Terminal | Continuity | |
| 13 | M107 | 101 | Existed | |
| 2. Also check ha | arness for s | short to gr | ound and s | short to powe |
| s the inspection r | esult norm | <u>al?</u> | | |

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

6.DETECT MALFUNCTIONING PART

Check the following.

Combination switch (spiral cable)

· Harness for open and short between ECM and combination switch

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

| 7. CHECK ASCD STEERING SW | птоц |
|---------------------------|------|
| I.CHECK ASCD STEERING SW | псн |

Refer to EC-440, "Component Inspection".

Is the inspection result normal?

| YES | >> GO TO 8. |
|-----|-------------|
| | |

NO >> Replace ASCD steering switch. Refer to <u>ST-16, "Exploded View"</u>.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK ASCD STEERING SWITCH

1. Turn ignition switch OFF.

2. Disconnect combination switch (spiral cable) harness connector M303.

3. Check resistance between combination switch harness connector terminals under the following conditions.

| Combinat | tion switch | Condition | Resistance (Ω) |
|-------------|-------------|--------------------------------------|-----------------|
| Connector | Terminals | Condition | Resistance (12) |
| | | MAIN switch: Pressed | Approx. 0 |
| | | CANCEL switch: Pressed | Approx. 250 |
| M303 | 13 and 16 | SET/COAST switch: Pressed | Approx. 660 |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 1,480 |
| | | All ASCD steering switches: Released | Approx. 4,000 |
| Is the insp | ection resu | ult normal? | |
| YES > | > INSPEC | TION END | |

NO >> Replace ASCD steering switch. Refer to <u>ST-16, "Exploded View"</u>.

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-18</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-375, "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. Press LDP/DCA switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 8. Check DTC.

Is DTC detected?

- YES >> Go to EC-441, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ICC STEERING SWITCH CIRCUIT

INFOID:000000010597046

INFOID:000000010597044

P1564 ICC STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

1.

Turn ignition switch ON. Check the voltage between ECM harness connector terminals as per the following. 2.

| | ECM | | | | |
|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|--------------------------------------------------------------------------------|-------------|
| Connector | + | | _ | Condition | Voltage (V) |
| | Terminal | Т | erminal | | |
| | | | | MAIN switch: Pressed | Approx. 0 |
| | | | | LDP/DCA switch: Pressed | Approx. 0.8 |
| | 101 | | | CANCEL switch: Pressed | Approx. 1.6 |
| M107 | 101 (ICC steering switch sig | anal) | 108 | DISTANCE switch: Pressed | Approx. 2.2 |
| | (| J , | | SET/COAST switch: Pressed | Approx. 2.9 |
| | | | | RESUME/ACCELERATE switch: Pressed | Approx. 3.4 |
| | | | | All ICC steering switches: Released | Approx. 4.0 |
| CHECK Turn ig Discor Discor | gnition switch OFF. nnect ECM harness nnect combination s | connecto witch har | or. ness con | CIRCUIT FOR OPEN AND SHORT nector M303. witch and ECM harness connector. | |
| Combinatio | n switch ECM | | Continuity | | |
| Termi | nal Connector ⁻ | Terminal | Continuity | | |
| 16 | M107 | 108 | Existed | _ | |
| the insp YES > NO > | heck harness for sh <u>ection result normal</u> > GO TO 5. > GO TO 4. CT MALFUNCTIONII | ? | | | |
| Combina | following. ation switch (spiral ca for open and short l | | ECM and | I combination switch | |
| | > Repair open circui | | - | or short to power in harness or conn | ectors. |
| - | | WITCH II | NPUT SIG | GNAL CIRCUIT FOR OPEN AND SH | IORT |
| D.CHECK | CICC STEERING S | | | GNAL CIRCUIT FOR OPEN AND SH switch and ECM harness connector. | IORT |
| D.CHECK | CICC STEERING S | een com | pination s | | IORT |
| CHECK | CICC STEERING SN the continuity betwo n switch ECM | een com | | | IORT |
| CHECK Check | the continuity between switch ECM | een com | pination s | | IORT |
| CHECK Check Combinatio Termi | the continuity between switch ECM | een com Terminal 101 | Continuity Existed | witch and ECM harness connector. | IORT |
| CHECK Combination Combination Termi 13 C. Also constructions Sthe insponses YES > | A ICC STEERING SN to the continuity between n switch ECM nal Connector M107 | Terminal 101 ort to gro | Continuity Existed | witch and ECM harness connector. | IORT |

• Combination switch (spiral cable)

Revision: February 2015

P1564 ICC STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

• Harness for open and short between ECM and combination switch

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

7. CHECK ICC STEERING SWITCH

Refer to EC-443, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ICC steering switch. Refer to <u>CCS-177, "Exploded View"</u>.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000010597047

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 | Resistance (12) | |
| | | MAIN switch: Pressed | Approx. 0 | |
| | | LDP/DCA switch: Pressed | Approx. 270 | |
| | | CANCEL switch: Pressed | Approx. 620 | |
| M303 | 13 and 16 | DISTANCE switch: Pressed | Approx. 1,100 | |
| | | SET/COAST switch: Pressed | Approx. 1,810 | |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 2,990 | |
| | | All ICC steering switches: Released | Approx. 5,420 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC steering switch. Refer to <u>CCS-177, "Exploded View"</u>.

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-375, "DTC Logic"</u>.
- If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-377, "DTC Logic"</u>.

| | 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 COM | NFIRMATION PRO | DCEDURE | |
| 1.PRECO | ONDITIONING | | |
| before cor | nducting the next te | | always perform the following procedure |
| 2. Turn i | gnition switch ON. | | |
| TESTING | CONDITION: | and wait at least 10 seconds. ith the drive wheels lifted in the shop | or by driving the vehicle. If a road test |
| is expect | ed to be easier, it i | s unnecessary to lift the vehicle. | |
| > | > GO TO 2. | | |
| • | | MATION PROCEDURE | |
| | gnition switch ON. | | |
| 3. Drive | | C steering switch. than 40 km/h (25 MPH). | |
| Drive CAUT Alway Press | the vehicle at more | than 40 km/h (25 MPH). a safe speed. | |
| Drive CAUT Alway Press Check <u>Is DTC de</u> | the vehicle at more ION: /s drive vehicle at SET/COAST switcl CDTC. tected? | than 40 km/h (25 MPH). a safe speed. h. | |
| 3. Drive CAUT Alway 4. Press 5. Check Is DTC de YES > | the vehicle at more ION: /s drive vehicle at SET/COAST switcl CDTC. tected? | than 40 km/h (25 MPH). a safe speed. h. <u>hagnosis Procedure"</u> . | |
| 3. Drive CAUT Alway 4. Press 5. Check Is DTC de YES > NO > | the vehicle at more ION: /s drive vehicle at SET/COAST switcl CDTC. <u>tected?</u> > Go to <u>EC-444, "D</u> | than 40 km/h (25 MPH). a safe speed. h. <u>hagnosis Procedure"</u> . | INFC/ID:000000010597049 |
| 3. Drive CAUT Alway 4. Press 5. Check Is DTC de YES > NO > Diagnos | the vehicle at more ION: /s drive vehicle at SET/COAST switcle CDTC. <u>tected?</u> > Go to <u>EC-444, "D</u> > INSPECTION EN is Procedure | than 40 km/h (25 MPH). a safe speed. h. <u>hagnosis Procedure"</u> . | INFCID:000000010597049 |
| 3. Drive CAUT Alway 4. Press 5. Check Is DTC de YES > NO > Diagnos 1.REPLA 1. Repla | the vehicle at more ION: /s drive vehicle at SET/COAST switcle (DTC. <u>tected?</u> > Go to <u>EC-444, "D</u> > INSPECTION EN is Procedure ACE ICC SENSOR I ce ICC sensor integ | than 40 km/h (25 MPH). a safe speed. h. <u>viagnosis Procedure"</u> . ID | |

>> INSPECTION END

INFOID:000000010597048

А

EC

С

D

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-77</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-375, "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.

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.

| Vehicle speed | More than 30 km/h (19 mph) |
|----------------|----------------------------|
| Selector lever | Suitable position |

4. Check 1st trip DTC.

INFOID:000000010597050

| | CUIT DIAGNOSIS > | | | | | [VQ37VHR] |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------|--------------------|--------------------------|
| | TC detected? | | | | | |
| | Go to <u>EC-446, "Diagno</u> GO TO 3. | sis Proce | <u>dure"</u> . | | | |
| - | RM DTC CONFIRMATIC | ON PROC | EDURE | | | |
| | e vehicle for at least 5 o | | | er the following | conditions. | |
| CAUTIO | | | | | | |
| NOTE: | | | | ala lifta din th | | |
| | ocedure may be cond d test is expected to b | | | | | ig the vehicle. |
| | - | | | - | | |
| Vehicle speed | d | More than 3 | 30 km/h (19 mph) | | | |
| Selector lever | r | Suitable po | sition | | | |
| Driving location | on | seconds so | e brake pedal for mon as not to come off f tioned vehicle speed | rom the | | |
| 2. Check 1 | 1st trip DTC. | | | | | |
| | TC detected? | | | | | |
| | Go to EC-446. "Diagno | <u>sis Proce</u> | <u>dure"</u> . | | | |
| NO >> | INSPECTION END | | | | | |
| | | | | | | |
| Diagnosis | s Procedure | | | | | INFOID:000000010597052 |
| | | I | | | | INFOID:0000000010597052 |
| 1.снеско | OVERALL FUNCTION- | | | | | INFOID:0000000010597052 |
| 1.CHECK (| OVERALL FUNCTION- | 1 | | | | INFOID:0000000010597052 |
| 1.CHECK | OVERALL FUNCTION- | | R" mode with C | ONSULT. | | INFOID:000000010597052 |
| With CO With CO United Turn igr Select " | OVERALL FUNCTION- NSULT hition switch ON. | | | | | INFOID:0000000010597052 |
| CHECK (With CO . Turn igr . Select " . Check " | OVERALL FUNCTION- INSULT Inition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication | MONITC n under th | | litions. | | INFOID:000000010597052 |
| With CO With CO Urrn igr Select " | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication | MONITC n under th | e following cond | litions. | | INFOID:000000010597052 |
| With CO With CO Select " Check " | OVERALL FUNCTION- NSULT inition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Co Brake pedal | MONITC n under th | e following conc | litions. Indication OFF | | INFOID:000000010597052 |
| 1.CHECK (With CO 1. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 | OVERALL FUNCTION- NSULT hition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Co Brake pedal Brake pedal | MONITC n under th | e following cond | litions. | | INFOID:000000010597052 |
| CHECK (With CO Turn igr Select " Check " Monitor item BRAKE SW1 | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Co Brake pedal Brake pedal CONSULT | MONITC n under th | e following conc | litions. Indication OFF | | INFOID:000000010597052 |
| CHECK With CO Turn igr Select " Check " Monitor item BRAKE SW1 Without Turn igr | OVERALL FUNCTION- INSULT inition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Drake pedal CONSULT inition switch ON. | MONITC n under th | e following cond Slightly depressed Fully released | litions. Indication OFF ON | e following. | INFOID:00000001059705 |
| 1.CHECK (With CO I. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 RAKE SW1 Without I. Turn igr | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Co Brake pedal Brake pedal CONSULT | MONITC n under th | e following cond Slightly depressed Fully released | litions. Indication OFF ON | e following. | INFOID:000000010597052 |
| 1.CHECK (With CO 1. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 Without 1. Turn igr | OVERALL FUNCTION- INSULT inition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Drake pedal CONSULT inition switch ON. | MONITC n under th | e following cond Slightly depressed Fully released | litions. Indication OFF ON | e following. | INFOID:000000010597053 |
| 1.CHECK (With CO 1. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 BRAKE SW1 Without 1. Turn igr 2. Check t | OVERALL FUNCTION- NSULT hition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Co Brake pedal Brake pedal CONSULT hition switch ON. he voltage between EC | MONITC n under th | e following cond Slightly depressed Fully released | litions. Indication OFF ON | e following. | INFOID:000000010597054 |
| 1.CHECK (With CO . Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 Without . Turn igr | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Brake pedal Brake pedal CONSULT nition switch ON. the voltage between EC ECM | MONITC n under th | Slightly depressed Fully released s connector term | litions. Indication OFF ON ninals as per th | e following. | |
| CHECK With CO Turn igr Select " Check " Monitor item BRAKE SW1 Without Turn igr Check t Connector | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Brake pedal Brake pedal CONSULT nition switch ON. he voltage between EC ECM + Terminal 126 | MONITC n under th ondition M harnes | Slightly depressed Fully released s connector term | litions. Indication OFF ON ninals as per th | e following. | |
| CHECK With CO Turn igr Select " Monitor item BRAKE SW1 Without Check t | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Drake pedal Brake pedal CONSULT nition switch ON. he voltage between EC ECM + Terminal | MONITC n under th ondition M harnes | Slightly depressed Fully released s connector term | litions. Indication OFF ON ninals as per th | | Voltage (V) |
| 1.CHECK (With CO 1. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 BRAKE SW1 Without 1. Turn igr 2. Check t Connector M107 s the inspec | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Brake pedal Brake pedal CONSULT nition switch ON. he voltage between EC ECM + Terminal 126 (ASCD brake switch signal) ction result normal? | MONITC n under th ondition M harnes | Slightly depressed Fully released s connector term | litions. Indication OFF ON ninals as per th | Slightly depressed | Voltage (V) Approx. 0 |
| 1.CHECK (With CO 1. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 Without 1. Turn igr 2. Check t Connector M107 <u>s the inspec</u> YES >> | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Brake pedal Brake pedal CONSULT nition switch ON. the voltage between EC ECM + Terminal 126 (ASCD brake switch signal) ction result normal? GO TO 2. | MONITC n under th ondition M harnes | Slightly depressed Fully released s connector term | litions. Indication OFF ON ninals as per th | Slightly depressed | Voltage (V) Approx. 0 |
| 1.CHECK (With CO 1. Turn igr 2. Select " 3. Check " Monitor item BRAKE SW1 BRAKE SW1 Without 1. Turn igr 2. Check t Connector M107 S the inspec YES >> NO >> | OVERALL FUNCTION- NSULT nition switch ON. BRAKE SW1" in "DATA BRAKE SW1" indication Consult Brake pedal Brake pedal CONSULT nition switch ON. he voltage between EC ECM + Terminal 126 (ASCD brake switch signal) ction result normal? | MONITC n under th ondition M harnes – Termina 128 | Slightly depressed Fully released s connector term | litions. Indication OFF ON ninals as per th | Slightly depressed | Voltage (V) Approx. 0 |

< DTC/CIRCUIT DIAGNOSIS >

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 |
| 101 | (Stop lamp switch signal) | 120 | Diake peual | Fully released | Approx. 0 |

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 8.

3.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD bra | ake switch | Ground | Voltage |
|-----------|------------|--------|-----------------|
| Connector | Terminal | Ground | 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 | ASCD brake switch | | ECM | |
|-----------|-------------------|--------------------|-----|------------|
| 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.

O.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness for open or short between ECM and ASCD brake switch

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

7.CHECK ASCD BRAKE SWITCH

| | | _ | ASCD BRAKE SWITCH | |
|------------------------------------------------------------|---------------|-------------------|---------------------------------------|------------------------|
| < DTC/CIRCUI | | - | | [VQ37VHR] |
| Refer to EC-449 |), "Componei | nt Inspection (A | SCD Brake Switch)" | |
| Is the inspection | | al? | | |
| | | nako owitch D | efer to <u>BR-20, "Exploded View'</u> | |
| · · | | | SUPPLY CIRCUIT | - E |
| | | | | |
| | n switch OFF | /itch harness co | nnector | |
| | | | witch harness connector and g | round. |
| | - | | - | |
| Stop lam | p switch | Ground | Voltage | |
| Connector | Terminal | Ground | voltage | |
| E110 | 1 | Ground | Battery voltage | |
| Is the inspection | result norm | al? | | |
| | TO 10. | | | |
| NO >> GO | | | | |
| 9.DETECT MA | LFUNCTION | ING PART | | |
| Check the follow | | - | | _ |
| Fuse block (J/10A fuse (No. | | E103 | | |
| | | between stop la | mp switch and battery | |
| | | | | |
| >> Rep | air open circ | uit, short to gro | und or short to power in harnes | ss or connectors. |
| 10.CHECK ST | FOP LAMP S | WITCH INPUT | SIGNAL CIRCUIT FOR OPEN | I AND SHORT |
| | ECM harnes | | | |
| | | | switch harness connector and | ECM harness connector. |
| | 1 | | | |
| Stop lamp sv | vitch | ECM | Continuity | |
| | | onnector Term | nal | |
| E110 | 2 | M107 12 | 2 Existed | |
| | | - | and short to power. | |
| Is the inspection | | al? | | |
| YES >> GO NO >> GO | TO 12. | | | |
| | | | | |
| 11.DETECT M | | INING PART | | |
| Check the follow | | - E102 M2 | | |
| Fuse block (J/ Harness for or | | | nd stop lamp switch | |
| | | | | |
| >> Rep | air open circ | uit, short to gro | und or short to power in harnes | ss or connectors. |
| 12.CHECK ST | | | | |
| | | | op Lamp Switch)" | |
| Is the inspection | | • • | | |
| • | TO 13. | <u>~···</u> | | |
| NO >> Rep | lace stop lar | | r to <u>BR-20, "Exploded View"</u> . | |
| 13. CHECK IN | TERMITTEN | T INCIDENT | | |
| Refer to GI-45, ' | | | | |
| $\frac{1}{1}$ | monitorit | | | |

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

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 | 1 and 2 Brake peda | Fully released | Existed |
| 1 4110 2 | Diake peual | 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-21, "Inspection and Adjustment"</u>.
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| T and Z | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to <u>BR-20. "Exploded View"</u>.

Component Inspection (Stop Lamp Switch)

INFOID:000000010597054

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 | С | 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-21</u>, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|----------------|--------------------|-------------|
| 1 and 2 | 12 Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-20, "Exploded View"</u>.

[VQ37VHR]

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-18</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-375, "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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Is 1st trip DTC detected?

YES >> Go to EC-451, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION: Always drive vehicle at a safe speed. NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

| Vehicle speed | More than 30 km/h (19 mph) |
|------------------|---------------------------------------------------------------------------------------------------------------|
| Selector lever | Suitable position |
| Driving location | Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed. |

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-451, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK OVERALL FUNCTION-I

With CONSULT

1. Turn ignition switch ON.

2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.

3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| DIVARE OW I | Brake pedal | Fully released | ON |

Without CONSULT

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|
| Connector | + | - | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M107 | 126 | 128 | Brake pedal | Slightly depressed | Approx. 0 |
| 101 | (ICC brake switch signal) | 120 | Brake pedal | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

With CONSULT

Select "BRAKE SW2" and check indication under the following conditions.

| Monitor item | C | Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| DIVARE SWZ | Brake pedal | Fully released | OFF |

< DTC/CIRCUIT DIAGNOSIS >

Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

| | | ECM | | | | | |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------|--------------------|-----------------|--|
| Connector | | + | - | 0 | Condition | Voltage (V) | |
| | Terr | minal | Terminal | | | | |
| M107 | | 22 | | Brake pedal | Slightly depressed | Battery voltage | |
| WHO? | (Stop lamp s | switch sig | nal) | Braile pedal | Fully released | Approx. 0 | |
| is the inspe | ection result | normal | 2 | | | | |
| | • GO TO 17 | | <u> </u> | | | | |
| | • GO TO 11 | | | | | | |
| 3.снеск | ICC BRAK | E SWIT | CH POWER SUP | PLY CIRCUIT | | | |
| | nition switc | h OFF. | | | | | |
| | | | tch harness conn | ector. | | | |
| | nition switc | | n ICC brake swite | ch harness con | nector and groun | d. | |
| | 90 | | | | | | |
| ICC brak | ke switch | Ground | Voltage | | | | |
| Connector | Terminal | Ground | voltage | | | | |
| E111 | 1 | Ground | Battery voltage | | | | |
| Is the inspe | ection result | <u>normal</u> | ? | | | | |
| | • GO TO 8. | | | | | | |
| | • GO TO 4. | | | _ | | | |
| | | | ORELAY CIRCUI | I | | | |
| | nition switc | | d relay harness c | onnector | | | |
| | nition switc | | | onneetor. | | | |
| 4. Check | the voltage | hotwoo | | | | | |
| | | Dermee | n ICC brake hold | relay narness | connector and gro | bund. | |
| | | | n ICC brake hold | relay narness | connector and gro | bund. | |
| ICC brake | - | Ground | n ICC brake hold Voltage | relay narness | connector and gro | bund. | |
| Connector | Terminal | Ground | Voltage | relay narness | connector and gro | bund. | |
| Connector E50 | Terminal 3 | Ground | Voltage Battery voltage | relay narness | connector and gro | bund. | |
| Connector E50 Is the inspe | Terminal 3 ection result | Ground Ground t normal | Voltage Battery voltage | relay namess | connector and gro | bund. | |
| Connector E50 Is the inspe YES >> | Terminal 3 | Ground Ground t normal | Voltage Battery voltage | relay narness | connector and gro | bund. | |
| Connector E50 Is the inspe YES >> NO >> | Terminal 3 ection result GO TO 6. GO TO 5. | Ground Ground t normal | Voltage Battery voltage | relay narness | connector and gro | bund. | |
| Connector E50 Is the inspe YES >> NO >> 5.DETEC | Terminal 3 ection result GO TO 6. GO TO 5. T MALFUNO | Ground Ground t normal | Voltage Battery voltage | relay namess | connector and gro | bund. | |
| Connector E50 YES >> NO >> 5.DETEC Check the f | Terminal 3 ection result GO TO 6. GO TO 5. T MALFUNO following. ck (J/B) con | Ground Ground t normal | Voltage Battery voltage ? NG PART | relay namess | connector and gro | bund. | |
| Connector E50 YES >> NO >> 5.DETEC Check the f • Fuse bloc • 10 A fuse | Terminal 3 ection result GO TO 6. GO TO 5. T MALFUNG following. ck (J/B) con (No. 3) | Ground Ground t normal CTIONIN | Voltage Battery voltage ? NG PART E103 | | | bund. | |
| Connector E50 YES >> NO >> 5.DETEC Check the f • Fuse bloc • 10 A fuse | Terminal 3 ection result GO TO 6. GO TO 5. T MALFUNG following. ck (J/B) con (No. 3) | Ground Ground t normal CTIONIN | Voltage Battery voltage ? NG PART | | | bund. | |
| Connector E50 YES >> NO >> 5.DETEC Check the f • Fuse bloc • 10 A fuse • Harness f | Terminal 3 ection result GO TO 6. GO TO 5. T MALFUNO following. ck (J/B) con (No. 3) for open or | Ground Ground t normal CTIONIN Inector E short be | Voltage Battery voltage ? NG PART E103 etween ICC brake | hold relay and | I fuse | bund. | |
| Connector E50 YES >> NO >> 5.DETEC Check the f • Fuse bloc • 10 A fuse • Harness f | Terminal 3 ection result GO TO 6. GO TO 5. T MALFUNG following. ck (J/B) con (No. 3) for open or Repair ope | Ground Ground t normal CTIONIN Inector E short be en circui | Voltage Battery voltage ? NG PART E103 etween ICC brake it or short to groun | hold relay and | I fuse | | |

 Check the continuity between ICC brake hold relay harness connector and ICC brake switch harness connector. А

< DTC/CIRCUIT DIAGNOSIS >

| ICC brake | hold relay | ICC brak | e switch | Continuity |
|-----------|------------|--------------------|----------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E50 | 4 | E111 | 1 | Existed |

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

Is the inspection result normal?

YES >> GO TO 7.

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

I.CHECK ICC BRAKE HOLD RELAY

Refer to EC-456, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace ICC brake hold relay. Refer to <u>EC-39</u>, "Component Parts Location".

8.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brak | e switch | EC | Continuity | |
|-----------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E111 | 2 | M107 | 126 | Existed |

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

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness for open or short between ICC brake switch and ECM

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

10.CHECK ICC BRAKE SWITCH

Refer to EC-455, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace ICC brake switch. Refer to <u>BR-20, "Exploded View"</u>.

11. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Disconnect ICC brake hold relay harness connector.
- 4. Check the voltage between stop lamp switch harness connector and ground.

| Stop lam | p switch | Ground | Voltage |
|-----------|--------------------|--------|-----------------|
| Connector | Connector Terminal | | Voltage |
| E110 | 1 | Ground | Battery voltage |

5. Check the voltage between ICC brake hold relay harness connector and ground.

< DTC/CIRCUIT DIAGNOSIS >

| | hold relay | Ground | Voltage | | | |
|------------------------------------------------|----------------------------------------------|-------------|-------------|-------------|-------------------------------------------------|----------|
| Connector | Terminal | | | | | |
| E50 | 7 | Ground | , | age | | |
| Is the inspe YES >> | Contraction rest GO TO ² | | <u>17</u> | | | |
| | > GO TO ⁻ | | | | | |
| 12.dete | CT MALF | | | т | | |
| Check the | | | | | | <u> </u> |
| • Fuse bloc | | onnector l | E103 | | | |
| 10 A fuse Harness | | or short be | etween bat | terv and st | p lamp switch | |
| | | | | | brake hold relay | |
| | | | | | | |
| 1 0 | | | | | harness or connectors. | |
| 13. CHEC | CK STOP | LAMP SV | VITCH INP | UT SIGNA | CIRCUIT FOR OPEN AND SHORT | |
| | | | connector | | | |
| 2. Check | the contin | IUILY DETW | een stop la | amp switch | narness connector and ECM harness connector. | |
| Stop lam | p switch | E | CM | | | |
| Connector | Terminal | Connector | | Continuity | | |
| E110 | 2 | M107 | 122 | Existed | | |
| 3. Check | the contir | nuitv betw | een ICC b | rake hold r | ay harness connector and ECM harness connector. | |
| | | ,, | | | | |
| ICC brake | hold relay | E | CM | Continuity | | |
| Connector | Terminal | Connector | Terminal | Continuity | | |
| E50 | 6 | M107 | 122 | Existed | | |
| | | | ort to grou | nd and sho | t to power. | |
| Is the inspe | | | <u> ?</u> | | | |
| | > GO TO ⁻ > GO TO ⁻ | | | | | |
| 14.DETE | | | | т | | |
| Check the | - | | | | | |
| Fuse bloc | | onnector I | E103, M2 | | | |
| Harness | for open c | or short be | etween EC | | amp switch | |
| namess | ior open c | or short de | etween EC | ivi and ICC | orake hold relay | |
| >> | > Renair o | nen circu | it short to | around or | nort to power in harness or connectors. | |
| 15.CHEC | • | • | | ground or | | |
| | | | | (Stop Lor | Switch)" | |
| Refer to <u>EC</u> Is the inspe | | | | I JOIUP Lar | <u>) Switch)</u> . | |
| | > GO TO ⁻ | | <u>L:</u> | | | |
| NO >> | Replace | stop lam | | | 20, "Exploded View". | |
| 16. CHEC | CK ICC BF | RAKE HO | LD RELAY | , | | |
| | | | | | Hold Relay)". | |
| Is the inspe | | | | | | |
| | GO TO | | | | | |
| NO >> | Donlaco | ICC brok | o hold rola | v Dofor to | C 30 "Component Parts Location" | |

< DTC/CIRCUIT DIAGNOSIS >

17. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

1.CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.

- 2. Disconnect ICC brake switch harness connector.
- 3. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | (| Condition | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| i allu z | Diake pedal | 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-21, "Inspection and Adjustment"</u>.
- 2. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | Diake pedai | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch. Refer to <u>BR-20, "Exploded View"</u>.

Component Inspection (Stop Lamp Switch)

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1.CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to <u>BR-21, "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 pedal | Slightly depressed | Existed |

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

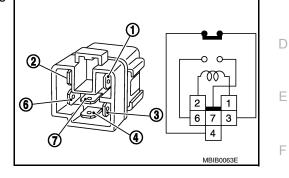
NO >> Replace stop lamp switch. Refer to <u>BR-20, "Exploded View"</u>.

Component Inspection (ICC Brake Hold Relay)

1. CHECK ICC BRAKE HOLD RELAY

- 1. Turn ignition switch OFF.
- 2. Remove ICC brake hold relay. Refer to EC-39, "Component Parts Location".
- 3. Check the continuity between ICC brake hold relay terminals under the following conditions.

| Terminals | Condition | Continuity |
|-----------|-----------------------------------------------------|-------------|
| 3 and 4 | 12V direct current supply between terminals 1 and 2 | Not existed |
| 5 anu 4 | No current supply | Existed |
| 6 and 7 | 12V direct current supply between terminals 1 and 2 | Existed |
| 0 anu 7 | No current supply | Not existed |



Is the inspection result normal? YES >> INSPECTION END

NO >> Replace ICC brake hold relay. Refer to EC-39, "Component Parts Location".

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Revision: February 2015

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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-77, "System Description"</u> 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-358, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-375, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-377, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1574 | ASCD vehicle speed sensor | The difference between the two vehicle speed signals is out of the specified range. | Harness or connectors (The CAN communication line is open or shorted.) Unified meter and A/C amp. ABS actuator and electric unit (control unit) Wheel sensor TCM ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine (VDC switch OFF).
- 2. Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION: Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3. Check DTC.

Is DTC detected?

YES >> Go to <u>EC-457, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

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P1574 ASCD VEHICLE SPEED SENSOR

| < 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 |
| Refer to <u>BRC-30, "CONSULT Function"</u> . | |
| Is the inspection result normal? | EC |
| YES >> GO TO 3. | |
| NO >> Repair or replace. | С |
| 3. CHECK DTC WITH "UNIFIED METER AND A/C AMP." | |
| Refer to MWI-42, "CONSULT Function (METER/M&A)". | D |
| >> INSPECTION END | _ |
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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-18</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-358, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-375, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-377, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1574 | ICC vehicle speed sensor | The difference between the two vehicle speed signals is out of the specified range. | Harness or connectors (The CAN communication line is open or shorted.) Unified meter and A/C amp. ABS actuator and electric unit (control unit) Wheel sensor TCM ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine (VDC switch OFF).
- 2. Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION: Always drive vehicle at a safe speed.

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.

3. Check DTC.

Is DTC detected?

YES >> Go to <u>EC-459</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

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P1574 ICC VEHICLE SPEED SENSOR

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|---------------------------------------------------------------------------------------------------|-----------|--|
| YES >> GO TO 2. NO >> Perform trouble shooting relevant to DTC indicated. | A | |
| 2. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)" | / \ | |
| Refer to BRC-30, "CONSULT Function". | EC | |
| <u>Is the inspection result normal?</u> YES >> GO TO 3. | | |
| NO >> Repair or replace. | С | |
| 3.CHECK DTC WITH "UNIFIED METER AND A/C AMP." | | |
| Check combination meter function. Refer to <u>MWI-42, "CONSULT Function (METER/M&A)"</u> . | D | |
| >> INSPECTION END | E | |
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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 |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> Go to EC-461, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- Perform DTC Confirmation Procedure. See <u>EC-461, "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-39, "Component Parts Location".

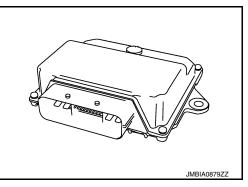
Revision: February 2015

EC-460

2015 QX50

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P1606 VVEL CONTROL MODULE

[VQ37VHR]

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Description".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

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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

| 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 CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to EC-463, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-463, "DTC Logic"</u>.

Is the DTC P1607 displayed again?

YES >> GO TO 2.

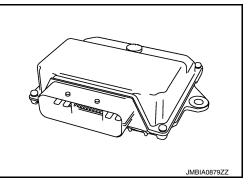
NO >> INSPECTION END

2.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".

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[VQ37VHR]



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P1607 VVEL CONTROL MODULE

[VQ37VHR]

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Description".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

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P1608 VVEL SENSOR POWER SUPPLY

DTC Logic

INFOID:000000010597073

[VQ37VHR]

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|----------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1608 | VVEL sensor power supply circuit | VVEL control module detects a voltage of power source for sensor is excessively low or high. | Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) VVEL control shaft position sensor VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.
- Is DTC detected?
- YES >> Go to EC-465, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect VVEL control shaft position sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

| VVEL control shaft position sensor | | | Ground | Voltage (V) |
|------------------------------------|-----------|----------|--------|-------------|
| Bank | Connector | Terminal | Ground | voltage (v) |
| 1 | F46 | 3 | | |
| I | F40 | 6 | Ground | Approx 5 |
| 2 | E47 | 3 | Ground | Approx. 5 |
| Z | F47 | 6 | | |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

P1608 VVEL SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

$\overline{\mathbf{3.}}$ check vvel control shaft position sensor power supply circuit for open and SHORT

- 1. Turn ignition switch OFF.
- Disconnect VVEL control module harness connector. 2.
- EC Check the continuity between VVEL control shaft position sensor harness connector and VVEL control 3. module harness connector.

| VVEL control shaft position sensor | | | VVEL control module | | Continuity |
|------------------------------------|-----------|----------|---------------------|----------|------------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F46 | 3 | | 9 | |
| I | 140 | 6 | E14 | 22 | Existed |
| 2 | F47 | 3 | E 14 | 7 | Existed |
| 2 | F47 | 6 | | 20 | |

| 4. Also check harness for short to ground and power. | |
|------------------------------------------------------|---|
| Is the inspection result normal? | F |
| YES >> GO TO 5. | |
| NO >> GO TO 4. | |
| 4.DETECT MALFUNCTIONING PART | G |
| | - |

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

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

5. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident". Is the inspection result normal? YES >> GO TO 6. NO >> Repair or replace. 6.REPLACE VVEL CONTROL MODULE

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

>> INSPECTION END 7. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident". Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace.

8.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".

2. Go to EC-466, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

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[VQ37VHR]

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>> GO TO 2.

 $2. {\sf perform\ idle\ air\ volume\ learning}$

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

>> END

P1805 BRAKE SWITCH

Description

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.

DTC Logic

INFOID:000000010597077

2015 QX50

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DT | C detecting condition | Possible cause |
|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| P1805 | Brake switch | | n signal is not sent to ECM for ex- me while the vehicle is being driv- | Harness or connectors (Stop lamp switch circuit is open or short- ed.) Stop lamp switch |
| DTC CON | FIRMATION PROC | EDURE | | |
| 1.PERFOR | RM DTC CONFIRMA | TION PROCE | DURE | |
| Fully de Erase t Check <u>Is 1st trip D</u> YES >> | nition switch ON. epress the brake peo he DTC. 1st trip DTC. <u>TC detected?</u> Go to <u>EC-468, "Dia</u> INSPECTION END | | | |
| Diagnosi | s Procedure | | | INFOID:000000010597078 |
| | STOP LAMP SWITC | | | |
| | nition switch OFF. | | | |
| | | depressing an | d releasing the brake peda | I. |
| | | | | |
| | Brake pedal | - | lamp | |
| Fi | ully released | Not illu | minated | |
| - | htly depressed | Illum | inated | |
| YES >> NO >> | ction result normal? GO TO 4. GO TO 2. | | | |
| | STOP LAMP SWITC | | | |
| | nect stop lamp switcl | | nector. itch harness connector and | around |
| 01000 | | etep lamp ow | | 9 |
| Sto | p lamp switch | | | |
| Connecto | r Terminal | Ground | Voltage | |
| E110 | 1 | Ground | Battery voltage | |
| YES >> | ction result normal? GO TO 4. GO TO 3. | | · | |
| 3 DETECT | MALFUNCTIONIN | G PART | | |
| U.DETEC | | | | |
| Check the f | | | | |

• 10 A fuse (No. 7)

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EC

С

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

· Harness for open or short between stop lamp switch and battery

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

4.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect stop lamp switch harness connector.

2. Disconnect ECM harness connector.

3. Check the continuity between stop lamp switch harness connector and ECM harness connector.

| Stop lamp switch | | ECM | | Continuity |
|------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E110 | 2 | M107 | 122 | Existed |

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

• Fuse block (J/B) connector E103, M2

Harness for open or short between ECM and stop lamp switch

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

6.CHECK STOP LAMP SWITCH

Refer to EC-469, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace stop lamp switch. Refer to <u>BR-20, "Exploded View"</u>.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

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.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | | |
| | Diake pedai | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".

2. Check the continuity between stop lamp switch terminals under the following conditions.

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

| Terminals | C | Condition | Continuity |
|-------------|---------------|--------------------|----------------------|
| | | Fully released | Not existed |
| 1 and 2 | Brake pedal | Slightly depressed | Existed |
| Is the insp | ection result | t normal? | |
| YES > | > INSPECT | ION END | |
| NO > | > Replace s | top lamp switch. F | terer to <u>BR-2</u> |
| | | | |
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< 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 logar and risk range. Together with its capital electronics, the capacity of the sensor is capable of precise measurement $\lambda = 1$, but also in the logar and risk range.

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 $800^{\circ}C$ (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

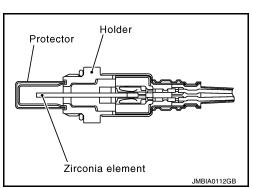
If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

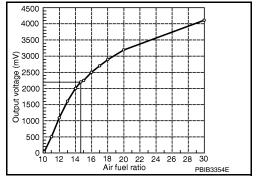
1. Turn ignition switch OFF and wait at least 10 seconds.

- 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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| P2096, P2097, P2098, P2099 A/F SENSOR 1 | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR |] |
| >> GO TO 2. | ٨ |
| 2.PERFORM DTC CONFIRMATION PROCEDURE | A |
| Clear the mixture ratio self-learning value. Refer to <u>EC-24, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Description"</u>. | Ξ |
| 2. Turn ignition switch OFF and wait at least 10 seconds. | EC |
| Turn ignition switch ON. 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. | С |
| Let engine idle for 1 minute. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes. | |
| 8. Check 1st trip DTC. | D |
| Is 1st trip DTC detected? | D |
| YES >> Go to <u>EC-472, "Diagnosis Procedure"</u> . NO >> INSPECTION END | |
| | E |
| Diagnosis Procedure | 82 |
| 1. CHECK GROUND CONNECTION | F |
| 1. Turn ignition switch OFF. | - |
| Check ground connection M95. Refer to Ground Inspection in <u>GI-48. "Circuit Inspection"</u>. <u>Is the inspection result normal?</u> | G |
| YES >> GO TO 2. | |
| NO >> Repair or replace ground connection. | Ц |
| 2. RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2 | Н |
| Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to EM-34, "Exploded View". | _ |
| | |
| >> GO TO 3. 3.CHECK FOR EXHAUST GAS LEAK | |
| 1. Start engine and run it at idle. | J |
| Listen for an exhaust gas leak before the three way catalyst 2. | |
| Is exhaust gas detected? | K |
| YES >> Repair or replace. NO >> GO TO 4. | |
| 4. CHECK FOR INTAKE AIR LEAK | |
| 1. Start engine and run it at idle. | _ L |
| Listen for an intake air leak after the mass air flow sensor. | |
| Is intake air leak detected? | M |
| YES >> Repair or replace. NO >> GO TO 5. | |
| 5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE | Ν |
| Clear the mixture ratio self-learning value. Refer to <u>EC-24, "MIXTURE RATIO SELF-LEARNING VALUE</u> | Ē |
| CLEAR : Description". | 0 |
| 2. Run engine for at least 10 minutes at idle speed. | 0 |
| Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine? YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-263, "Diagnosi | s |
| Procedure" or EC-267, "Diagnosis Procedure". | <u> </u> |
| NO >> GO TO 6. | |
| 6.CHECK HARNESS CONNECTOR | _ |
| Turn ignition switch OFF. Disconnect A/F sensor 1 harness connector. | |
| 3 Check harness connector for water | |

3. Check harness connector for water.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Water should not exit.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace harness connector.

7. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

2. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor | Ground | Voltage | |
|----------------|------|------------|----------|---------|-----------------|
| DIC | Bank | Connector | Terminal | Giouna | vollage |
| P2096 P2097 | 1 | F123 | 4 | Ground | Battery voltage |
| P2098 P2099 | 2 | F124 | 4 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

$9. {\sf CHECK} \text{ a/f sensor 1 input signal circuit for open and short}$

- 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 | inal Connector Terminal | Continuity | | |
| P2096 | 1 F123 | | 1 | | 57 | | |
| P2097 | 1 | 1 125 | 2 | E102 | 61 | Existed | |
| P2098 | 2 | F124 | 1 | 1 102 | 65 | Existed | |
| P2099 | 2 | Г 124 | 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 Not existed | |
|-------|--------|------------|----------------|--------|---------------------------|------------|
| DIC | Bank | Connector | Terminal | Ground | | Continuity |
| P2096 | 1 F123 | | 1 | | | |
| P2097 | 1 | 1 125 | 2 | Ground | Not existed | |
| P2098 | 2 | F124 | 1 | Ground | | |
| P2099 | 2 | Г 124 | 2 | - | | |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | ECM | | | | | A |
|---------------------|------------------|--------------------------|-------------|----------------|----------------------|----------------------------------------------|-----|
| DTC | Bank | Connector | Terminal | Ground | Continuity | | 2 1 |
| P2096 | - | | 57 | | | | |
| P2097 | 1 | F102 | 61 | Cround | Not evicted | | EC |
| P2098 | 2 | F102 | 65 | Ground | Not existed | | |
| P2099 | 2 | | 66 | | | | С |
| | | arness for | • | ower. | | | |
| • | ection > GO 1 | result norm | <u>nal?</u> | | | | D |
| | | | cuit, short | to ground | or short to p | ower in harness or connectors. | |
| | | SENSOR | | - | · | | E |
| Refer to E | C-181. | "Compone | ent Inspect | <u>tion"</u> . | | | |
| | | result norm | nal? | | | | _ |
| | > GO 1 > GO 1 | | | | | | F |
| | | ATED OXY | GEN SEN | ISOR 2 | | | |
| Refer to E | | | | | | | G |
| | | result norm | | | | | |
| YES > | > GO 1 | ΓO 12. | | | | | Н |
| | | | | | gen sensor 2 | . Refer to EM-34, "Exploded View". | |
| | | ERMITTE | | | | | |
| Perform <u>G</u> | | | | | | | |
| | ection > GO 1 | result norm | <u>nal?</u> | | | | |
| - | | air or replac | ce. | | | | J |
| | • | AIR FUEL F | | F) SENSC |)R 1 | | |
| | | | | | <u> 1-34, "Explo</u> | ded View". | K |
| CAUTION | • | | which he | a baan d | renned free | a = baight of more than 0.5 m (10.7 in) and | |
| | | | | | a new one. | n a height of more than 0.5 m (19.7 in) onto | ba |
| | | | | | | stem threads using Oxygen Sensor Thre | |
| | | mercial se ervice too | | DI (J-4389 | 7-18 or J-4 | 3897-12)] and approved Anti-seize Lubrica | ant |
| <u>Do you ha</u> | | | , | | | | M |
| | > GO 1 | | | | | | |
| | > GO 1 | | | | | | Ν |
| | | VF ADJUS | STMENT D | ATA | | | |
| | | | | | | | |
| | | switch ON DJ-B1" an | | J-B2" in "E | | OR" mode with CONSULT. | 0 |
| | | | is displaye | ed on CON | ISULT scree | n. | |
| <u>ls "0.000"</u> | | | | | | | Р |
| | > INSP > GO 1 | PECTION E | IND | | | | |
| | | | E RATIO S | SELF-LEAI | RNING VAL | JE | |
| Clear the CLEAR : D | mixtur | e ratio sel | f-learning | value. Re | efer to EC-2 | 4. "MIXTURE RATIO SELF-LEARNING VAL | UE |
| Do you ha | | | | | | | |
| | | | | | | | |

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 16. NO >> INSPECTION END 16.CONFIRM A/F ADJUSTMENT DATA

()With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
- 3. Make sure that "0.000" is displayed on CONSULT screen.

>> INSPECTION END

< 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 <u>EC-378, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | ŀ |
|---------|----------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------|---|
| 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) | I |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

- 1. Turn ignition 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 <u>EC-476. "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

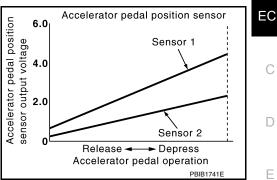
Check ground connection M95. Refer to Ground Inspection in <u>GI-48, "Circuit Inspection"</u>.

Is the inspection result normal?

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< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

| APP se | ensor | Ground | Voltage (V/) |
|---------------------------------------------|----------------|-------------|--------------|
| Connector | Ground Voltage | voltage (v) | |
| E112 (Without ICC) E116 (With ICC) | 5 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and accelerator pedal position sensor

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

4.CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

| APP ser | nsor | EC | Continuity | | |
|-----------------------|----------|-----------|------------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| E112 (Without ICC) | 4 | 4 M107 | | Existed | |
| E116 (With ICC) | 1 | WITO7 | 100 | Existed | |

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and accelerator pedal position sensor

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

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| APP sensor ECM Continuity A Connector Terminal Continuity E E Connector Terminal Continuity E116 3 M107 97 Existed C C E116 4 M107 97 Existed C C Et the inspection result normal? YES > S0 TO 7. D D C 7. DETECT MALFUNCTIONING PART D C E C E C E 1. Harness for open or short between ECM and accelerator pedal position sensor P E C E C E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E | | | | | | | | | | |
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| Image: Control Instruction 3 M107 97 Existed E3 E118 4 M107 97 Existed C 2. Also check hamess for short to ground and short to power. Is the inspection result normal? D YES > GO TO 8. D D NO >> GO TO 7. Z.OETECT MALFUNCTIONING PART D Check the following. E E E • Harness for open or short between ECM and accelerator pedal position sensor F E >> Repair open circuit, short to ground or short to power in hamess or connectors. E 8.CHECK APP SENSOR G G Refer to EC-478. "Component Inspection". Is the inspection result normal? H YES > GO TO 10. NO > GO TO 10. H 9.REPLACE ACCELERATOR PEDAL ASSEMBLY I Rejece accelerator pedal assembly. Refer to ACC-3. "Removal and Installation". I 2. Go to EC-479. "Special Repair Requirement". I I Specific Pedal Assembly. Refer to ACC-3. "Removal and Installation". I 2. Go to EC-479. "Special Repair Requirement". I I I I 2. Go to EC-479. "Special Repair Req | Connecto | or Terminal | Connector | Terminal | Continuity | | | | | |
| (Win IcC) 4 C 2. Also check hamess for short to ground and short to power. C Is the inspection result normal? C YES >> GO TO 8. NO >> GO TO 7. 7. DETECT MALFUNCTIONING PART C Check the following. E • Harness connectors M6, E106 F • Harness for open or short between ECM and accelerator pedal position sensor F >> Repair open circuit, short to ground or short to power in harness or connectors. 8. CHECK APP SENSOR G Refer to EC-478. "Component Inspection". Is the inspection result normal? YES >> GO TO 10. NO >> GO TO 2. 9. REPLACE ACCELERATOR PEDAL ASSEMBLY H 1. Replace accelerator pedal assembly. Refer to ACC-3. "Removal and Installation". 1 2. Go to EC-479. "Special Repair Requirement". I >> INSPECTION END J 10. CHECK INTERMITTENT INCIDENT K Refer to GI-45. "Intermittent Incident". K >> INSPECTION END Image: Condition Switch OFF. Image: Condition Switch OFF. 1. There all harness connectors disconnected. Image: Condition Switch O | (Without IC | C) ³ | M107 | 97 | Existed | | | | EC | |
| 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES \Rightarrow GO TO 8. NO \Rightarrow GO TO 7. 7. DETECT MALFUNCTIONING PART Check the following. • Harness connectors M6, E106 • Harness connectors M6, E106 • Harness connectors M6, E106 • Harness for open or short between ECM and accelerator pedal position sensor \Rightarrow Repair open circuit, short to ground or short to power in harness or connectors. 8. CHECK APP SENSOR Refer to EC-478. "Component Inspection". Is the inspection result normal? YES \Rightarrow GO TO 10. NO \Rightarrow GO TO 9. 9. REPLACE ACCELERATOR PEDAL ASSEMBLY 1. Replace accelerator pedal assembly. Refer to <u>ACC-3</u> . "Removal and Installation". 2. Go to <u>EC-479</u> . "Special Repair Requirement". \Rightarrow INSPECTION END 10. CHECK INTERMITTENT INCIDENT Refer to <u>GI-45</u> . "Intermittent Incident". \Rightarrow INSPECTION END 1. CHECK ACCELERATOR PEDAL POSITION SENSOR 1. Turn ignition switch OFF. 2. Reconnect all harness connectors disconnected. 3. Turn ignition switch OFF. 4. Check the voltage ECM harness connector terminals as per the following. 1. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Turn ignition switch ON. 4. Check the voltage ECM harness connector terminals as per the following. 1. Government in terminal term | | 3) 4 | | | | | | | 0 | |
| YES >> GO TO 8. NO >> GO TO 7. Z.DETECT MALFUNCTIONING PART Check the following. E Check the following. + Harness connectors M6, E106 E + 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 8.CHECK APP SENSOR G Refer to EC-478. "Component Inspection". Isthe inspection result normal? YES >> GO TO 0. NO >> GO TO 0. 9.REPLACE ACCELERATOR PEDAL ASSEMBLY H 1. Replace accelerator pedal assembly. Refer to ACC-3. "Removal and Installation". I 2. Go to EC-479. "Special Repair Requirement". I >> INSPECTION END J 10.CHECK INTERMITTENT INCIDENT K Refer to GI-45. "Intermittent Incident". >> INSPECTION END L 1. CHECK ACCELERATOR PEDAL POSITION SENSOR M 1. Turn ignition switch OFF. M 2. Reconnect all harness connectors disconnected. N 3. Turn ignition switch ON. Accelerator pedal 4. Check the voltage ECM harness connector terminals as per the following. N <td>2. Also c</td> <td>heck harnes</td> <td>s for short</td> <td>to ground</td> <td>d and short to</td> <td>power.</td> <td></td> <td></td> <td>C</td> | 2. Also c | heck harnes | s for short | to ground | d and short to | power. | | | C | |
| NO >> GO TO 7. 7.DETECT MALFUNCTIONING PART Check the following. E + Harness connectors M6, E106 + 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 G Refer to EC-478. "Component Inspection". G Is the inspection result normal? YES YES > GO TO 9. 9.REPLACE ACCELERATOR PEDAL ASSEMBLY H 9.REPLACE ACCELERATOR PEDAL ASSEMBLY I 1 Refer to GL45. "Intermittent Incident". > INSPECTION END J 10.CHECK ACCELERATOR PEDAL POSITION SENSOR M 1.CHECK ACCELERATOR PEDAL POSITION SENSOR M 2. Reconnect all harness connector terminals as per the following. N Connector + - Condition Voltage (V) N M107 B(APP sensor 1) 100 Accelerator pedal Fully released <td>-</td> <td></td> <td>normal?</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | - | | normal? | | | | | | | |
| Check the following. E • 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. F 8. CHECK APP SENSOR G Refer to EC-478, "Component Inspection". Is the inspection result normal? YES > GO TO 10. NO >> GO TO 9. 9. REPLACE ACCELERATOR PEDAL ASSEMBLY I 1. Replace accelerator pedal assembly. Refer to ACC-3. "Removal and Installation". I 2. Go to EC-479. "Special Repair Requirement". J >> INSPECTION END J 10. CHECK INTERMITTENT INCIDENT K Refer to GI-45. "Intermittent Incident". >> INSPECTION END L Component Inspection 1. Turn ignition switch OFF. Reconnect all harness connectors disconnected. 3. Turn ignition switch OFF. N 2. To the full harness connector terminals as per the following. N Image: the inspection in the indicent is a specific remainal indices in the indite indices in the indite indices in the indices in the indite indi | _NO > | > GO TO 7. | | | | | | | D | |
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| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | een ECM | and accelerat | or nedal position | sensor | | | |
| 8. CHECK APP SENSOR G Refer to EC-478, "Component Inspection". Is the inspection result normal? YES >> GO TO 10. NO >> GO TO 9. 9. REPLACE ACCELERATOR PEDAL ASSEMBLY I 1. Replace accelerator pedal assembly. Refer to <u>ACC-3. "Removal and Installation".</u> I 2. Go to EC-479. "Special Repair Requirement". I >> INSPECTION END J 10. CHECK INTERMITTENT INCIDENT K Refer to GI-45. "Intermittent Incident". > INSPECTION END Component Inspection *********************************** | Tiamess | | Short betw | | | | 1 3011301 | | F | |
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| $\frac{ s \text{ the inspection result normal?}}{\text{YES} >> 60 TO 10.} H \\ 9. \text{REPLACE ACCELERATOR PEDAL ASSEMBLY} \\ 1. Replace accelerator pedal assembly. Refer to ACC-3. "Removal and Installation". 2. Go to EC-479. "Special Repair Requirement". 3. INSPECTION END 10. CHECK INTERMITTENT INCIDENT Refer to GI-45. "Intermittent Incident". K 3. INSPECTION END Component Inspection 1. CHECK ACCELERATOR PEDAL POSITION SENSOR 1. Turn ignition switch OFF. 2. Reconnect all harness connectors disconnected. 3. Turn ignition switch OFF. 4. Check the voltage ECM harness connector terminals as per the following. M \frac{ECM}{\frac{Connector + - Condition Voltage (V)}{\frac{97 (APP sensor 1) 100}{98 (APP sensor 2) 104}} \frac{Fully released 0.45 \cdot 1.0}{Fully depressed 4.2 \cdot 4.8} \frac{Fully released 0.22 \cdot 0.50}{Fully depressed 2.1 \cdot 2.5}$ | | | | | | - | | | G | |
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| $\begin{array}{c c} \text{NO} \implies \text{GO TO 9.} \\ \hline \textbf{9.} \text{REPLACE ACCELERATOR PEDAL ASSEMBLY} \\ \hline \textbf{1.} \text{Replace accelerator pedal assembly. Refer to ACC-3. "Removal and Installation".} \\ \hline \textbf{2.} \text{Go to } \underline{\text{EC-479. "Special Repair Requirement".}} \\ \hline \textbf{3.} \text{INSPECTION END} \\ \hline \textbf{10.} \text{CHECK INTERMITTENT INCIDENT} \\ \hline \textbf{Refer to } \underline{\text{GI-45. "Intermittent Incident".}} \\ \hline \textbf{NO} \textbf{NO} \\ \hline \textbf{Component Inspection} \\ \hline \textbf{1.} \text{CHECK ACCELERATOR PEDAL POSITION SENSOR} \\ \hline \textbf{1.} \text{CUPECK ACCELERATOR PEDAL POSITION SENSOR} \\ \hline \textbf{1.} \text{Turn ignition switch OFF.} \\ \hline \textbf{2.} \text{ Reconnect all harness connectors disconnected.} \\ \hline \textbf{3.} \text{ Turn ignition switch ON.} \\ \hline \textbf{4.} \text{ Check the voltage ECM harness connector terminals as per the following.} \\ \hline \hline \begin{array}{c} \hline \textbf{ECM} \\ \hline \hline \textbf{Connector} \end{array} \\ \hline \textbf{100} \hline \textbf{100} \\ \hline \textbf{100} \\ \hline \textbf{100} \hline \textbf{100} \hline \textbf{100} \\ \hline \textbf{100} \hline \textbf{100} \hline \textbf{100} \\ \hline \textbf{100} \hline 10$ | | | | | | | | | Ц | |
| 1. Replace accelerator pedal assembly. Refer to <u>ACC-3. "Removal and Installation"</u> . 1 2. Go to <u>EC-479</u> . "Special Repair Requirement". J 10. CHECK INTERMITTENT INCIDENT K Refer to <u>GI-45. "Intermittent Incident"</u> . × INSPECTION END Component Inspection ACCELERATOR PEDAL POSITION SENSOR 1. Turn ignition switch OFF. M 2. Reconnect all harness connectors disconnected. M Accelerator pedal economic terminals as per the following. M Condition Voltage ECM harness connector terminals as per the following. M M M M M M M M M M M M M M M Condition Voltage (V) Fully released <td co<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>П</td></td> | <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>П</td> | | | | | | | | | П |
| 2. Go to EC-479, "Special Repair Requirement". >> INSPECTION END 10.CHECK INTERMITTENT INCIDENT Refer to GI-45, "Intermittent Incident". >> INSPECTION END Component Inspection I.CHECK ACCELERATOR PEDAL POSITION SENSOR I. 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. $\boxed{\frac{ECM}{\frac{Connector}{\frac{+}{1-rminal}}} Condition Voltage (V)}{\frac{97 (APP sensor 1)}{98 (APP sensor 2)} \frac{104}{104}} Accelerator pedal Fully released 0.45 - 1.0}{Fully released 0.22 - 0.50} Fully depressed 2.1 - 2.5}$ | 9.REPLA | CE ACCELE | ERATOR P | EDAL AS | SEMBLY | | | | | |
| $\frac{10. \text{CHECK INTERMITTENT INCIDENT}}{\text{Refer to GI-45, "Intermittent Incident".}} K \\ > \text{INSPECTION END} \\ \hline \text{Component Inspection} \\ \hline \text{I.CHECK ACCELERATOR PEDAL POSITION SENSOR} \\ \hline \text{I. Turn ignition switch OFF.} \\ \hline \text{2. Reconnect all harness connectors disconnected.} \\ \hline \text{3. Turn ignition switch ON.} \\ \hline \text{4. Check the voltage ECM harness connector terminals as per the following.} \\ \hline \hline \frac{\text{ECM}}{\frac{\text{Connector}}{\frac{+ \text{Terminal}}{1 \text{Terminal}}}} O \\ \hline \frac{97 (\text{APP sensor 1)}{100}}{\frac{98 (\text{APP sensor 2)}}{104}} 100 \\ \hline \text{Accelerator pedal} \\ \hline \frac{\text{Fully released}}{\text{Fully released}} \frac{0.45 - 1.0}{100 \text{Fully depressed}} \\ \hline \text{Fully depressed} \frac{0.22 - 0.50}{5 \text{Fully depressed}} \\ \hline \text{Fully depressed} \frac{0.22 - 0.50}{2.1 - 2.5} \\ \hline \end{array}$ | | | | | | 3, "Removal and | Installation". | | I | |
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| > 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. N Voltage (V) York the voltage in the interval of the | 10.CHE | CK INTERM | ITTENT IN | ICIDENT | | | | | | |
| Component Inspection Image: National State S | Refer to G | I-45, "Interm | ittent Incid | lent". | | | | | Κ | |
| Component Inspection Image: National State S | | | | | | | | | | |
| 1. CHECK ACCELERATOR PEDAL POSITION SENSOR M 1. Turn ignition switch OFF. Seconnect all harness connectors disconnected. N 3. Turn ignition switch ON. N N 4. Check the voltage ECM harness connector terminals as per the following. N Voltage (V) $\frac{ECM}{\frac{1}{1 - \frac{1}{100}} + \frac{1}{100}}{\frac{1}{100} + \frac{1}{100} + \frac{1}{$ | | | | | | | | | L | |
| 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. N 4. Check the voltage ECM harness connector terminals as per the following. N ECM O Condition Voltage (V) Connector + - Condition Voltage (V) O M107 97 (APP sensor 1) 100 Accelerator pedal Fully released 0.45 - 1.0 P M107 98 (APP sensor 2) 104 Accelerator pedal Fully depressed 4.2 - 4.8 Fully released 0.22 - 0.50 Fully depressed 2.1 - 2.5 | Compor | ient inspe | CUON | | | | | INFOID:000000010597086 | | |
| 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. N 4. Check the voltage ECM harness connector terminals as per the following. N N ECM Condition Voltage (V) Connector + - Condition Voltage (V) M107 97 (APP sensor 1) 100 Accelerator pedal Fully released 0.45 - 1.0 M107 98 (APP sensor 2) 104 Accelerator pedal Fully released 0.22 - 0.50 | 1.CHECK | ACCELER | ATOR PED | DAL POSI | ITION SENSO | R | | | М | |
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| 4. Check the voltage ECM harness connector terminals as per the following. N ECM Voltage (V) Connector + - Condition Voltage (V) Terminal Terminal Terminal Voltage (V) P M107 97 (APP sensor 1) 100 Accelerator pedal Fully released 0.45 - 1.0 P M107 98 (APP sensor 2) 104 Accelerator pedal Fully released 0.22 - 0.50 Fully depressed 2.1 - 2.5 | | | | ectors dise | connected. | | | | | |
| $ \frac{ECM}{Connector} \xrightarrow{FCM} Condition Voltage (V) $ $ \frac{+ - }{Terminal} Terminal } Condition Voltage (V) $ $ \frac{97 (APP sensor 1)}{98 (APP sensor 2)} 100 Accelerator pedal $ $ \frac{Fully released 0.45 - 1.0}{Fully depressed 4.2 - 4.8} Fully released 0.22 - 0.50 Fully depressed 2.1 - 2.5 $ | | | | ess conn | ector terminals | s as per the follo | wina. | | Ν | |
| $ \begin{array}{c c c c c c c } \hline & & & & & & & & & & & & & & & & & & $ | | | | | | | 5 | | | |
| $\frac{1}{100} + \frac{1}{100} + \frac{1}$ | | ECM | | | | | | | 0 | |
| TerminalTerminalTerminalP97 (APP sensor 1)100Fully released0.45 - 1.098 (APP sensor 2)104Accelerator pedalFully depressed4.2 - 4.8Fully released0.22 - 0.50Fully depressed2.1 - 2.5 | Connector | + | | _ | Con | dition | Voltage (V) | | - | |
| M107 97 (APP sensor 1) 100 98 (APP sensor 2) 104 Accelerator pedal 98 (APP sensor 2) 104 Fully depressed 0.22 - 0.50 Fully depressed 2.1 - 2.5 | | Termina | I Te | rminal | | | | | | |
| M107 98 (APP sensor 2) 104 Accelerator pedal Fully depressed 4.2 - 4.8 Fully released 0.22 - 0.50 Fully depressed 2.1 - 2.5 | | 97 (APP sens | sor 1) | 100 | | Fully released | 0.45 - 1.0 | | Ρ | |
| 98 (APP sensor 2) 104 Fully released 0.22 - 0.50 Fully depressed 2.1 - 2.5 | M107 | | | | Accelerator pedal | | 4.2 - 4.8 | | | |
| Fully depressed 2.1 - 2.5 | | 98 (APP sens | | | | | | | | |
| Is the inspection result normal? | | - | | | | Fully depressed | 2.1 - 2.5 | | | |

Is the inspection result normal?

YES >> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to <u>ACC-3, "Removal and Installation"</u>.

2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000010597087

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 2.

2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 3.

3. PERFORM IDLE AIR VOLUME LEARNING

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

>> END

< DTC/CIRCUIT DIAGNOSIS >

P2127, P2128 APP SENSOR

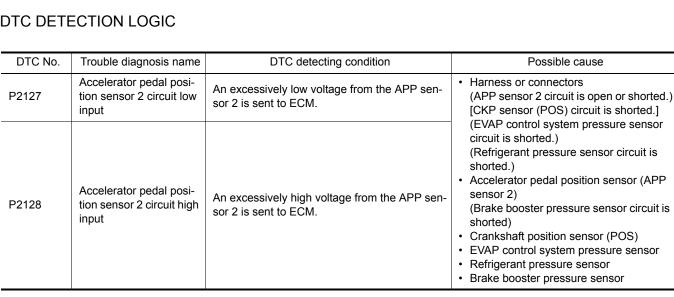
Description

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 CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.

2. Check DTC.

Is DTC detected?

YES >> Go to EC-481, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:000000010597089

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< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

INFOID:0000000010597090

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

| APP se | ensor | Ground | Voltage (V) | |
|-----------------------|----------|--------|-------------|--|
| Connector | Terminal | Giouna | | |
| E112 (Without ICC) | 6 | Ground | Approx. 5 | |
| E116 (With ICC) | 3 | Cround | , ippiox. 5 | |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

Disconnect ECM harness connector. 2.

Check the continuity between APP sensor harness connector and ECM harness connector. 3.

| APP sensor | | ECM | | Continuity |
|-----------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E112 (Without ICC) | 6 | M107 | 103 | Existed |
| E116 (With ICC) | 3 | | 100 | LAISIEU |

Is the inspection result normal?

YES >> GO TO 5. >> GO TO 4.

NO

4.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

· Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit.

5. CHECK SENSOR POWER SUPPLY CIRCUIT

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

| EC | CM | Sensor | | |
|-----------|----------|-------------------------------|-----------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| E101 | 45 | Brake booster pressure sensor | E48 | 1 |
| F101 46 | | CKP sensor (POS) | F2 | 1 |

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| E | CM | | | Sensor | | | | | | |
|---------------------------------------------------------------------|--------------------------------------------|--------------------------------------------|------------------|--------------------|-------------------------------------------------|---------------|----------------|----|---|---|
| Connector | Terminal | | Name | | Connector | Terminal | | A | | |
| | 100 | | | | E112 (Without ICC) | 6 | - | | | |
| M107 | 103 | APP sensor | | E116 (With ICC) | 3 | - | EC | | | |
| | 107 | EVAP control system pressure sensor B252 3 | | | | | | | - | C |
| | 107Refrigerant pressure sensorE773 | | | | | | - | 0 | | |
| Is the insp | ection resu | ult normal? | | | | | | | | |
| | • | hort to grour | nd or short to | power in | harness or con | nectors. | | D | | |
| Check the | following. | | | | | | | E | | |
| Cranksh EVAP co Refrigeration | aft position ontrol syste ant pressu | m pressure | sensor (Refei | r to <u>EC-3</u> | Component Ins 34, Componer osis Procedure | it Inspection | <u>n"</u> .) | F | | |
| YES > | > GO TO ⁻ | 13. | | | | | | | | |
| _ | • | | ng componer | | | | | G | | |
| I.CHECK | APP SEN | ISOR 2 GRO | OUND CIRCU | JIT FOR (| OPEN AND SH | ORT | | | | |
| | gnition swi | | | | | | | Н | | |
| | | l harness co | | harness | connector and | ECM barn | ass connector | | | |
| o. oncor | | | 17411 3011301 | namess | | | | | | |
| APP | sensor | E | CM | | | | | I | | |
| Connecto | or Termina | al Connector | Terminal | ontinuity | | | | | | |
| E112 (Without IC E116 (With ICC | | M107 | 104 E | Existed | | | | J | | |
| 4. Also c | heck harne | ess for short | to ground an | d short to | power. | | | K | | |
| | | ult normal? | - | | - | | | | | |
| | > GO TO 9 > GO TO 8 | | | | | | | L | | |
| - | | NCTIONING | PART | | | | | | | |
| Check the | | | | | | | | M | | |
| | | s M6, E106 | | | | | | | | |
| • Harness | for open c | or short betw | een ECM and | accelera | ator pedal posit | ion sensor | | N | | |
| | > Denair a | nen circuit c | bort to group | d or shor | t to nower in he | | nnectors | IN | | |
| ~ | - | - | - | | t to power in ha | | | | | |
| - | | | | | FOR OPEN AN | | | 0 | | |
| 1. Check | the contin | uity betweer | n APP sensor | harness | connector and | ECM harne | ess connector. | | | |
| | 0.000 | | CM | | | | | _ | | |
| | sensor | | CM Tanania al | Continuity | | | | Ρ | | |
| Connecto | nr i lermin | nal Connector | Terminal | | | | | | | |

| Connector | Terminal | Connector | Terminal | , , , , , , , , , , , , , , , , , , , |
|-----------------------|----------|-----------|----------|---------------------------------------|
| E112 (Without ICC) | 1 | M107 | 98 | Existed |
| E116 (With ICC) | 6 | MITO/ | 50 | Existed |

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

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

• Harness for open or short between ECM and accelerator pedal position sensor

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

11.CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".

2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

13.CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

>> INSPECTION END

Component Inspection

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) 1 | | | Fully released | 0.45 - 1.0 | |
| M107 | | 100 | Accelerator pedal | Fully depressed | 4.2 - 4.8 | |
| WITO7 | 98 (APP sensor 2) | 104 | Accelerator pedar | Fully released | 0.22 - 0.50 | |
| | 90 (AFF Selisor 2) | 104 | | Fully depressed | 2.1 - 2.5 | |

Is the inspection result normal?

YES >> INSPECTION END

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".

2. Go to EC-489, "Special Repair Requirement".

>> INSPECTION END

| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
|-------------------------------------------------------------------------------|------------------------|----|
| Special Repair Requirement | INFOID:000000010597092 | А |
| 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING | | A |
| Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description". | | EC |
| >> GO TO 2. | | |
| 2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING | | С |
| Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description". | | |
| >> GO TO 3. | | D |
| 3. PERFORM IDLE AIR VOLUME LEARNING | | |
| Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description". | | Ε |
| >> END | | |
| | | F |
| | | |
| | | G |
| | | Н |
| | | 11 |
| | | 1 |
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| | | |

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 <u>EC-378, "DTC Logic"</u>.

| 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.

1. Turn ignition 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

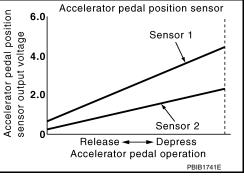
1. Start engine and let it idle for 1 second.

2. Check DTC.

Is DTC detected?

```
YES >> Go to <u>EC-486. "Diagnosis Procedure"</u>.
```

NO >> INSPECTION END



INFOID:000000010597094

| | | | | APP SENSOR | [VQ37VHR] |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------|
| DTC/CIRCUI | | | | | |
| Diagnosis Procedure 1.check ground connection | | | INFOID:0000000010597095 | | |
| | | | ON | | |
| Turn ignitio Check grou | | | . Refer to Gro | und Inspection in <u>GI-48, "Circuit Inspection"</u> . | |
| s the inspection | | ormal? | | | |
| YES >> GC NO >> Re | - | lace groui | nd connection | | |
| 2.CHECK APP | P SENSOF | R 1 POWE | ER SUPPLY C | IRCUIT | |
| Disconnect Turn ignitio | | | osition (APP) | sensor harness connector. | |
| | | | P sensor harr | ess connector and ground. | |
| APP sen | sor | | | - | |
| Connector | Terminal | Ground | Voltage (V) | | |
| E112 (Without ICC) E116 | 5 | Ground | Approx. 5 | _ | |
| (With ICC) | | | | _ | |
| s the inspection | | ormal? | | | |
| | | | | | |
| |) TO 4.) TO 3. | | | | |
| NO >> GC |) TO 3. | Ioning P | ART | | |
| NO >> GC DETECT MA | TO 3. ALFUNCT wing. | | ART | | |
| NO >> GC B.DETECT MA Check the follow Harness conr |) TO 3. ALFUNCTI wing. nectors M6 | 6, E106 | | ccelerator pedal position sensor | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o |) TO 3. ALFUNCT wing. nectors M6 pen or sho | 6, E106 ort betwee | en ECM and a | ccelerator pedal position sensor | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re |) TO 3. ALFUNCTI wing. nectors M6 pen or sho pair open | 5, E106 ort betwee circuit, sho | en ECM and a | or short to power in harness or connectors. | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF |) TO 3. ALFUNCTI mectors M6 pen or sho pair open | 6, E106 ort betwee circuit, sho R 2 POWE | en ECM and a | or short to power in harness or connectors. | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re .CHECK APF . Turn ignitio |) TO 3. ALFUNCTI mectors M6 pen or sho pair open SENSOF | 6, E106 ort betwee circuit, sho R 2 POWE DN. | en ECM and a ort to ground o ER SUPPLY C | or short to power in harness or connectors. | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio Check the |) TO 3. ALFUNCTI nectors M6 pen or sho pair open SENSOF n switch C voltage be | 6, E106 ort betwee circuit, sho R 2 POWE DN. | en ECM and a ort to ground o ER SUPPLY C | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio . Check the APP sen | D TO 3. ALFUNCTI mectors M6 pen or sho pair open P SENSOF n switch C voltage be | 6, E106 ort betwee circuit, sho R 2 POWE DN. | en ECM and a ort to ground o ER SUPPLY C | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio | D TO 3. ALFUNCTI mectors M6 pen or sho pair open or SENSOF n switch C voltage be sor Terminal | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP | en ECM and a ort to ground o ER SUPPLY C P sensor harr | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio Check the APP sen Connector E112 (Without ICC) | D TO 3. ALFUNCTI mectors M6 pen or sho pair open P SENSOF n switch C voltage be | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP | en ECM and a ort to ground o ER SUPPLY C P sensor harr | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conn Harness for o >> Re CHECK APF . Turn ignitio Check the APP sen Connector E112 | D TO 3. ALFUNCTI mectors M6 pen or sho pair open or SENSOF n switch C voltage be sor Terminal | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP | en ECM and a ort to ground o ER SUPPLY C P sensor harr Voltage (V) | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio Check the APP sen Connector E112 (Without ICC) E116 (With ICC) s the inspection |) TO 3. ALFUNCTI mectors M6 pen or sho pair open P SENSOF n switch C voltage be sor Terminal 6 3 n result no | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP Ground Ground | en ECM and a ort to ground o ER SUPPLY C P sensor harr Voltage (V) | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio . Check the APP sen Connector E112 (Without ICC) E116 (With ICC) s the inspection YES >> GC |) TO 3. ALFUNCTI mectors M6 pen or sho pair open or SENSOF n switch C voltage be sor Terminal 6 3 n result nc) TO 9. | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP Ground Ground | en ECM and a ort to ground o ER SUPPLY C P sensor harr Voltage (V) | or short to power in harness or connectors. IRCUIT-I | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio Check the APP sen Connector E112 (Without ICC) E116 (With ICC) S the inspection YES >> GC NO >> GC |) TO 3. ALFUNCTI wing. hectors M6 pen or sho pair open of SENSOF n switch C voltage be sor Terminal 6 3 <u>n result nc</u>) TO 9.) TO 5. | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP Ground Ground | en ECM and a ort to ground o ER SUPPLY C P sensor harr Voltage (V) Approx. 5 | or short to power in harness or connectors. IRCUIT-I ness connector and ground. | |
| NO >> GC DETECT MA Check the follow Harness conr Harness for o >> Re CHECK APF . Turn ignitio Check the APP sen Connector E112 (Without ICC) E116 (With ICC) s the inspection YES >> GC |) TO 3. ALFUNCTI wing. hectors M6 pen or sho pair open of SENSOF n switch C voltage be sor Terminal 6 3 <u>n result nc</u>) TO 9.) TO 5. P SENSOF | 6, E106 ort betwee circuit, sho R 2 POWE DN. etween AP Ground Ground ormal? | en ECM and a ort to ground o ER SUPPLY C P sensor harr Voltage (V) Approx. 5 | or short to power in harness or connectors. IRCUIT-I ness connector and ground. | |

| APP sensor | | ECM | | Continuity | |
|-----------------------|----------|--------------------|-----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| E112 (Without ICC) | 6 | M107 | 103 | Existed | |
| E116 (With ICC) | 3 | WITO7 | 105 | LAISted | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit.

7.CHECK SENSOR POWER SUPPLY CIRCUIT

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

| EC | CM | Sensor | | |
|-------------|----------|-------------------------------------|-----------------------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 45 | Brake booster pressure sensor | E48 | 1 |
| FIUI | 46 | CKP sensor (POS) | F2 | 1 |
| 100 | | APP sensor | E112 (Without ICC) | 6 |
| 103 M107 | | E116 (With ICC) | 3 | |
| | 107 | EVAP control system pressure sensor | B252 | 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-300, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-334, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>ÈC-529, "Diagnosis Procedure".</u>)

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace malfunctioning component.

9. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between APP sensor harness connector and ECM harness connector.

Without ICC

| APP sensor | | EC | Continuity | |
|------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F112 | 4 | M107 | 100 | Existed |
| L112 | 2 | 101 | 104 | LAISLEU |

< DTC/CIRCUIT DIAGNOSIS >

| [VQ37 | 'VHR] |
|-------|-------|
|-------|-------|

| With ICC | ; | | | | |
|---------------------------------------------|--------------------|-------------|-------------|-------------|-------------------------------------------|
| APP s | ensor | ECM | | Continuity | |
| Connector | Terminal | Connector | Terminal | Continuity | |
| E116 | 1 | M107 | 100 | Existed | |
| - | 2 | _ | 104 | | |
| | | | - | nd and she | ort to power. |
| | | ult normal | <u>?</u> | | |
| - | > GO TO > GO TO | | | | |
| | | FUNCTION | | т | |
| | | | | 1 | |
| Check the Harness | | rs M6, E10 |)6 | | |
| | | | | M and acc | elerator pedal position sensor |
| | | | | | |
| | | | | - | short to power in harness or connectors. |
| 11. CHEC | CK APP S | ENSOR IN | IPUT SIG | NAL CIRC | JIT FOR OPEN AND SHORT |
| 1. Check | the conti | nuity betwe | en APP s | ensor harr | ness connector and ECM harness connector. |
| Without I | ICC | | | | |
| APP s | ensor | EC | CM | | |
| Connector | Terminal | Connector | Terminal | Continuity | |
| E112 | 3 | M107 | 97 | Existed | |
| EIIZ | 1 | MITU7 | 98 | Existed | |
| With ICC | ; | | | | |
| APP s | ensor | EC | M | | |
| Connector | Terminal | Connector | Terminal | Continuity | |
| E116 | 4 | M407 | 97 | Eviated | |
| E116 | 6 | M107 | 98 | Existed | |
| 2. Also cl | heck harr | ess for she | ort to grou | nd and she | prt to power. |
| | | ult normal | <u>?</u> | | |
| | > GO TO > GO TO | | | | |
| | | | | Ŧ | |
| | | FUNCTION | NING PAR | I | |
| Check theHarness | | |)6 | | |
| | | | | M and acc | elerator pedal position sensor |
| | - | | | | |
| >: | > Repair o | open circui | t, short to | ground or | short to power in harness or connectors. |
| 13.снес | CK APP S | SENSOR | | | |
| Refer to E | <u>C-489, "C</u> | omponent | Inspectior | <u>ı"</u> . | |
| | | ult normal | | | |
| | > GO TO | | | | |
| | > GO TO | | | | |
| 14.REPL | ACE AC | CELERAT | DR PEDAI | | LY |
| | | | | | ACC-3, "Removal and Installation". |
| | | Special Re | | | |

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

15. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "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 | | | | | |
| M107 | 97 (APP sensor 1) | 100 | | Fully released | 0.45 - 1.0 | |
| | | | Accelerator pedal | Fully depressed | 4.2 - 4.8 | |
| | | 104 | | 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 <u>ACC-3, "Removal and Installation"</u>.

2. Go to EC-489, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000010597097

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

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

>> END

DTC detecting condition

< DTC/CIRCUIT DIAGNOSIS >

P219A, P219B AIR FUEL RATIO

DTC Description

DTC No. CONSULT screen terms (Trouble diagnosis content)

DTC DETECTION LOGIC

| | (Trouble diagnosis content) | | | C |
|---------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| P219A | AIR FUEL RATIO IMBALANCE B1 (Air-fuel ratio imbalance bank 1) | | Fuel injectorExhaust gas leaks | |
| P219B | AIR FUEL RATIO IMBALANCE B2 (Air-fuel ratio imbalance bank 2) | ECM detects a lean/rich air fuel ratio state in any cylinder for a specified length of time. | Incorrect fuel pressure Mass air flow sensor Intake air leaks Lack of fuel Incorrect PCV hose connection Improper spark plug Insufficient compression The fuel injector circuit is open or shorted ignition coil The ignition signal circuit is open or shorted | E |
| FAIL-SAF Not applica | | | | (|
| •• | IFIRMATION PROCEDURE | | | |
| 4 | | | | F |
| | | n other DTC, first perfo | rm the confirmation procedure (trouble diagno- | |
| | e other DTC. <u>ole DTC detected?</u> | | | |
| YES > | > Perform diagnosis of applica | ble. Refer to <u>EC-576, '</u> | 'DTC_Index". | |
| • | > GO TO 2. | | | , |
| | ONDITIONING - 1 | | | |
| ing the nex 1. Turn ig | | | , always perform the following before conduct- | k |
| 3. Turn iç | gnition switch OFF and wait at | least 10 seconds. | | 1 |
| NOTE: Before per | forming the following procedur | e, confirm that battery | voltage is 11 V or more at idle. | - |
| > | > GO TO 3. | | | Ν |
| • | NDITIONING - 2 | | | |
| 2. Clear | gnition switch ON. the mixture ratio self-learning <u>R : Description"</u> . | value. Refer to <u>EC-24</u> | . "MIXTURE RATIO SELF-LEARNING VALUE | Ν |
| YES > | <u>SULT be used?</u> > GO TO 4. > GO TO 7. | | | C |
| A - | P GO TO 7. PRM DTC CONFIRMATION PR | ROCEDURE - 1 | | F |
| 2. Select 3. Start e | gnition switch ON. : "COOLAN TEMP/S" in "DATA engine. sure that "COOLAN TEMP/S" i | | - | |

4. Make sure that "COOLAN TEMP/S" indicates more than 65°C (149°F).

EC-489

2015 QX50

Possible cause

A

EC

С

< DTC/CIRCUIT DIAGNOSIS >

5. PERFORM DTC CONFIRMATION PROCEDURE - 2

With CONSULT

- Select "SYSTEM 1 DIAGNOSIS B B1", "SYSTEM 1 DIAGNOSIS A B1", "SYSTEM 1 DIAGNOSIS B B2", "SYSTEM 1 DIAGNOSIS A B2" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
- 2. Drive vehicle under the following conditions for at least 5 consecutive seconds.
 - CAUTION:

• Always drive vehicle at a safe speed.

| ENG SPEED | 1,200 – 1,800rpm |
|-----------------------------------------------------|------------------------|
| COOLAN TEMP/S | More than 65°C (149°F) |
| B/FUEL SCHDL | 8 – 11 msec |
| Selector lever | D position |
| SYSTEM 1 DIAGNOSIS B B1 SYSTEM 1 DIAGNOSIS B B2 | PRSENT |

NOTE:

- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during crusing.

3. Check "SYSTEM 1 DIAGNOSIS A B1" or "SYSTEM 1 DIAGNOSIS A B2" indication.

Is "CMPLT" displayed?

YES >> GO TO 6.

NO >> GO TO 3.

O.PERFORM DTC CONFIRMATION PROCEDURE - 3

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-491, "Diagnosis Procedure".

- NO-1 >> To check malfunction symptom before repair: Refer to GI-45, "Intermittent Incident".
- NO-2 >> Confirmation after repair: INSPECTION END

7.PERFORM DTC CONFIRMATION PROCEDURE - 4

Without CONSULT

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

| Engine speed | 1,200 – 1,800rpm |
|-----------------------|------------------|
| Calculated load value | 45 – 62 % |
| Selector lever | D position |

NOTE:

- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during crusing.
- 3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to EC-491, "Diagnosis Procedure".
- NO-1 >> To check malfunction symptom before repair: Refer to GI-45, "Intermittent Incident".
- NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

1.CHECK DTC PRIORITY

If DTC P219A, or P219B is displayed with other DTC, first perform the confirmation procedure (trouble diagnosis) for the other DTC.

P219A, P219B AIR FUEL RATIO

| <pre></pre> | [VQ37VHR] |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| s applicable DTC detected? | |
| YES >> Perform diagnosis of applicable. Refer to <u>EC-576, "DTC Index"</u> . NO >> GO TO 2. | |
| CHECK FOR INTAKE AIR LEAK | |
| Stop engine and check the following for connection. Air duct Vacuum hoses PCV hose | |
| Intake air passage between air duct to intake manifoldStart engine and let it idle.Listen for an intake air leak after the mass air flow sensor. | |
| s the inspection result normal? | |
| YES >> GO TO 3. NO >> Repair or replace error-detected parts. CHECK EXHAUST GAS LEAK | |
| | |
| Stop engine and visually check exhaust tube, three way catalyst and muffler for dents Start engine and let it idle. Listen for an exhaust gas leak before three way catalyst (manifold). | connection. |
| A/F sensor 1 HO2S2 / Muff | iler |
| To exhaust manifold | PBIB1922E |
| the inspection result normal? | |
| YES >> GO TO 4. NO >> Repair or replace error-detected parts. | |
| •.CHECK FUEL PRESSURE | |
| . Release fuel pressure to zero. Refer to <u>EC-628, "Inspection"</u> . | |
| Check fuel pressure. Refer to $\underline{\text{EC-628}}$, "Inspection". | |
| the inspection result normal? | |
| YES >> GO TO 5. NO >> GO TO 10. | |
| CHECK MASS AIR FLOW SENSOR | |
| With CONSULT Check "MASS AIR FLOW" in "DATA MONITOR" mode of "ENGINE" using CONSULT. For specification, refer to <u>EC-631, "Mass Air Flow Sensor"</u> . With GST Check mass air flow sensor signal in Service \$01 using GST. For specification, refer to <u>EC-631, "Mass Air Flow Sensor"</u> . | |
| s the inspection result normal? YES >> GO TO 6. | |
| NO >> Check connectors for rusted terminals or loose connections in the mass air fl grounds. Refer to <u>EC-189. "Diagnosis Procedure"</u> . | ow sensor circuit or |
| CHECK FUNCTION OF FUEL INJECTOR - 1 | |
| DWith CONSULT | |

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
- 3. Check that each circuit produces a momentary engine speed drop.

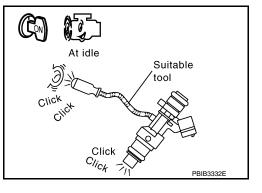
< DTC/CIRCUIT DIAGNOSIS >

- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Perform trouble diagnosis for fuel injector, refer to <u>EC-</u> <u>506, "Component Function Check"</u>.



7. CHECK FUNCTION OF FUEL INJECTOR - 2

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

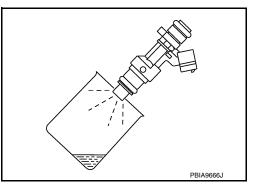
- 1. Turn ignition switch OFF.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- Remove fuel tube assembly. Refer to <u>EM-38</u>, "<u>Removal and Installation</u>". Keep fuel hose and all fuel injectors connected to fuel tube.
- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.
- 7. Crank engine for approximately 3 seconds.

• Fuel should be sprayed evenly for each fuel injector.

• Fuel must not drip from the tip of fuel injector.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Replace fuel injector. Refer to <u>EM-38</u>, "<u>Removal and</u> <u>Installation</u>".



8.CHECK FUNCTION OF IGNITION COIL - 1

CAUTION:

Perform the following steps in a well-ventilated area with no combustibles.

- 1. Turn ignition switch OFF.
- 2. Remove fuel pump fuse from IPDM E/R to release fuel pressure. NOTE:

CONSULT must not be used to release fuel pressure. It develops again during the following steps, if released by using CONSULT.

- 3. Start the engine.
- 4. After an engine stall, crank the engine two or three times to release all the fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Disconnect all the harness connectors of ignition coil to prevent electric discharge from occurring in ignition coil.
- 7. Remove ignition coil assembly and spark plug of cylinder. Refer to EM-48. "Removal and Installation".
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

Allow a 13 – 17mm (0.52 – 0.66 in) spacing between spark plug and grounded metal portion as shown in the figure to fix the ignition coil with a rope or an equivalent.

11. Crank the engine for approximately 3 seconds to see if sparking occurs between spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- The discharge voltage becomes 20 kV or higher. Therefore, always stay away from the spark plug and ignition coil at least 50 cm (19.7 in) during the inspection.
- Leaving a space of more than 17mm (0.66 in) may damage the ignition coil.

NOTE:

When the gap is less than 13 mm (0.52 in), a the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

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

9.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-16, "Inspection".

- Is the inspection result normal?
- YES >> INSPECTION END

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

10. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

- YES >> Replace fuel filter and fuel pump assembly. Refer to <u>FL-6, "Removal and Installation"</u>.
- NO >> Repair or replace error-detected parts.

11. CHECK FUNCTION OF IGNITION COIL - 2

- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

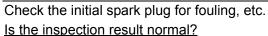
Spark should be generated.

Is the inspection result normal?

YES >> GO TO 12.

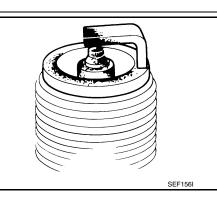
NO >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-516</u>, "Component Function <u>Check"</u>.

12.CHECK SPARK PLUG

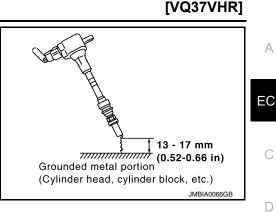


- YES >> 1. Repair or clean spark plug. Refer to <u>EM-48</u>, "<u>Removal and Installation</u>".
 - 2. GO TO 13. >> Replace spark plug(s) with s

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-147, "Spark Plug"</u>.



13. CHECK FUNCTION OF IGNITION COIL - 3



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< DTC/CIRCUIT DIAGNOSIS >

- 1. Reconnect the initial spark plugs.
- 2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-147, "Spark</u> <u>Plug"</u>.

ASCD BRAKE SWITCH

< 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 <u>EC-77, "System Description"</u> for the ASCD function.

Component Function Check

1. CHECK ASCD BRAKE SWITCH FUNCTION

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| DIVARE SWI | Brake pedal | Fully released | ON |

Without CONSULT

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | | H | | |
|----------------------------------|----------------------------|----------|-------------|--------------------|-----------------------|---|-------------|--|
| Connector | + | - | Condition | | Condition Voltage (V) | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | | | |
| M107 | 126 | 128 | Brake pedal | Slightly depressed | Approx. 0 | | | |
| 101107 | (ASCD brake switch signal) | 120 | Brake pedal | Fully released | Battery voltage | | | |
| Is the inspection result normal? | | | | | | | | |

YES >> INSPECTION END

NO >> Go to EC-496, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD bra | ike switch | Ground | Voltage |
|--------------|-------------|----------|-----------------|
| Connector | Terminal | Giounu | voitage |
| E109 | 1 | Ground | Battery voltage |
| Is the inspe | ection resu | lt norma | ? |
| | • GO TO 3 | - | |
| | GO TO 2 | | |
| 2.DETEC | I MALFUN | | NG 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

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ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

$\mathbf{3}$.check ascd brake switch input signal circuit for open and short

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

| ASCD bra | ke switch | EC | 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 5. NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness for open or short between ECM and ASCD brake switch

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

5.CHECK ASCD BRAKE SWITCH

Refer to EC-497, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ASCD brake switch. Refer to <u>BR-20</u>, "Exploded View".

O.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "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 | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| T and Z | Diake peual | 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-21, "Inspection and Adjustment"</u>.

2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | Diake peual | Slightly depressed | Not existed |

INFOID:000000010597101

[VQ37VHR]

ASCD BRAKE SWITCH

| Revision: February 2015 | |
|-------------------------|--|

| | ASCD BRAKE SWITCH | |
|--------|------------------------------------------------------------------------|-----------|
| < DT(| C/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| Is the | inspection result normal? | |
| YES | >> INSPECTION END | |
| NO | >> Replace ASCD brake switch. Refer to <u>BR-20, "Exploded View"</u> . | |
| | | |
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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 in combination meter.

CRUISE indicator is displayed to indicated that ASCD system is ready for operation when MAIN switch on ASCD steering switch is turned ON.

SET indicator is displayed when the following conditions are met.

- CRUISE indicator is displayed.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET indicator is displayed during ASCD control.

Refer to EC-77, "System Description" for the ASCD function.

Component Function Check

INFOID:000000010597103

INFOID:000000010597104

1.CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

| ASCD INDICATOR | CONDITION | | SPECIFICATION |
|----------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------|
| CRUISE LAMP | Ignition switch: ON | MAIN switch: Pressed at the 1st time → at the 2nd time | $ON\toOFF$ |
| | 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 EC-499, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to <u>MWI-136</u>, "Removal and Installation".

NO >> Repair or replace.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

COOLING FAN

Description INFOID:000000010597105 COOLING FAN CONTROL MODULE Cooling fan control module receives ON/OFF pulse duty signal from IPDM E/R. Corresponding to this ON/OFF pulse duty signal, cooling fan control module sends cooling fan motor operating voltage to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage. COOLING FAN MOTOR Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage. Component Function Check INFOID:000000010597106 1. CHECK COOLING FAN FUNCTION (I) With CONSULT 1. Turn ignition switch ON. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT. 2. 3. Make sure that cooling fan speed varies according to the percentage. **Without CONSULT** 1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description". Make sure that cooling fan operates. 2. Is the inspection result normal? YES >> INSPECTION END NO >> Go to EC-500, "Diagnosis Procedure". Diagnosis Procedure INFOID 000000010597107 1. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I 1. Turn ignition switch OFF. 2. Disconnect cooling fan control module harness connector E37. 3. Turn ignition switch ON. 4. Check the voltage between cooling fan control module harness connector and ground. Cooling fan control module Ground Voltage Connector Terminal E37 3 Ground Battery voltage Is the inspection result normal? YES >> GO TO 2. NO >> GO TO 7. 2.CHECK COOLING FAN CONTROL MODULE GROUND CIRCUIT 1. Turn ignition switch OFF. 2. Check the continuity between cooling fan control module harness connector and ground.

| Cooling fan co | ontrol module | Ground | Continuity | |
|----------------|---------------|--------|------------|--|
| Connector | Terminal | Ground | Continuity | |
| 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.

Revision: February 2015

EC-499

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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 | IPDM E/R | | Cooling fan control module | |
|-----------|----------|--------------------|----------------------------|------------|
| 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 | | | Cooling fan control module | | Voltage |
|-------------------|---|--------|----------------------------|--|---------|
| Connector Termina | | Giouna | voltage | | |
| E301 | 4 | Ground | Battery voltage | | |
| E302 | 6 | Ground | Dallery vollage | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace cooling fan control module. Refer to CO-17, "Exploded View".

6.CHECK COOLING FAN MOTORS -1 AND -2

Refer to EC-502, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan motor. Refer to <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.

COOLING FAN

| Cooling | fan relay | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connector | Terminal | Ground | Voltage | |
| E17 - | 2 | Ground | Battery voltag | ge |
| Is the inspe | 3 | ult norma | 10 | <u> </u> |
| | > GO TO S | | <u>l (</u> | |
| - | > GO TO 8 | | | |
| 8.DETEC | T MALFU | NCTION | NG PART | |
| Check the | | | | |
| 10A fuse IPDM E/F | | connecto | or E7 | |
| 50A fusib | ole link (let | tter F) | | |
| | | | | ing fan relay and fuse ing fan relay and battery |
| Tharmood | | | | |
| • | • | • | | round or short to power in harness or connectors. |
| 9. CHECK | COOLIN | g fan C | ONTROL MC | ODULE POWER SUPPLY CIRCUIT-III |
| | nition swi | | | |
| 2. Check | the contir | nuity betw | veen cooling | fan relay harness connector and ground. |
| Coolin | g fan relay | | | |
| Connector | | | round Cor | ontinuity |
| E17 | 1 | | round Ex | Existed |
| | the contir | | | fan relay harness connector and cooling fan control module harness |
| connec | | , | 0 | , |
| | | | | |
| 0 | | O selles fe | | |
| Cooling f | - | - | n control modul | Continuity |
| Connector | Terminal | Connect | or Terminal | Continuity |
| Connector E17 | Terminal 5 | Connecto E37 | or Terminal 3 | Continuity Existed |
| Connector E17 4. Also ch | Terminal 5 neck harne | Connecto E37 ess for sh | or Terminal 3 nort to ground | Continuity |
| Connector E17 4. Also ch Is the inspe YES >> | Terminal 5 neck harn ection resu > GO TO | Connecto E37 ess for sh ult norma 10. | or Terminal 3 nort to ground | Existed Id and short to power. |
| Connector E17 4. Also ch Is the inspe YES >> NO >> | Terminal 5 neck harn ection resu > GO TO > Repair o | Connecto E37 ess for sh ult norma 10. ppen circu | or Terminal 3 nort to ground <u>1?</u> iit, short to gr | Continuity Existed |
| Connector E17 4. Also ch Is the inspe YES >> NO >> 10.CHEC | Terminal 5 neck harn ection resu > GO TO > Repair o CK COOLI | Connect E37 ess for sh <u>ult norma</u> 10. pen circu ING FAN | or Terminal 3 nort to ground 1? it, short to gr RELAY | Continuity Existed and and short to power. ground or short to power in harness or connectors. |
| Connector E17 4. Also ch Is the inspe YES >> NO >> 10.CHEC Refer to EC | Terminal 5 neck harn ection resu > GO TO > Repair o CK COOLI | Connect E37 ess for sh ult norma 10. open circu ING FAN | or Terminal 3 nort to ground <u>1?</u> nit, short to gr RELAY t Inspection (| Existed Id and short to power. |
| Connector E17 4. Also ch Is the inspe YES >> NO >> 10. CHEC Refer to <u>EC</u> Is the inspe | Terminal 5 heck harn ection resu > GO TO > Repair o CK COOLI C-503, "Co ection resu | Connect E37 ess for sh ult norma 10. pen circu ING FAN omponen ult norma | or Terminal 3 nort to ground <u>1?</u> nit, short to gr RELAY t Inspection (| Continuity Existed and and short to power. ground or short to power in harness or connectors. |
| Connector E17 4. Also ch Is the inspective YES >> 10.CHEC Refer to EC Is the inspective YES >> | Terminal 5 heck harn cection resu GO TO Repair o CK COOLI C-503. "Co ection resu > GO TO | Connect E37 ess for sh ult norma 10. pen circu ING FAN omponen ult norma 11. | or Terminal 3 nort to ground <u>1?</u> hit, short to gr RELAY t Inspection (<u>1?</u> | Continuity Existed and and short to power. ground or short to power in harness or connectors. |
| Connector E17 4. Also ch Is the inspective YES >> 10.CHEC Refer to EC Is the inspective YES >> NO >> | Terminal 5 heck harn cection resu > GO TO CK COOLI C-503, "Co ection resu > GO TO > Replace | Connect E37 ess for sh ult norma 10. open circu NG FAN omponen ult norma 11. cooling f | or Terminal 3 nort to ground <u>1?</u> hit, short to gr RELAY t Inspection (<u>1?</u> | Continuity Existed ad and short to power. ground or short to power in harness or connectors. (Cooling Fan Relay)". fer to EC-39. "Component Parts Location". |
| Connector E17 4. Also ch Is the inspective YES >> 10.CHEC Refer to EC Is the inspective YES >> NO >> 11.CHEC | Terminal 5 heck harn cection resu Repair o CK COOLI C-503, "Co ection resu GO TO Replace CK INTER | Connect E37 ess for sh ult norma 10. open circu NG FAN omponen ult norma 11. cooling f | or Terminal 3 nort to ground 1? hit, short to gr RELAY t Inspection (1? an relay. Refe | Continuity Existed ad and short to power. ground or short to power in harness or connectors. (Cooling Fan Relay)". fer to EC-39. "Component Parts Location". |
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| Connector E17 4. Also ch Is the inspective YES >> 10.CHEC Refer to EC Is the inspective YES >> 11.CHEC Perform GI Is the inspective YES >> | Terminal 5 heck harn ection resu > GO TO > Repair o CK COOLI C-503, "Co ection resu > GO TO > Replace CK INTERI -45, "Inter ection resu > Replace | Connect E37 ess for sh <u>ult norma</u> 10. open circu NG FAN DMFAN omponen <u>ult norma</u> 11. cooling f MITTENT rmittent In ult norma IPDM E/ | Terminal 3 nort to ground 1? it, short to gr RELAY t Inspection (1? an relay. Refe INCIDENT ncident". 1? R. Refer to P | Continuity Existed ad and short to power. pround or short to power in harness or connectors. (Cooling Fan Relay)". fer to EC-39, "Component Parts Location". PCS-35, "Removal and Installation". |
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| Connector E17 4. Also ch Is the inspective YES >> 10.CHEC Refer to EC Sthe inspective YES >> NO >> 11.CHECK Compon 1.CHECK | Terminal 5 heck harm cetion resu GO TO Repair o CK COOLI C-503, "Co ection resu GO TO Replace K INTERI -45, "Inter ection resu Replace Replace Replace Replace Replace | Connect E37 ess for sh ult norma 10. open circu ING FAN ING FAN omponen ult norma 11. cooling f MITTENT mittent In ult norma IPDM E/ or replace oection G FAN M | an relay. Refer INCIDENT CINCIDENT RELAY INCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT CINCIDENT | Continuity Existed ad and short to power. ground or short to power in harness or connectors. (Cooling Fan Relay)". fer to EC-39. "Component Parts Location". PCS-35. "Removal and Installation". nnectors. |

EC-501

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000010597109

3. Supply cooling fan control module terminals with battery voltage and check operation.

| Cool | ing fan contro | | | |
|-------|----------------|----------|-----|-----------------------|
| Motor | Connector | Terminal | | Operation |
| WOUG | Connector | (+) | (-) | |
| 1 | E301 | 4 | 5 | Cooling fan operates. |
| 2 | E302 | 6 | 7 | Cooling lan 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)

1. CHECK COOLING FAN RELAY

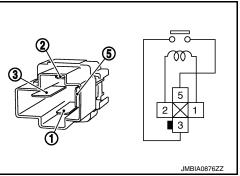
- 1. Turn ignition switch OFF.
- 2. Remove cooling fan relay. Refer to EC-39, "Component Parts Location".
- 3. Check the continuity between cooling fan relay terminals under

the following conditions.

| Terminals | Conditions | Continuity |
|-----------|------------------------------------------------------|-------------|
| 0 | 12 V direct current supply between terminals 1 and 2 | Existed |
| 3 and 5 | No current supply | Not existed |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace cooling fan relay. Refer to <u>EC-39, "Component</u> <u>Parts Location"</u>.



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 | | |
| LUAD SIGNAL | Real window delogger switch | OFF | OFF | | |
| Is the inspection result normal? | | | | | |
| YES >> GO TO 2. | | | | | |

| 160 | 00102. |
|-----|-----------------------------------------|
| NO | >> Go to EC-504, "Diagnosis Procedure". |
| - | |

2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-----------------|--------------------|------------|
| | Lighting switch | ON at 2nd position | ON |
| LOAD SIGNAL | | OFF | OFF |

Is the inspection result normal?

| YES | >> GO TO 3. | J |
|-----|-------------------------------------------------|---|
| NO | >> Go to <u>EC-504, "Diagnosis Procedure"</u> . | |

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 |
| HEALENTAN OW | | OFF | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-504, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>EC-504, "Compo-</u> nent Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2. Headlamp>>GO TO 3.

Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-3, "Work Flow".

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ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

 $3. {\sf CHECK} \, {\sf HEADLAMP} \, {\sf SYSTEM}$

Refer to EXL-7, "Work Flow" (Xenon type) or EXL-228, "Work Flow" (Halogen type).

>> INSPECTION END

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to HAC-4, "Work Flow".

>> INSPECTION END

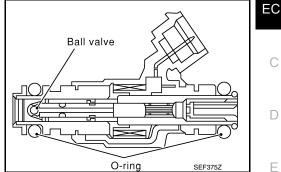
FUEL INJECTOR

< 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-506, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

With CONSULT

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

Without CONSULT

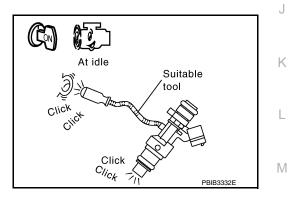
- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

| YES | >> INSPECTION END |
|-----|-------------------|
|-----|-------------------|

NO >> Go to EC-506, "Diagnosis Procedure".



Diagnosis Procedure

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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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FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

| | Fuel injecto | Ground | Voltage | |
|------------|--------------------|--------------|---------|-----------------|
| Cylinder | Connector Terminal | | Giouna | voltage |
| 1 | F21 | 1 | | |
| 2 | F22 | 1 | | |
| 3 | F23 | 1 | Ground | Potton voltago |
| 4 | F24 | 1 | | Battery voltage |
| 5 | F25 | 1 | | |
| 6 | F26 | 1 | 1 | |
| Is the ins | pection res | sult normal? | > | |

YES >> GO TO 3.

NO >> GO TO 2.

 ~ 00102

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness connectors F10, F120
- IPDM E/R harness connector E7

10 A fuse (No. 44)

· Harness for open or short between fuel injector and fuse

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

$\mathbf{3}$. 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 | | | ECM | | |
|----------|---------------|-------------------|-------|----------|------------|--|
| Cylinder | Connector | nector Terminal C | | Terminal | Continuity | |
| 1 | F21 | 2 | | 89 | | |
| 2 | F22 | 2 | | 85 | | |
| 3 | F23 | 2 | F102 | 81 | Existed | |
| 4 | F24 | 2 | F IUZ | 90 | Existed | |
| 5 | F25 | 2 | | 86 | | |
| 6 | F26 | 2 | | 82 | | |

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

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, F110
- Harness connectors F10, F120
- · Harness for open or short between fuel injector and ECM

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

5. CHECK FUEL INJECTOR

Refer to <u>EC-508</u>, "Component Inspection". <u>Is the inspection result normal?</u>

| | FUEL INJECTOR | | |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----|
| < DTC/CI | RCUIT DIAGNOSIS > | [VQ37VHR] | |
| NO > | > GO TO 6. > Replace malfunctioning fuel injector. Refer to <u>EM-38, "Removal and Installation"</u> . K INTERMITTENT INCIDENT | | А |
| | GI-45, "Intermittent Incident". | | |
| | pection result normal? | | EC |
| | Replace IPDM E/R. Refer to <u>PCS-35, "Removal and Installation"</u>. Repair open circuit, short to ground or short to power in harness or connectors. | | С |
| Compor | nent Inspection | INFOID:000000010597116 | |
| 1.CHEC | K FUEL INJECTOR | | D |
| 2. Disco | ignition switch OFF. Innect fuel injector harness connector. k resistance between fuel injector terminals as follows. | | E |
| Terminals | Resistance (Ω) | | |
| 1 and 2 | 11.1 - 14.3 [at 10 - 60°C (60 - 140°F)] | | F |
| • | pection result normal? | | |
| | > INSPECTION END > Replace malfunctioning fuel injector. Refer to <u>EM-38, "Removal and Installation"</u>. | | G |
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< DTC/CIRCUIT DIAGNOSIS > FUEL PUMP

Description

INFOID:000000010597117

| 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

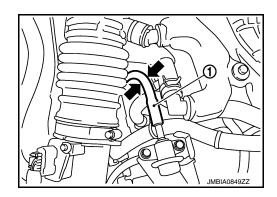
1.CHECK FUEL PUMP FUNCTION

- 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-509</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 | СМ | Ground | Voltage | |
|-----------|--------------------|--------|-----------------|--|
| Connector | Connector Terminal | | 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

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FUEL PUMP

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------|------------|----------------|--------------------|
| heck the vo | oltage be | tween IPE | DM E/R ha | arness conn | ector and gro | und. | | |
| IPDM | | | | | | | | |
| Connector | E/R Terminal | Ground | Voltag | ge | | | | |
| E7 | 77 | Ground | Battery vo | | | | | |
| the inspec | | | - | Jildge | | | | |
| | GO TO 3 | | - | | | | | |
| | GO TO 1 | | | | | | | |
| DETECT | MALFUN | ICTIONIN | IG PART | | | | | |
| neck the fo | | | 2 | | | | | |
| Harness co Harness co | | | | | | | | |
| | | | | DM E/R and | ECM | | | |
| | | | | | | | | |
| | • • | | | - | | in harness | or connectors | 6. |
| | | | EK SUPP | LY CIRCUIT | -111 | | | |
| | nition swite ect all ha | | nectors di | isconnected | | | | |
| Disconn | ect "fuel l | level sens | | | " harness co | nnector. | | |
| Turn ign | hition swite | | n "fuel levu | al sonsor un | it and fuel nu | mn" harnes | es connector a | and around |
| | | | | | n and idei pu | | | ina grouna. |
| Check th | ne voltage | | | | | P | | |
| Check th | - | | | | - | _ | | |
| Check th uel level sens fuel pu | sor unit and ump | | | Voltage | | _ | | |
| Check th uel level sens fuel pu | sor unit and | | | | int for 1 accord | - | | |
| Check th uel level sens fuel pu | sor unit and ump | | Battery vol | | ist for 1 second ned ON. | - | | |
| Check th Tuel level sens fuel pu Connector B22 | sor unit and ump Terminal 1 | Ground | Battery vol after ignitic | tage should ex | | - | | |
| Check th uel level sens fuel pu Connector B22 the inspec 'ES >> 0 | sor unit and ump Terminal 1 ction resu GO TO 8 | Ground Ground It normal? | Battery vol after ignitic | tage should ex | | - - | | |
| Check th uel level sens fuel pu Connector B22 the inspec (ES >> 0 IO >> 0 | sor unit and ump Terminal 1 ction resu GO TO 8 GO TO 5 | Ground Ground It normal? | Battery vol after ignitic | tage should ex | | - | | |
| Check th Fuel level sens fuel pu Connector B22 the inspect (ES >> 0 NO >> 0 .CHECK 1 | sor unit and ump Terminal 1 <u>Ction resu</u> GO TO 8 GO TO 5 15A FUSE | Ground Ground It normal? | Battery vol after ignitic | tage should ex | | - | | |
| Check th uel level sens fuel pu Connector B22 (ES >> 0 (CHECK 1 Turn ign | sor unit and ump Terminal 1 <u>ction resu</u> GO TO 8 GO TO 5 15A FUSE nition swite | Ground Ground It normal? | Battery vol after ignitic | tage should ex | | - | | |
| Check the uel level sense fuel put connector B22 the inspect (ES >> 0 IO >> 0 IO >> 0 IO >> 0 IO -> 0 | sor unit and ump Terminal 1 ction resu GO TO 8 GO TO 5 15A FUSE nition swite nect 15A f | Ground Ground It normal? | Battery vol after ignitic 2 41) from I | tage should ex | | - | | |
| Check the uel level sense fuel put connector B22 the inspective for the inspective for th | sor unit and ump Terminal 1 ction resu GO TO 8 GO TO 8 GO TO 5 15A FUSE 15A FUSE nition swite hect 15A f 15 A fuse. ction resu | Ground Ground It normal? | Battery vol after ignitic 2 41) from I | tage should ex | | - | | |
| Check th uel level sens fuel pu Connector B22 the inspec (ES >> 0 .CHECK 1 Turn ign Disconn Check 1 the inspec (ES >> 0 | sor unit and ump Terminal 1 2tion resu GO TO 8 GO TO 5 15A FUSE 15A FUSE 15A fuse. 2tion resu GO TO 6 | Ground Ground It normal? | Battery vol after ignitic 2 41) from I | tage should ex | | - | | |
| Check th Fuel level sense fuel put Connector B22 the inspect (ES >> 0 O >> 0 CHECK 1 Turn ign Disconn Check 1 the inspect (ES >> 0 NO >> 1 Check 1 Ch | sor unit and ump Terminal 1 ction resu GO TO 8 GO TO 8 GO TO 5 15A FUSE nition swite bect 15A fuse. ction resu GO TO 6 Replace 1 | Ground Ground It normal? | Battery vol after ignitic 2 41) from I | tage should ex on switch is turr PDM E/R. | ned ON. | - | | |
| Check th fuel level sens fuel pu Connector B22 the inspec (ES >> (NO >> (CHECK 1 Turn ign Disconn Check 1 the inspec (ES >> (NO >> (CHECK 5) CHECK F | sor unit and ump Terminal 1 2tion resu GO TO 8 GO TO 8 GO TO 5 15A FUSE hition swite bect 15A fuse. 2tion resu GO TO 6 Replace 1 FUEL PUI | Ground Ground It normal? | Battery vol after ignitic 2 41) from II | tage should ex on switch is turr PDM E/R. LY CIRCUIT | ned ON. | - | | |
| Check the uel level sense fuel put connector B22 the inspect (ES >> 0 IO >> 0 CHECK 1 Turn ign Disconn Check 1 the inspect (ES >> 0 IO >> 1 CHECK F IO >> 1 CHECK F Disconn Check the IO >> 1 CHECK F Disconn Check the IO >> 1 CHECK F IO Sconn Check the IO | sor unit and ump Terminal 1 ction resu GO TO 8 GO TO 8 GO TO 5 15A FUSE ition switt ect 15A f 15 A fuse. ction resu GO TO 6 Replace 1 FUEL PUI nect IPDM he contin | Ground Ground It normal? | Battery vol after ignitic 2 41) from II 2 ER SUPP | tage should ex on switch is turn PDM E/R. LY CIRCUIT ector E5. | -IV | - - | level sensor u | unit and fuel pump |
| Check the uel level sense fuel put connector B22 the inspece CES >> 0 IO >> 0 IO >> 0 CHECK 1 Turn ign Disconn Check 1 the inspece CES >> 0 IO >> 1 CHECK F Disconn Check the CHECK F | sor unit and ump Terminal 1 2tion resu GO TO 8 GO TO 8 GO TO 5 15A FUSE bition switch bect 15A f 15 A fuse. ction resu GO TO 6 Replace 1 FUEL PUI bect IPDM | Ground Ground It normal? | Battery vol after ignitic 2 41) from II 2 ER SUPP | tage should ex on switch is turn PDM E/R. LY CIRCUIT ector E5. | -IV | - - | level sensor u | unit and fuel pump |
| Check the level sense fuel put connector B22 the inspect (ES >> 0) CHECK 1 Turn ign Disconn Check 1 the inspect (ES >> 0) CHECK F Disconn Check the harness | sor unit and ump Terminal 1 Ction resu GO TO 8 GO TO 8 GO TO 5 15A FUSE 15A FUSE 15A FUSE 15A fuse. Ction resu GO TO 6 Replace 1 FUEL PUI he contin connecto | Ground Ground It normal? | Battery vol after ignitic 2 41) from II 2 ER SUPP ness conn- een IPDIV | tage should ex on switch is turn PDM E/R. LY CIRCUIT ector E5. | -IV | - - | level sensor u | unit and fuel pump |
| Check the sense fuel put connector B22 the inspect (ES >> 0 (NO >> 0) (CHECK 1) Turn ign Disconn Check 1) the inspect (ES >> 0) (CHECK F) Disconn Check the fuel (Check the context fuel (Check the co | sor unit and ump Terminal 1 Ction resu GO TO 8 GO TO 8 GO TO 5 15A FUSE 15A FUSE 15A FUSE 15A fuse. Ction resu GO TO 6 Replace 1 FUEL PUI he contin connecto | Ground Ground It normal? | Battery vol after ignitic 2 41) from II 2 ER SUPP ness conn- een IPDM | tage should ex on switch is turn PDM E/R. LY CIRCUIT ector E5. | -IV | - - | level sensor u | unit and fuel pump |
| Check the sense fuel put connector B22 the inspect YES >> 0 CHECK 1 Turn ign Disconn Check 1 the inspect YES >> 0 CHECK For Check the inspect YES >> 0 CHECK For Check the sense fuel put conn Check the sense fuel put | sor unit and ump Terminal 1 Ction resu GO TO 8 GO TO 8 GO TO 5 15A FUSE 15A FUSE 15A FUSE 15A fuse. Ction resu GO TO 6 Replace 1 FUEL PUI the continue connector | Ground Ground It normal? | Battery vol after ignitic 2 41) from II 2 ER SUPP ness conn- een IPDM | tage should ex on switch is turn PDM E/R. LY CIRCUIT ector E5. 1 E/R harne | -IV | - - | level sensor u | unit and fuel pump |

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 E104, B4
- IPDM E/R harness connector E5

Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"

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

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.

2. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and ground.

| Fuel level s and fue | | Ground | Continuity |
|-------------------------|----------|--------|------------|
| Connector | Terminal | | |
| B22 | 3 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK FUEL PUMP

Refer to EC-511, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace fuel pump. Refer to <u>FL-6, "Removal and Installation"</u>.

10.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
- NO >> Repair or replace harness or connectors.

Component Inspection

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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>.

< 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-18</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 | Slightly depressed | OFF |
| BITARE SWI | Brake pedal | Fully released | ON |

Without CONSULT

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|---|
| Connector | + | - | Condition | | Voltage (V) | |
| CONNECTOR | Terminal | Terminal | | | | |
| M107 | 126 | 128 | Brake pedal | Slightly depressed | Approx. 0 | |
| 101 | (ICC brake switch signal) | 120 | Brake pedal | Fully released | Battery voltage | J |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-512, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake switch harness connector and ground.

| ICC brak | e switch | Ground | Voltago |
|--------------|------------|----------|-----------------|
| Connector | Terminal | Giouna | Voltage |
| E111 | 1 | Ground | Battery voltage |
| Is the inspe | ction resu | lt norma | ? |
| YES >> | GO TO 8 | | |
| - | GO TO 2 | | |
| 2.CHECK | ICC BRAK | KE SWIT | CH POWER S |

- Turn ignition switch OFF.
 Disconnect ICC brake hold results.
- 2. Disconnect ICC brake hold relay.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake hold relay harness connector and ground.

EC-511

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< DTC/CIRCUIT DIAGNOSIS >

| ICC brake | hold relay | Ground | Voltage | |
|-----------|------------|--------|-----------------|--|
| Connector | Terminal | | voltage | |
| E50 | 3 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

Fuse block (J/B) connector E103

• 10A fuse (No. 3)

Harness for open or short between ICC brake hold relay and fuse

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

4.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.

 Check the continuity between ICC brake switch harness connector and ICC brake hold relay harness connector.

| ICC brak | e switch | ICC brake | Continuity | |
|-----------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E111 | 1 | E50 | 4 | Existed |

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK ICC BRAKE HOLD RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake hold relay harness connector.
- Check the continuity between ICC brake hold relay harness connector and brake booster control unit harness connector.

| ICC brake | hold relay | brake booste | Continuity | |
|-----------|--------------------|--------------|------------|------------|
| Connector | Connector Terminal | | Terminal | Continuity |
| E50 | 1 | B249 | 47 | Existed |

4. Check the continuity between ICC brake hold relay harness connector and ground.

| ICC brake | hold relay | Ground | Continuity | |
|-----------|------------|--------|------------|--|
| Connector | Terminal | Ground | | |
| E50 | 2 | Ground | Existed | |

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness connectors B201, M117

· Harness for open or short between ICC brake hold relay and brake booster control unit

< DTC/CIRCUIT DIAGNOSIS >

| >> Repair open circuit, short to ground or short to power in harness or connectors. 7 | A | | | | |
|---------------------------------------------------------------------------------------------------------------------------------|--------------|--|--|--|--|
| 7. CHECK ICC BRAKE HOLD RELAY | | | | | |
| Refer to <u>EC-456</u> , "Component Inspection (ICC Brake Hold Relay)". | EC | | | | |
| <u>Is the inspection result normal?</u> YES >> GO TO 11. | | | | | |
| NO >> Replace ICC brake hold relay. Refer to <u>BR-20, "Exploded View"</u> . | C | | | | |
| 8. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT | 0 | | | | |
| 1. Turn ignition switch OFF. | | | | | |
| 2. Disconnect ECM harness connector. | D | | | | |
| 3. Check the continuity between ICC brake switch harness connector and ECM harness connector. | | | | | |
| | E | | | | |
| ICC brake switch ECM Continuity | | | | | |
| Connector Terminal Connector Terminal E111 2 M107 126 Existed | | | | | |
| | F | | | | |
| Also check harness for short to ground and short to power. Is the inspection result normal? | | | | | |
| YES >> GO TO 10. | G | | | | |
| NO $>>$ GO TO 9. | 0 | | | | |
| 9. DETECT MALFUNCTIONING PART | | | | | |
| Check the following. | — Н | | | | |
| Harness connectors E106, M6 | | | | | |
| Harness for open or short between ICC brake switch and ECM | I | | | | |
| >> Densis energian it chart to around as chart to request in homeon or connectors | I | | | | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. | | | | | |
| 10.check ICC BRAKE SWITCH | J | | | | |
| Refer to EC-514, "Component Inspection (ICC Brake Switch)". | | | | | |
| Is the inspection result normal? | К | | | | |
| YES >> GO TO 11. NO >> Replace ICC brake switch. Refer to <u>BR-20, "Exploded View"</u> . | 1 % | | | | |
| 11. CHECK INTERMITTENT INCIDENT | | | | | |
| Refer to <u>GI-45, "Intermittent Incident"</u> . | L | | | | |
| Refer to <u>OF-45, Intermittent Incident</u> . | | | | | |
| >> INSPECTION END | M | | | | |
| | | | | | |
| Component Inspection (ICC Brake Switch) | 0597124 N | | | | |
| | | | | | |
| Turn ignition switch OFF. Disconnect ICC brake switch harness connector. | | | | | |
| 3. Check the continuity between ICC brake switch terminals under the following conditions. | 0 | | | | |
| | | | | | |
| Terminals Condition Continuity | Р | | | | |
| 1 and 2 Brake pedal Fully released Existed | I | | | | |
| Slightly depressed Not existed | | | | | |
| Is the inspection result normal? | | | | | |
| YES >> INSPECTION END | | | | | |
| NO >> GO TO 2. | | | | | |

2.CHECK ICC BRAKE SWITCH-II

< DTC/CIRCUIT DIAGNOSIS >

- 1. Adjust ICC brake switch installation. Refer to <u>BR-21, "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 |
| | Diake pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch. Refer to <u>BR-20, "Exploded View"</u>.

< 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 | INFOID:000000010597126 | С |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---|
| 1.INSPECTION START | | |
| Turn ignition switch OFF, and restart engine. | | D |
| Does the engine start? | | |
| YES-1 >> With CONSULT: GO TO 2. YES-2 >> Without CONSULT: GO TO 3. No >> Go to <u>EC-516, "Diagnosis Procedure"</u> . | | Ε |
| 2. CHECK IGNITION SIGNAL FUNCTION | | F |
| With CONSULT | | Г |
| Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT. Make sure that each circuit produces a momentary engine speed drop. | | G |
| Is the inspection result normal? | | 0 |
| YES >> INSPECTION END NO >> Go to <u>EC-516, "Diagnosis Procedure"</u> . | | Н |
| 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 | | | |
|----------|----------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F | - | - | Voltage signal | |
| Terminal | Connector | Terminal | | |
| 11 | | | | |
| 12 | | | 50mSec/div | |
| 15 | - | | | |
| 16 | M107 | 128 | | |
| 19 | | | | |
| 20 | | | 2V/div JMBIA0035GB | |
| | Terminal 11 12 15 16 19 | Terminal Connector 11 12 15 M107 16 19 | Terminal Connector Terminal 11 11 12 11 12 15 11 128 16 19 128 128 | Image: marked box Image: marked box Terminal Connector Terminal 11 Image: marked box Image: marked box 11 Image: marked box Image: marked box 12 Image: marked box Image: marked box 15 Image: marked box Image: marked box 16 Image: marked box Image: marked box 19 Image: marked box Image: marked box |

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>EC-516</u>, "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.

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| Connector | + | _ | Voltage |
|-----------|----------|----------|-----------------|
| Connector | Terminal | Terminal | |
| M107 | 125 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to <u>EC-164. "Diagnosis Procedure"</u>.

2. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between condenser harness connector and ground.

| - | Cond | enser | Ground | Voltage | |
|---|-----------|----------|--------|-----------------|--|
| | Connector | Terminal | Ground | voltage | |
| _ | F8 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 3.

3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.

- 2. Disconnect IPDM E/R harness connector E7.
- 3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

| IPDM | E/R | Cond | Continuity | |
|-----------|----------------------|------|------------|------------|
| Connector | Connector Terminal C | | Terminal | Continuity |
| E7 | 53 | F8 | 1 | Existed |

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

Is the inspection result normal?

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

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E13, F40

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

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

5. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between condenser harness connector and ground.

| Cond | enser | Ground | Continuity |
|-----------|----------|--------|------------|
| Connector | Terminal | Cround | Continuity |
| F8 | 2 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.

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

Revision: February 2015



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|-----------|

| B .CHECK CONDENSER | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| | |
| efer to EC-520, "Component Inspection (Condenser)" | |
| the inspection result normal? | |
| <pre>/ES >> GO TO 7. NO >> Replace condenser.</pre> | ł |
| NO >> Replace condenserCHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV | |
| | |
| Reconnect all harness connectors disconnected. Disconnect ignition coil harness connector. | |
| Turn ignition switch ON. | |
| Check the voltage between ignition coil harness connector and ground. | |
| Ignition coil | |
| cylinder Connector Terminal Ground Voltage | |
| 1 F11 3 | |
| 2 F12 3 | |
| 3 F13 3 | |
| 4 F14 3 Ground Battery voltage | |
| 5 F15 3 | |
| 6 F16 3 | |
| the inspection result normal? | |
| neck the following. | |
| heck the following. Harness connector F40 | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. Ignition coil Cylinder Connector Terminal Ground Continuity | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. Ignition coil Ignition coil Continuity 1 F11 2 2 F12 2 3 F13 2 | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. Image: state stat | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. •CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. Image: style="text-align: left;">Ignition coil Cylinder Connector Terminal Ground Cylinder Connector Terminal Ground Continuity Ground 1 F11 2 F12 3 F13 4 F14 5 F15 6 F16 2 F16 3 F16 4 F16 5 F16 6 F16 7 Also check harness for short to power. | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT . Turn ignition switch OFF. . Check the continuity between ignition coil harness connector and ground. Ignition coil Ground Continuity I F11 2 Ground Continuity I F11 2 Ground Ground Continuity Final Connector Terminal Ground Continuity Ground Continuity Final Connector Terminal Ground Continuity Also check harness for short to power. The inspection result normal? | |
| CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Check the continuity between ignition coil harness connector and ground. Image: state s | |
| heck the following. Harness connector F40 Harness for open or short between ignition coil and harness connector F40 >> Repair or replace harness or connectors. .CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT . Turn ignition switch OFF. . Check the continuity between ignition coil harness connector and ground. <u>Ignition coil</u> <u>Ignition coil</u> <u>Cylinder Connector Terminal</u> <u>Ignition coil</u> <u>Cylinder Connector Terminal</u> <u>Ignition coil</u> <u>Ground</u> <u>Ground</u> <u>Ground</u> <u>F11</u> <u>Cylinder F11</u> <u>Cylinder Connector Terminal</u> <u>Ground</u> <u>Ground</u> <u>Ground</u> <u>Existed</u> <u>Culticetor F15</u> <u>Culticetor F15 <u>Culticetor F15</u> <u>Culticetor F15</u> <u>Culticetor F15 <u>Culticetor F15 <u>Cultice</u></u></u></u></u></u></u></u></u></u></u></u></u> | |

< DTC/CIRCUIT DIAGNOSIS >

EC-517

< DTC/CIRCUIT DIAGNOSIS >

| | Ignition coil | | EC | CM | Continuity |
|----------|---------------|----------|-----------|----------|------------|
| Cylinder | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F11 | 1 | | 20 | |
| 2 | F12 | 1 | | 16 | |
| 3 | F13 | 1 | F101 | 12 | Existed |
| 4 | F14 | 1 | FIUI | 11 | Existed |
| 5 | F15 | 1 | | 15 | |
| 6 | F16 | 1 | | 19 | |

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

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F104, F105

Harness for open or short between ignition coil and ECM

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

12. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-519, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to <u>EM-48</u>, "<u>Removal and Installa-</u> <u>tion</u>".

13. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:000000010597128

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.

2. Disconnect ignition coil harness connector.

3. Check resistance between ignition coil terminals as per the following.

| Terminals | Resistance (Ω) [at 25°C (77°F)] |
|-----------|---------------------------------|
| 1 and 2 | Except 0 or ∞ |
| 1 and 3 | Except 0 |
| 2 and 3 | Except 0 |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to <u>EM-48</u>, "<u>Removal and Installa-</u> <u>tion</u>".

2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

1. Turn ignition switch OFF.

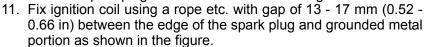
< DTC/CIRCUIT DIAGNOSIS >

- 2. Reconnect all harness connectors disconnected.
- 3. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- Start engine.
- 5. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- 7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 8. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-23, "Removal and Installation".
- 9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 10. Connect spark plug and harness connector to ignition coil.



12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

When the gap is less than 13 mm (0.52 in), spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-48, "Removal and Installation".

Component Inspection (Condenser)

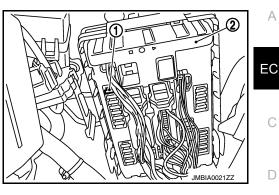
1.CHECK CONDENSER

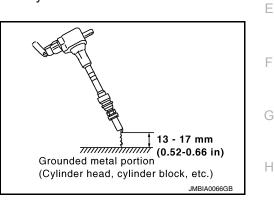
| 1. | Turn | ignition | switch | OFF. |
|----|------|----------|--------|------|
|----|------|----------|--------|------|

2. Disconnect condenser harness connector.

3. Check resistance between condenser terminals as per the following.

| Terminals | als Resistance (MΩ) | | |
|------------|--------------------------|--|--|
| 1 and 2 | Above 1 [at 25°C (77°F)] | | |
| Is the ins | spection result normal? | | |
| | >> INSPECTION END | | |
| NO | >> Replace condenser. | | |





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MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

MALFUNCTION INDICATOR LAMP

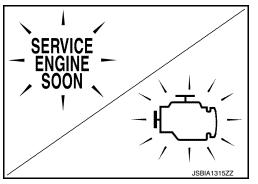
Description

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-142, "DIAGNOSIS DESCRIPTION : Malfunc-</u> tion Indicator Lamp (MIL)".



Component Function Check

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.

2. Make sure that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-521, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to <u>MWI-136, "Removal and Installation"</u>.

NO >> Repair or replace.

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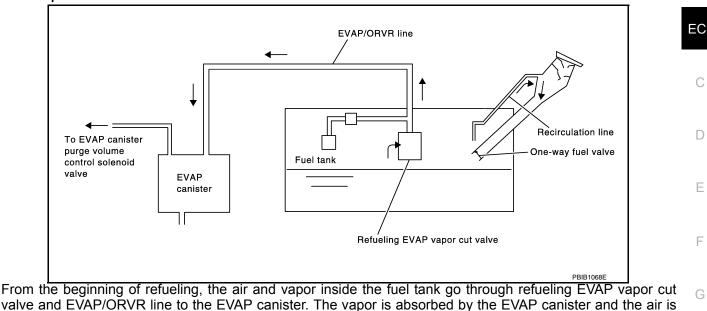
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< DTC/CIRCUIT DIAGNOSIS >

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Description



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 Н 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 wor Always furnish the workshop with a CO₂ fire extinguisher. CAUTION: | k area. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 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 <u>EC-628, "Inspection"</u>. Disconnect battery ground cable. Always replace O-ring when the fuel gauge retainer is removed. | ł |
| Never kink or twist hose and tube when they are installed. Never tighten hose and clamps excessively to avoid damaging hoses. After installation, run engine and check for fuel leaks at connections. Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire. | |
| Component Function Check | INFOID:0000000010597134 |
| 1.CHECK ORVR FUNCTION | ١ |
| Check whether the following symptoms are present.Fuel odor from EVAP canister is strong.Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling. | (|
| Are any symptoms present? YES >> Go to EC-522, "Diagnosis Procedure". NO >> INSPECTION END | F |
| Diagnosis Procedure | INFOID:000000010597135 |
| 1.INSPECTION START | |
| Check whether the following symptoms are present. A: Fuel odor from EVAP canister is strong. | |

INFOID:000000010597133

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Which symptom is present?

A >> GO TO 2. B >> GO TO 7.

2. CHECK EVAP CANISTER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-15</u>, "<u>Exploded View</u>".
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

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

NU >> GU 10 4.

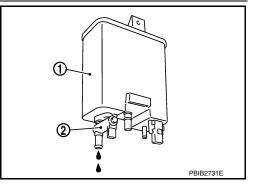
3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

• 2: EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 4. NO >> GO TO 6.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to <u>FL-16, "Removal and Installation"</u>.

>> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to FL-14, "Hydraulic Layout".

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-525. "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to <u>FL-11, "Exploded View"</u>.

7.CHECK EVAP CANISTER

- 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-16</u>, "<u>Removal and Installation</u>".
- 2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 9.

 $\mathbf{8}$.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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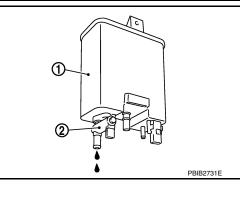
Ρ

Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

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



9.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-16, "Removal and Installation".

>> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

11. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

| 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. | J |
| Is the inspection result normal? | |
| YES >> GO TO 13. | |
| NO >> Replace filler neck tube. | Κ |
| 13. CHECK REFUELING EVAP VAPOR CUT VALVE | |
| Refer to EC-525, "Component Inspection". | |

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11. "Exploded View".

14.CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal? YES >> GO TO 15. NO >> Replace fuel filler tube.

15.CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 16.

NO >> Repair or replace one-way fuel valve with fuel tank.

16.CHECK ONE-WAY FUEL VALVE-II

Make sure that fuel is drained from the tank. 1.

2. Remove fuel filler tube and hose. Refer to FL-11, "Removal and Installation".

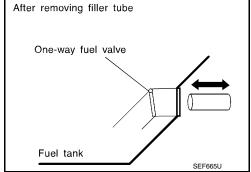
< DTC/CIRCUIT DIAGNOSIS >

 Check one-way fuel valve for operation as follows. When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



Component Inspection

INFOID:000000010597136

[VQ37VHR]

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

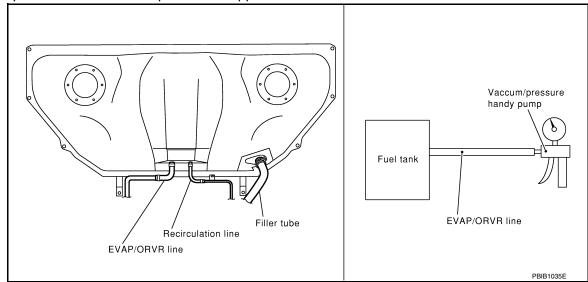
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK REFUELING EVAP VAPOR CUT VALVE

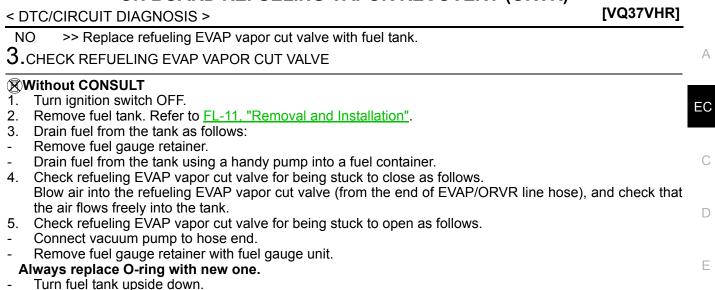
With CONSULT

- 1. Turn ignition switch OFF.
- 2. Remove fuel tank. Refer to FL-11, "Removal and Installation".
- 3. Drain fuel from the tank as follows:
- Remove fuel feed hose located on the fuel gauge retainer.
- Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
- Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
- 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.

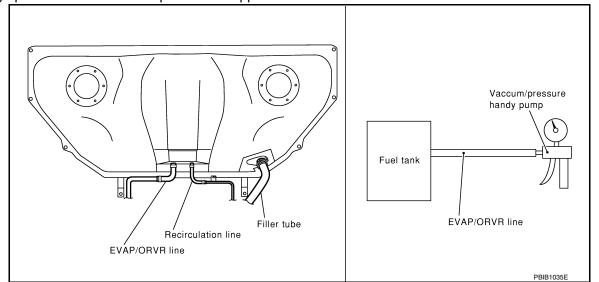


Is the inspection result normal? YES >> INSPECTION END

Revision: February 2015



- 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.

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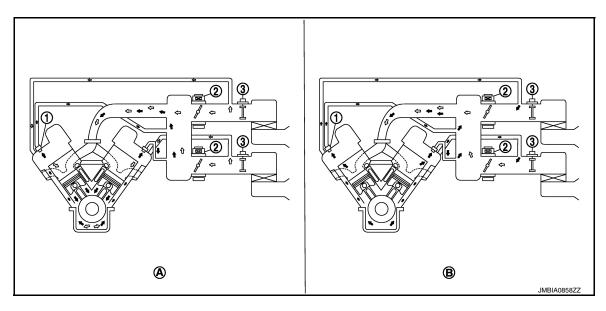
< DTC/CIRCUIT DIAGNOSIS >

POSITIVE CRANKCASE VENTILATION

Description

INFOID:000000010597137

[VQ37VHR]



1. PCV valve

- 2. Electric throttle control actuator
- 3. Mass air flow sensor

- A. Normal condition
- B. Hi-load condition

- <□ : Fresh air
- E : Blow-by air

This system returns blow-by gas to the intake manifold.

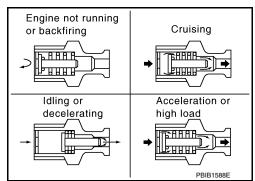
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

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

1.CHECK PCV VALVE

INFOID:000000010597138

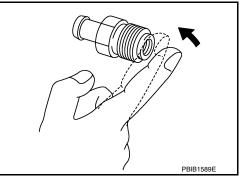
POSITIVE CRANKCASE VENTILATION

< 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-48, "Exploded View"</u>.





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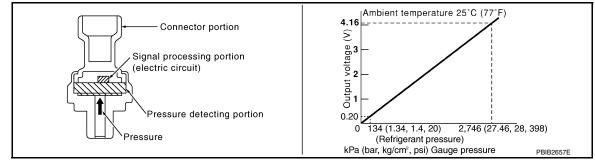
REFRIGERANT PRESSURE SENSOR

Description

INFOID:000000010597139

IVQ37VHR

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Component Function Check

INFOID:000000010597140

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 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-529, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000010597141

1. CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF.
- 2. Turn ignition switch OFF.
- 3. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

NO >> Repair or replace ground connection.

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect refrigerant pressure sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between refrigerant pressure sensor harness connector and ground.

| Refrigerant p | essure sensor | Ground | Voltage (V) |
|---------------|---------------|--------|-------------|
| Connector | Terminal | Cround | voltage (v) |
| E77 | 3 | Ground | Approx. 5 |
| | | | |

Is the inspection result normal?

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

REFRIGERANT PRESSURE SENSOR

IVQ37VHR < 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. ${f 4}$. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. 2. Disconnect ECM harness connector. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| | Refrigerant pressure sensor | | ECM | | Continuity |
|---|-----------------------------|----------|--------------------|-----|------------|
| - | Connector | Terminal | Connector 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.

1.

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5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and refrigerant pressure sensor

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

6.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| Refrigerant pre | Refrigerant pressure sensor | | ECM | | |
|-----------------|-----------------------------|-----------|----------|------------|--|
| 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.

I.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

· Harness for open or short between ECM and refrigerant pressure sensor

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

8. CHECK INTERMITTENT INCIDENT

Refer to GI-45. "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to <u>HAC-131, "Removal and Installation"</u>.

NO >> Repair or replace. А

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SNOW MODE SWITCH

Description

INFOID:000000010597142

[VQ37VHR]

The snow mode switch signal is sent to the "unified meter and A/C amp." from the snow mode switch. The "unified meter and A/C amp." then sends the signal to the ECM via the CAN communication line. The snow mode is used for driving or starting the vehicle on snowy roads or slippery areas. If the snow mode is activated, the vehicle speed will not accelerates as quickly as normal to avoid vehicle slip. In other words, ECM controls rapid engine torque change by controlling the electric throttle control actuator operating speed.

Component Function Check

INFOID:000000010597143

1.CHECK SNOW MODE SWITCH FUNCTION

- 1. Turn ignition switch ON.
- 2. Select "SNOW MODE SW" in "DATA MONITOR" mode with CONSULT.
- 3. Check "SNOW MODE SW" indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|---------------------|----|------------|
| SNOW MODE SW | Snow mode switch | ON | ON |
| | SW Snow mode switch | | OFF |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-531, "Diagnosis Procedure".

2.CHECK SNOW MODE INDICATOR FUNCTION

- 1. Turn ignition switch ON.
- 2. Check the snow mode indicator in the snow mode switch under the following condition.

| Condition | | Snow mode indicator |
|------------------|-----|---------------------|
| Snow mode switch | ON | ON |
| Show mode switch | OFF | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-531, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000010597144

1. CHECK SNOW MODE SWITCH OVERALL FUNCTION

Confirm the malfunctioning circuit (snow mode switch or snow mode indicator). Refer to <u>EC-531</u>, "Component <u>Function Check"</u>.

Which circuit is related to the incident?

Snow mode switch>>GO TO 2.

Snow mode indicator>>GO TO 6.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to <u>MWI-42, "CONSULT Function (METER/M&A)"</u>.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to <u>MWI-4, "Work flow"</u>.

3. CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect snow mode switch harness connector.

3. Turn ignition switch ON.

4. Check the voltage between snow mode switch harness connector and ground.

SNOW MODE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

| 0 | ala avritala | | | _ | |
|-------------------------------------------------|-------------------|------------------|-----------------|---------------|---------------------------------------------------|
| | de switch | Ground | Voltage | | |
| Connector M176 | Terminal 1 | Ground | Battery voltage | _ | |
| | | | Dattery voltage | _ | |
| <u>Is the inspector</u> YES >> | • GO TO 5 | | | | |
| | • GO TO 4 | | | | |
| 4.DETEC | T MALFUI | | B PART | | |
| Check the f | following. | | | | |
| Harness | | | | | |
| Harness (IPDM E/F | | | | | |
| • 10 A fuse | (No. 43) | | | | |
| Harness f | for open o | r short betw | een snow m | ode switch | and fuse. |
| | Donaira | oon oirouit | abort to arou | ad ar abort | a nower in hornoop or connectors |
| _ | • | | - | | o power in harness or connectors. |
| | | | | IGNAL CIR | CUIT FOR OPEN AND SHORT |
| | nition swit | | nd A/C amp." | harness co | nector |
| 3. Check | the contin | nuity betwee | | | arness connector and "unified meter and A/C amp." |
| harnes | s connect | or. | | | |
| | | | | | |
| Snow mod | | | r and A/C amp. | Continuity | |
| Connector M176 | Terminal 4 | Connector M66 | Terminal 23 | Existed | |
| | - | | - | | |
| 4. Also cr Is the inspe | | | t to ground a | na snort to j | ower. |
| | · GO TO 8 | | | | |
| | | | short to grou | nd or short | o power in harness or connector. |
| 6. CHECK | - | | - | | |
| 1. Turn ia | nition swit | ch OFF. | | | |
| U U | | | 95. Refer to | Ground Insp | ection in GI-48, "Circuit Inspection". |
| Is the inspe | ection resu | ilt normal? | | | |
| | GO TO 7 | | | К | |
| _ | • | | ound connec | | |
| | | | | | CIRCUIT FOR OPEN AND SHORT |
| 1. Check | the contin | uity betwee | n snow mode | e switch har | ness connector and ground. |
| Snow mod | le switch | | | | |
| Connector | Terminal | Ground | Continuity | | |
| M176 | 2 | Ground | Existed | | |
| 2. Also ch | | | | | |
| Is the inspe | | | | | |
| • | • GO TO 8 | | | | |
| | | | or short to po | wer in harne | ess or connectors. |
| 8. CHECK | - | | - | | |
| Refer to EC | <u>-53</u> 3, "Co | mponent In | spection". | | |
| Is the inspe | | | | | |
| | • GO TO 9 | | | | |
| | | | | | |

SNOW MODE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

NO >> Replace snow mode switch. Refer to <u>IP-12</u>, "Exploded View".

9. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK SNOW MODE SWITCH-I

1. Turn ignition switch OFF.

- 2. Disconnect snow mode switch harness connector.
- 3. Check the continuity between snow mode switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|------------------|-----|-------------|
| 1 and 4 | Snow mode switch | ON | Existed |
| | Show mode switch | OFF | Not Existed |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace snow mode switch. Refer to <u>IP-12</u>, "Exploded View".

2.CHECK SNOW MODE SWITCH-II

Check the continuity between snow mode switch terminals under the following conditions.

| Terminals (Polarity) | Continuity |
|----------------------|-------------|
| 2 (+) - 4 (–) | Existed |
| 4 (+) - 2 (-) | Not Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace snow mode switch. Refer to <u>IP-12, "Exploded View"</u>.

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INFOID:000000010597145

ECU DIAGNOSIS INFORMATION ECM

Reference Value

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- Numerical values in the following table are reference values.
- These values are input/output values that ECM receives/transmits and may differ from actual operations. Example:

The ignition timing shown by the timing light may differ from the ignition timing displayed on the data monitor. This occurs because the timing light shows a value calculated by ECM according to signals received from the can shaft position sensor and other sensors related to ignition timing.

For outlines of following items, refer to EC-146, "CONSULT Function".

CONSULT MONITOR ITEM

| Monitor Item | Co | ondition | Values/Status |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------|
| ENG SPEED | Run engine and compare CONSUL | Almost the same speed as the tachometer indication | |
| MAS A/F SE-B1 | See EC-156, "Description". | | <u>.</u> |
| MAS A/F SE-B2 | See EC-156. "Description". | | |
| B/FUEL SCHDL | See EC-156, "Description". | | |
| A/F ALPHA-B1 | See EC-156, "Description". | | |
| A/F ALPHA-B2 | See EC-156, "Description". | | |
| COOLAN TEMP/S | Ignition switch: ON | | Indicates engine coolant temperature |
| A/F SEN1 (B1) | Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| A/F SEN1 (B2) | Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| HO2S2 (B1) | Revving engine from idle up to 3,00 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 3,000 rpm quickly after the following conditions are met. Engine: After warming up After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | 0 - 0.3 V ←→ Approx. 0.6 - 1.0 V |
| HO2S2 MNTR (B1) | Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. Engine: After warming up After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | LEAN ←→ RICH |
| HO2S2 MNTR (B2) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | LEAN ←→ RICH | |
| VHCL SPEED SE | • Turn drive wheels and compare CONSULT value with the speedometer indica- 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 JEN I | (Engine stopped) | Accelerator pedal: Fully depressed | 4.4 - 4.8 V |

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< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| Monitor Item | Co | ondition | Values/Status |
|---------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------|
| | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.00 V |
| ACCEL SEN 2 ^{*1} | (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 | Accelerator pedal: Fully depressed | Less than 4.75 V |
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 2-B1* ¹ | (Engine stopped)Selector lever: D | 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 |
| | Engine: After warming up, idle the | Air conditioner switch: OFF | OFF |
| AIR COND SIG | engine | Air conditioner switch: ON (Compressor operates.) | ON |
| | | Selector lever: P or N | 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 | NAL 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 SW | Ignition switch: ON | Brake pedal: Fully released | OFF |
| DIVARE SW | ignition switch. ON | Brake pedal: Slightly depressed | ON |
| | Engine: After warming up | ldle | 2.0 - 3.0 msec |
| INJ PULSE-B1 | Selector lever: P or N Air conditioner switch: OFF No 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 Air conditioner switch: OFF No load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | ldle | 7° BTDC |
| IGN TIMING | Selector lever: P or N Air conditioner switch: OFF No load | 2,000 rpm | 25° - 45° BTDC |
| | Engine: After warming up | Idle | 5% - 35% |
| CAL/LD VALUE | Selector lever: P or N Air conditioner switch: OFF No load | 2,500 rpm | 5% - 35% |

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< ECU DIAGNOSIS INFORMATION >

| Monitor Item | Co | ondition | Values/Status |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| MASS AIRFLOW | Engine: After warming up Selector lever: P or N Air conditioner switch: OFF | Idle 2,500 rpm | 2.0 - 6.0 g/s 7.0 - 20.0 g/s |
| | No load Engine: After warming up | Idle (Accelerator pedal: Not depressed even | 0% |
| PURG VOL C/V | Selector lever: P or N Air conditioner switch: OFF No load | slightly, after engine starting.) | |
| | Engine: After warming up | Idle | – 5 - 5°CA |
| INT/V TIM (B1) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 30°CA |
| | Engine: After warming up | Idle | – 5 - 5°CA |
| INT/V TIM (B2) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 30°CA |
| INT/V SOL (B1) | Engine: After warming up Selector lever: P or N | Idle | 0 - 2% |
| | Air conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% |
| | Engine: After warming up | ldle | 0 - 2% |
| INT/V SOL (B2) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% |
| TP SEN 1-B2 | Ignition switch: ON (Engine standed) | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN I-B2 | (Engine stopped)Selector lever: D | Accelerator pedal: Fully depressed | Less than 4.75 V |
| | Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 2-B2* ¹ | (Engine stopped) Selector lever: D | Accelerator pedal: Fully depressed | Less than 4.75 V |
| | Engine: After warming up, idle the | Air conditioner switch: OFF | OFF |
| AIR COND RLY | engine | Air conditioner switch: ON (Compressor operates) | ON |
| FUEL PUMP RLY | For 1 second after turning ignition s Engine running or cranking | witch: ON | ON |
| | Except above | | OFF |
| | Ignition switch: ON | | OFF |
| THRTL RELAY | Ignition switch: ON Engine speed: Below 3,600 rpm aft | er the following conditions are met | ON |
| HO2S2 HTR (B1) | - Engine: After warming up | 3,500 and 4,000 rpm for 1 minute and at | ON |
| | Engine speed: Above 3,600 rpm | | OFF |
| H02S2 HTR (B2) | Engine speed: Jubble 0,000 rpm Engine speed: Below 3,600 rpm after the following conditions are met. Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | ON |
| | Engine speed: Above 3,600 rpm | | OFF |
| I/P PULLY SPD | Vehicle speed: More than 20 km/h (| (12 MPH) | Almost the same speed as the tachometer indication |
| VEHICLE SPEED | Turn drive wheels and compare CO tion. | NSULT value with the speedometer indica- | Almost the same speed as the speedometer indication |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | C | condition | Values/Status |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------|
| IDL A/V LEARN | Facility Duration | Idle air volume learning has not been per- formed yet. | YET |
| | Engine: Running | Idle air volume learning has already been performed successfully. | CMPLT |
| | - Ignition quitab: ON | Snow mode switch: Pressed | ON |
| SNOW MODE SW | Ignition switch: ON | Snow mode switch: Released | OFF |
| ENG OIL TEMP | Engine: After warming up | | More than 70°C (158°F) |
| TRVL AFTER MIL | Ignition switch: ON | Vehicle has traveled after MIL has illumi- nated. | 0 - 65,535 km (0 - 40,723 miles) |
| A/F S1 HTR (B1) | Engine: After warming up, idle the (More than 140 seconds after start) | | 4 - 100% |
| A/F S1 HTR (B2) | Engine: After warming up, idle the (More than 140 seconds after start) | | 4 - 100% |
| AC PRESS SEN | Engine: IdleBoth A/C switch and blower fan sw | vitch: ON (Compressor operates) | 1.0 - 4.0 V |
| VHCL SPEED SE | Turn drive wheels and compare CO tion. | DNSULT 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 SW | Ignition switch: ON | MAIN switch: Pressed | ON |
| MAIN SW | | MAIN switch: Released | OFF |
| CANCEL SW | Ignition switch: ON | CANCEL switch: Pressed | ON |
| CANCEL SW | · Ignition switch. ON | CANCEL switch: Released | OFF |
| RESUME/ACC SW | Ignition switch: ON | RESUME/ACCELERATE switch: Pressed | ON |
| RESUME/ACC SW | | RESUME/ACCELERATE switch: Re- leased | OFF |
| SET SW | - Ignition owitch: ON | SET/COAST switch: Pressed | ON |
| SETSW | 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) | ignition switch. ON | Brake pedal: Slightly depressed | ON |
| DIST SW | Ignition switch: ON | DISTANCE switch: Pressed | ON |
| DIGT GW | ignition switch. On | DISTANCE switch: Released | OFF |
| CRUISE LAMP | Ignition switch: ON | MAIN switch: Pressed at the 1st time \rightarrow at the 2nd time | $ON \rightarrow OFF$ |
| BAT CUR SEN | Engine speed: Idle Battery: Fully charged*² Selector lever: P or N Air conditioner switch: OFF No load | | Approx. 2,600 - 3,500 mV |
| ALT DUTY | Engine: Idle | | 0 - 80% |
| ATOM PRES SEN | This item is displayed but is not applicable to this model. | | |
| BRAKE BST PRES | This item is displayed but is not ap | · | |
| | Engine: After warming up | Idle | Approx. 0.25 - 1.40 V |
| VVEL POSITION SEN-B1 | Selector lever: P or N Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0.25 - 4.75 V |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | | Condition | Values/Status |
|-------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|
| | Engine: After warming up | Idle | Approx. 0.25 - 1.40 V |
| VVEL POSITION SEN-B2 | Selector lever: P or NAir conditioner switch: OFFNo 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 NAir conditioner switch: OFFNo 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 | Selector lever: P or NAir conditioner switch: OFFNo load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| VVEL LEARN | • Ignition switch: OFF \rightarrow ON | VVEL learning has not been performed yet. | YET |
| | (After warming up) | VVEL learning has already been per- formed successfully. | DONE |
| VVEL SEN LEARN- B1 | VVEL learning has already been | performed successfully | Approx. 0.30 - 0.80 V |
| VVEL SEN LEARN- B2 | VVEL learning has already been | performed successfully | Approx. 0.30 - 0.80 V |
| A/F ADJ-B1 | Engine: Running | | -0.330 - 0.330 |
| A/F ADJ-B2 | Engine: Running | | -0.330 - 0.330 |
| FAN DUTY | Engine: Running | | 0 - 100% |
| ALT DUTY SIG | Power generation voltage variable | e control: Operating | ON |
| | Power generation voltage variable | e 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 |
| THRTL STK CNT B1 | This item is displayed but is not a | applicable to this model. | |
| SYSTEM 1 DIAG- | DTC P219A self-diagnosis is incomplete. | | INCMP |
| NOSIS A B1 | DTC P219A self-diagnosis is comp | lete. | CMPLT |
| SYSTEM 1 DIAG- | DTC P219B self-diagnosis is incom | nplete. | INCMP |
| NOSIS A B2 | DTC P219B self-diagnosis is comp | lete. | CMPLT |
| SYSTEM 1 DIAG- | DTC P219A self-diagnosis is on sta | andby. | ABSENT |
| NOSIS B B1 | DTC P219A self-diagnosis is under | diagnosis. | PRSENT |
| SYSTEM 1 DIAG- | DTC P219B self-diagnosis is on sta | andby. | ABSENT |
| NOSIS B B2 | DTC P219B self-diagnosis is under | diagnosis. | PRSENT |
| | DTC P0139 self-diagnosis (delay | ved response) has not been performed yet. | INCMP |
| HO2 S2 DIAG1 (B1) | DTC P0139 self-diagnosis (delay successfully. | ed response) has already been performed | CMPLT |
| | DTC P0159 self-diagnosis (delay | ved response) has not been performed yet. | INCMP |
| HO2 S2 DIAG1 (B2) | DTC P0159 self-diagnosis (delay successfully. | ved response) has already been performed | CMPLT |
| | DTC P0139 self-diagnosis (slow | response) has not been performed yet. | INCMP |
| HO2 S2 DIAG2 (B1) | DTC P0139 self-diagnosis (slow cessfully. | response) has already been performed suc- | CMPLT |
| | DTC P0159 self-diagnosis (slow | response) has not been performed yet. | INCMP |
| HO2 S2 DIAG2 (B2) | DTC P0159 self-diagnosis (slow cessfully. | response) has already been performed suc- | CMPLT |

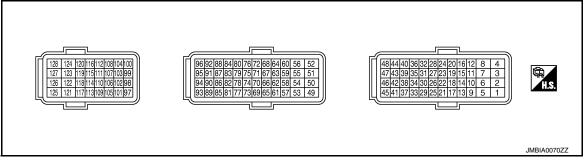
< ECU DIAGNOSIS INFORMATION >

| Monitor Item | Condition | Values/Status |
|------------------------|----------------------------------------------------------------------------------------------|---------------|
| 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 (B2) | DTC P014E and P014F self-diagnosis incomplete. | INCMP |
| | 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 (B2) | The vehicle condition is not within the diagnosis range of DTC P014E, P014F, P015C or P015D. | ABSNT |
| | The vehicle condition is within the diagnosis range of DTC P014E, P014F, P015C or P015D. | PRSNT |

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to <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]

| Terminal No. (Wire color) | | Description | | Ora III - | Value |
|------------------------------|------------|----------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 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 € 50/div JMBIA0030GB |
| 2 (G) | 128 (B) | Throttle control motor (Open) (bank 1) | Output | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: Fully depressed | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div 500µSec/div 500µSec/div JMBIA0031GB |
| | | | | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: Fully released | 0 - 14 V★ 500µSec/div |
| 3 (R) | 128 (B) | Throttle control motor power supply (bank 1) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 4 (BR) | 128 (B) | Throttle control motor (Close) (bank 1) | Output | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500µSec/div € 500µSec/div 5V/div |
| 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 |
| 8 (B) | _ | ECM ground | _ | _ | _ |

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< ECU DIAGNOSIS INFORMATION >

| Terminal No. (Wire color) | | Description | | Condition | Value |
|------------------------------|------------|-------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 11 (GR) | 128 (B) | Ignition signal No. 4 | Output | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.2 V★ 50mSec/div |
| 12 (L) | | Ignition signal No. 3 | | | ÷ |
| 15 (V) | | Ignition signal No. 5 | | | 2V/div JMBIA0035GB |
| 16 (G) | | Ignition signal No. 2 | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 0.1 - 0.4 V★ 50mSec/div |
| 19 (SB) | | Ignition signal No. 6 | | | |
| 20 (Y) | | Ignition signal No. 1 | | | 2V/div JMBIA0036GB |
| 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) |
| | 128 (B) | Intake valve timing con- trol solenoid valve (bank 1) | Output | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) |
| 18 (W) | | | | [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.) | |
| | | EVAP canister purge vol- | | [Engine is running]Idle speedAccelerator pedal: Not depressed even slightly, after engine starting | BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div | C D |
| 21 (GR) | 128 (B) | ume control solenoid valve | Output | [Engine is running] Engine speed: About 2,000 rpm (More than 100 seconds after starting engine) | 10V/div JMBIA0039GB BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div 50mSe | 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 | [Engine is running] • Warm-up condition • Idle speed | 0 V | Ν |
| 29 (G) | 128 (B) | Intake valve timing con- trol solenoid valve (bank 2) | Output | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition Engine speed: 2,000rpm | BATTERY VOLTAGE (11 - 14 V) 7 - 12 V★ | O |

< ECU DIAGNOSIS INFORMATION >

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| | nal No. e color) | Description | | Condition | Value |
|------------|---------------------|-----------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 30 | 40 | Throttle position sensor | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | More than 0.36 V |
| (Y) | (R) | 1 (bank 1) | mput | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | Less than 4.75 V |
| 31 | 48 | Throttle position sensor | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | More than 0.36 V |
| (R) | (B) | 1 (bank 2) | mput | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | Less than 4.75 V |
| 33 (SB) | 128 (B) | Heated oxygen sensor 2 heater (bank 2) | Output | [Engine is running] Engine speed: Below 3,600 rpm after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 10 V★ 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) |
| 34 | 40 | Throttle position sensor | l | [Ignition switch: ON]Engine stoppedSelector lever: DAccelerator pedal: Fully released | Less than 4.75 V |
| (B) | (R) | 2 (bank 1) | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | More than 0.36 V |
| 35 | 48 | Throttle position sensor | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | Less than 4.75 V |
| (W) | (B) | 2 (bank 2) | mput | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | More than 0.36 V |
| 36 (O) | _ | Sensor ground [Brake booster pressure sensor] | _ | | _ |

< ECU DIAGNOSIS INFORMATION >

| | nal No. e color) | Description | | Oradition | Value |
|------------|---------------------|---------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 37 | 128 | 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 |
| (W) | (B) | sor (POS) | Input | [Engine is running] • Engine speed: 2,000 rpm | 4.0 - 5.0 V★ 1mSec/div = |
| 38 | 96 | Manifold absolute pres- | Input | [Engine is running]Warm-up conditionIdle speed | 1.2 V |
| (0) | (P) | sure (MAP) sensor | mput | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.5 V |
| 39 | 36 | Brake booster pressure | Input | [Engine is running]Warm-up conditionIdle speedBrake pedal: Fully released | 1.2 V |
| (P) | (O) | sensor | mput | [Engine is running]Warm-up conditionIdle speedBrake pedal: Fully depressed | 3.0 V |
| 40 (R) | _ | Sensor ground [Throttle position sensor (bank 1)] | _ | _ | _ |
| 43 (G) | 48 (B) | Sensor power supply [Throttle position sensor (bank 2)] | _ | [Ignition switch: ON] | 5 V |
| 44 (L) | 40 (R) | Sensor power supply [Throttle position sensor (bank 1)] | | [Ignition switch: ON] | 5 V |
| 45 (LG) | 36 (O) | Sensor power supply [Brake booster pressure sensor] | _ | [Ignition switch: ON] | 5 V |
| 46 (R) | 128 (B) | Sensor power supply [Crankshaft position sensor (POS)] | _ | [Ignition switch: ON] | 5 V |
| 47 (Y) | _ | Sensor ground [Crankshaft position sensor (POS)] | | _ | _ |
| 48 (B) | _ | Sensor ground [Throttle position sensor (bank 2)] | | _ | _ |

< ECU DIAGNOSIS INFORMATION >

| | nal No. 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 Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500µSec/div € 500µSec/div 5V/div JMBIA0033GB |
| 50 | 128 | Throttle control motor | Output | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: Fully depressed | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div 500µSec/div 500µSec/div JMBIA0031GB |
| (V) | (B) | (Open) (bank 2) | Cupu | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: Fully released | 0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div 500µSec/div 500µSec/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 | 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 |
| (O) | (B) | sor (PHASE) (bank 1) | 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) | 128 (B) | 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 | 128 | Camshaft position sen- | lagut | [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 |
| (L) | (B) | sor (PHASE) (bank 2) | Input | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div € 2V/div JMBIA0046GB |
| 64 (SB) | 128 (B) | 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) | 128 (B) | Intake air temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with intake air temperature. |
| 68 (LG) | _ | Sensor ground [Mass air flow sensor (bank 1), Intake air tem- perature sensor] | _ | _ | _ |
| 69 (W) | 128 (B) | Knock sensor (bank 2) | Input | [Engine is running] • Idle speed | 2.5 V* ¹ |
| 71 (Y) | 128 (B) | Engine coolant 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 | | Condition | 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 conditionIdle speed | 0.7 - 1.2 V |
| (SB) | (LG) | (bank 1) | mpor | [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 | Input | [Engine is running]Warm-up conditionIdle 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: The pulse cycle changes depending on | 50mSec/div |
| 85 (BR) | 100 | Fuel injector No. 2 | | rpm at idle | 10V/div JMBIA0047GB |
| 86 (W) | 128 (B) | Fuel injector No. 5 | Output | | BATTERY VOLTAGE (11 - 14 V)★ |
| 89 (GR) | | Fuel injector No. 1 | | [Engine is running] • Warm-up condition | 50mSec/div |
| 90 (O) | | Fuel injector No. 4 | | Engine speed: 2,000 rpm | 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 | | Oradilian | Value | А |
|----------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------|-----|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 87 | 96 | Power steering pressure | Output | [Engine is running] • Steering wheel: Being turned | 0.5 - 4.5 V | EC |
| (Y) | (P) | sensor | Output | [Engine is running] • Steering wheel: Not being turned | 0.4 - 0.8 V | С |
| 91 (SB) | 95 (G) | Battery current sensor | Input | [Engine is running] Battery: Fully charged*² Idle speed | 2.6 - 3.5 V | D |
| 92 (G) | _ | Sensor ground [Camshaft position sen- sor (PHASE) (bank 2)] | _ | _ | _ | E |
| 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)] | _ | _ | _ | F |
| 95 (G) | _ | Sensor ground (Battery current sensor) | _ | _ | _ | G |
| 96 (P) | _ | Sensor ground [Camshaft position sen- sor (PHASE) (bank 1),Manifold absolute pressure (MAP) sensor, Power steering pressure sensor] | _ | | | H |
| 97 | 100 | Accelerator pedal posi- | Innut | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released | 0.45 - 1.00 V | J |
| (R) | (W) | tion sensor 1 | Input | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed | 4.2 - 4.8 V | K |
| 98 (D) ^{*3} | 104 (GR) ^{*3} | Accelerator pedal posi- | Innut | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released | 0.22 - 0.50 V | |
| (P) ^{*3} (Y) ^{*4} | (BR) ^{*4} | tion sensor 2 | Input | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed | 2.1 - 2.5 V | |
| 99 (L) ^{*3} (G) ^{*4} | 100 (W) | Sensor power supply (Accelerator pedal posi- tion sensor 1) | _ | [Ignition switch: ON] | 5 V | - M |
| 100 (W) | | Sensor ground (Accelerator pedal posi- tion sensor 1) | | | _ | - N |

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< ECU DIAGNOSIS INFORMATION >

| | nal No. color) | Description | | Condition | Value |
|-------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| | | | | [Ignition switch: ON] • ICC steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| | | | | [Ignition switch: ON] • CANCEL switch: Pressed | 1.5 V |
| 101 (SB) | 108 (Y) | ICC steering switch (models with ICC sys- tem) | Input | [Ignition switch: ON]RESUME/ACCELERATE switch: Pressed | 3.4 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 2.8 V |
| | | | | [Ignition switch: ON] • DISTANCE switch: Pressed | 2.2 V |
| | | | | [Ignition switch: ON] LDP/DCA switch: Pressed | 0.8 V |
| | | | | [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 (LG) | 112 (V) | EVAP control system pressure sensor | Input | [Ignition switch: ON] | 1.8 - 4.8 V |
| 103 (G) ^{*3} (L) ^{*4} | 104 (GR) ^{*3} (BR) ^{*4} | Sensor power supply (Accelerator pedal posi- tion sensor 2) | _ | [Ignition switch: ON] | 5 V |
| 104 (GR) ^{*3} (BR) ^{*4} | _ | Sensor ground (Accelerator pedal posi- tion sensor 2) | _ | _ | _ |
| 105 (L) | 112 (V) | Refrigerant pressure sensor | Input | [Engine is running] Warm-up condition Both A/C switch and blower fan motor switch: ON (Compressor operates) | 1.0 - 4.0 V |
| 106 (W) | 128 (B) | Fuel tank temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with fuel tank temperature. |
| 107 (BG) | 112 (V) | Sensor power supply (EVAP control system pressure sensor, Refrig- erant pressure sensor) | _ | [Ignition switch: ON] | 5 V |
| 108 (Y) | _ | Sensor ground (ASCD/ICC steering switch) | _ | _ | _ |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| Termin (Wire | nal No. color) | Description | | Condition | Value | А |
|--------------------------|-------------------|---------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 109 (G) | 128 (B) | PNP signal | Input | [Ignition switch: ON] • Selector lever: P or N | BATTERY VOLTAGE (11 - 14 V) | EC |
| (0) | (0) | | | [Ignition switch: ON] Selector lever: Except above | 0 V | С |
| 110 | 120 | Engine speed output sig- | | [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 | D |
| (R) | 128 (B) | nal | Output | [Engine is running] • Engine speed is 2,000 rpm | 1 V★ 10mSec/div 2V/div JMBIA0077GB | F G H |
| 112 (V) | _ | Sensor ground (EVAP control system pressure sensor, Refrig- erant pressure sensor) | _ | _ | _ | I |
| 113 (P) | _ | CAN communication line | Input/ Output | _ | _ | |
| 114 (L) | _ | CAN communication line | Input/ Output | _ | _ | J |
| 117 (V) | 128 (B) | Data link connector | Input/ Output | _ | _ | К |
| 121 (LG) | 128 (B) | EVAP canister vent con- trol valve | Output | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 122 | 128 | Stop lamp switch | Input | [Ignition switch: OFF] Brake pedal: Fully released | 0 V | L |
| (P) | (B) | | • | [Ignition switch: OFF] Brake pedal: Slightly depressed | BATTERY VOLTAGE (11 - 14 V) | M |
| 123 (B) 124 (B) | _ | ECM ground | _ | _ | _ | Ν |
| 125 (R) | 128 (B) | Power supply for ECM | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | 0 |
| 126 (BR) | 128 (B) | ICC brake switch (mod- els with ICC system) ASCD brake switch | Input | [Ignition switch: ON] Brake pedal: Slightly depressed | | 0 |
| (DK) | (□) | (models with ASCD sys- tem) | | [Ignition switch: ON] Brake pedal: Fully released | BATTERY VOLTAGE (11 - 14 V) | Ρ |
| 127 (B) 128 (B) | _ | ECM ground | _ | _ | _ | |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.) *1: This may vary depending on internal resistance of the tester.

Revision: February 2015

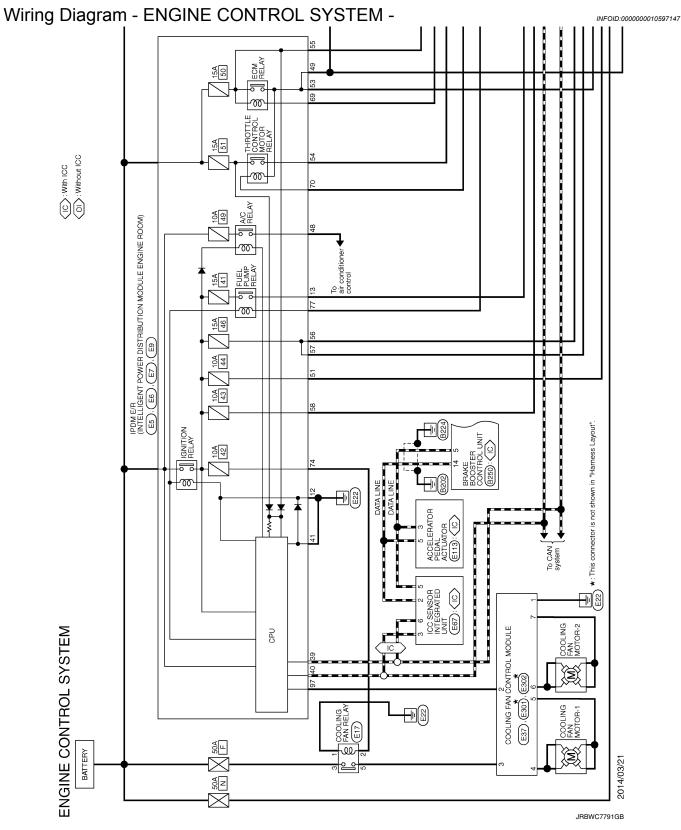
EC-549

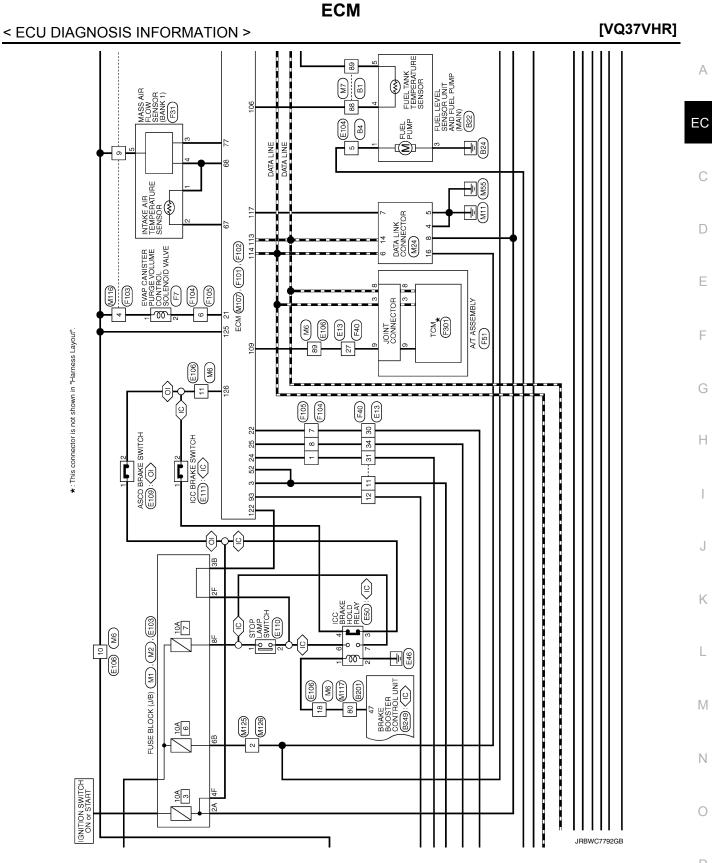
*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to <u>PG-3, "How to</u> <u>Handle Battery"</u>.

ECM

*3: Without ICC

*4: With ICC





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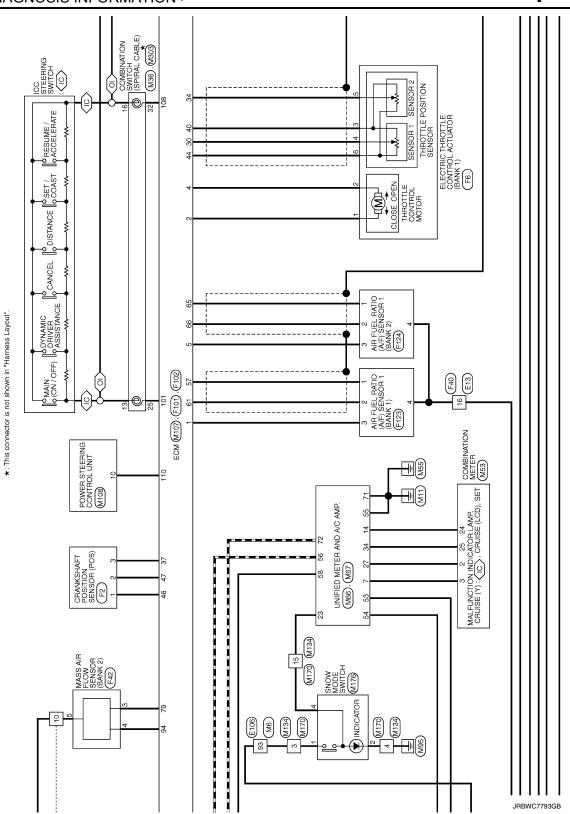
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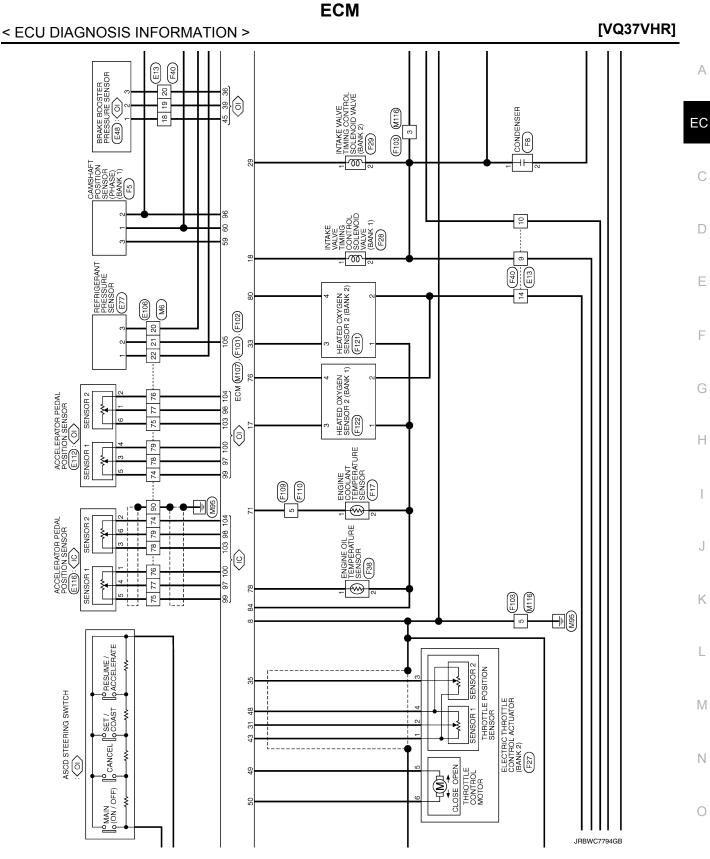
Μ

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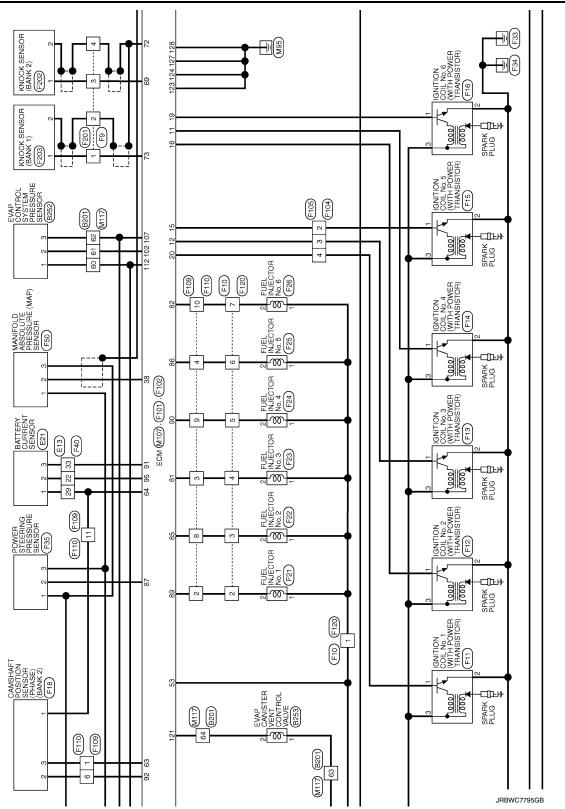
0

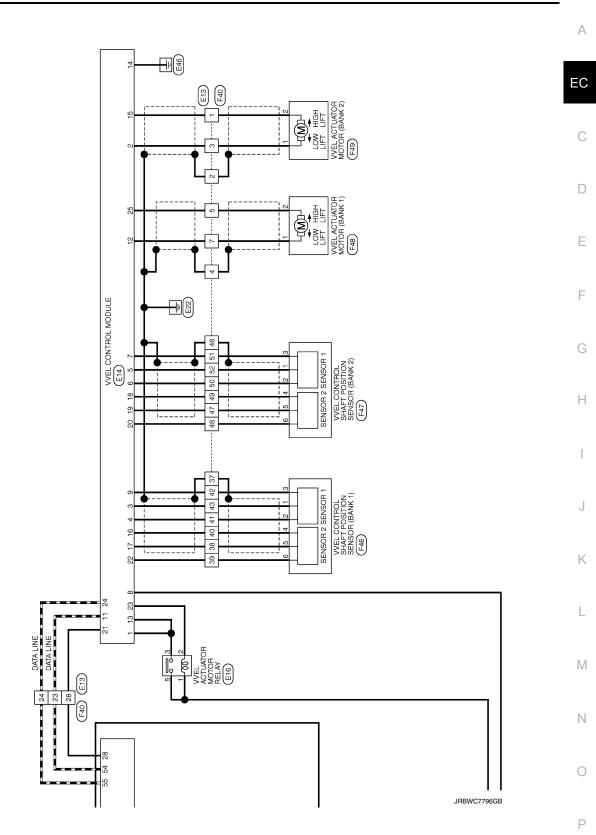


< ECU DIAGNOSIS INFORMATION >



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< ECU DIAGNOSIS INFORMATION >

| ENGI | NE CC | ENGINE CONTROL SYSTEM | | | | | | | | | | | |
|----------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------|------|-------------|------------------|---------------------------------------------|-----------------------------|----------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Connector No. | Π | B1 | 47 | Н | ' | S S | Connector No. | B4 | | Con | Connector No. | B201 | П |
| Connector Name | | WIRE TO WIRE | 48 | ß | | Cor | Connector Name | WIRE TO WIRE | | Con | Connector Name | WIRE TO WIRE | |
| Connector Type | Ť | TH80FW-CS16-TM4 | 20 | + | 1 | Cor | Connector Type | NS12FW-CS | | Con | Connector Type | TH80FW-CS16-TM4 | П |
| 4 | | | 99 | ٩ | | | | | | 4 | | | |
| F | | | 61 | | | F T | ß | | | F | | | |
| Si | | | 8 | $^{+}$ | | T | ŝi | 5 4 | □ 3 2 1 | | ŝ | (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) | |
| | 3 | N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N N | 64 | ┝ | , | | | | 0 8 7 6 | | 1 | (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) <td></td> | |
| | | | 65 | SHIELD | - 01 | Π | | AI 11 71 | 5 | | | | |
| | | | 99 | M | 1 | | | | | | | | |
| | | | 67 | > | - | | | | | | | | I |
| Terminal | Color Of | Signal Name [Specification] | 68 | + | | َة <u>'</u> | erminal Color Of | | Signal Name [Specification] | Ter | Terminal Color Of | Of Signal Name [Specification] | |
| | | | 8 | 7 | - | 1 Т | - MIG | | | - | $^+$ | | Т |
| ~ u | <u>r</u> c | | 5 5 | > 0 | | Т Т | ≥ a - ° | | | 1 | • | 1 1 | Т |
| | , a | , | 2 | ┝ | , | L | 4 e | | | | : eg | , | Т |
| - | > | | 75 | A | | L | 4 SHIFLD | 6 | | | BG. | | Г |
| | - | | 76 | ┝ | - | L | ء د | | | | 0 | | Г |
| = | > | 1 | 12 | ۳ | 1 | L | 7 4 | | | <u> </u> | 10 W | 1 | Γ |
| 12 | B | , | 78 | ۵. | 1 | | 8 8 | | | _ | 15 SB | , | Г |
| 13 | ΓC | 1 | 79 | ЯQ | - | | 9 BR | | | - | 16 V | 1 | Г |
| 14 | GR | 1 | 83 | BG | - | | 10 BG | | | - | 17 BR | - | |
| 15 | ΓC | | 85 | ~ | - | | 11 FG | | | | 26 BR | - | |
| 16 | В | | 86 | LG | - | | 12 GR | | | | 27 L | - | |
| 17 | W | - | 87 | 7 | - | | | | | | 28 Y | - | |
| 18 | SB | - | 88 | æ | - | | | | | ~ | 29 Y | - | |
| 19 | LG | - | 89 | 8 | - | Cor | Connector No. | B22 | | | 30 GR | - | |
| 20 | BR | - | 6 | BG | - | | Connector Name | FIEL FEVEL SENSOR UNIT AND FIEL BUMP (MAIN) | ND FIFL DIMP (MAIN) | | 31 R | - | |
| 21 | SHIELD | 1 | 91 | | - | 5 | | | THE FORMER DRIVEN | | 32 BR | | |
| 22 | 7 | 1 | 92 | BR | - | Ğ | Connector Type | E05FGY-RS | | | 33 G | | |
| 24 | ٩ | | 93 | + | T | ц Т | | | | | + | | Ţ |
| 27 | m | - | 94 | + | ' | | | | | Ű | + | | Т |
| 28 | Ľ | 1 | 95 | G | т | - | ł | | Σ | Ű | ┥ | | Т |
| 29 | M | 1 | 96 | + | ' | | Ņ.H | Ę | 4 0 0 4 E | " | + | 1 | Т |
| 30 | SHIELD | 1 | 86 | + | 1 | Т | | | | Ű | 1 | 1 | Т |
| 31 | SHIELD | L | 66 | GR | - | ٦ | | J | | | σ | - | Т |
| 32 | N | | | | | | | | | Ű | | 1 | Т |
| 8 | BB . | 1 | | | | ļ | | | | 1 | ╉ | 1 | Т |
| 55 | _ | - | | | | ē. | e B | | Signal Name [Specification] | 1 | - | - | Т |
| 35 | • | 1 | | | | -1 | No. Wire | | | <u> </u> | 63 63 | 1 | Т |
| 36 | | Т | | | | | ۵ | | 1 | <u> </u> | + | П | Т |
| 37 | ٩ | 1 | | | | | 2 W | | | Ű | - | | Т |
| 38 | ۵. | | | | | | в г | | | Ű | 66 P | | Т |
| 39 | > | | | | | | 4 R | | , | Ű | 1 | 1 | Ţ |
| 40 | SB | 1 | | | | | 9 2 | | | Ű | 68 SHIELD | - | Т |
| 44 | > | 1 | | | | | | | | Ű | > 69 | 1 | Т |
| 45 | g | - | | | | | | | | | ╉ | | Т |
| 46 | P | 1 | | | | | | | | | 71 SB | - | ٦ |

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| E8 Now List | С |
| Connector No. Eff Connector Name Post Name Connector Name Post Name Post Name Post Name | D |
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| B133 E134 EVEN EDATE EDATE EVEN EDATE EDATE EXEMPLE EDATE EXEMPLE EDATE Stand EDATE EXEMPLE EDATE <td< td=""><td>F</td></td<> | F |
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| BE20 BEAVE BOOSTER CONTROL UNT TR24FW TR24FW TR24FW TR24FW TR24FW TR24FW 100 12 1416 17 100 12 1416 1 | J |
| Commetter No. Commetter Name Commetter Name | K |
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| ENGINE Constraint P P 7 7 8 1 1 7 8 1 1 1 8 1 1 1 1 8 1 1 1 1 8 1 1 1 1 9 1 1 1 1 9 1 1 1 1 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | Ν |
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[VQ37VHR]

| ENGINE CONTROL SYSTEM | 13 | - 0 | 1 1 | Connector No. Connector Name | E14 VVEL CONTROL MODULE | Connector No. E16 Connector Name VVEL ACTUATOR MOTOR RELAY | IOTOR RELAY |
|----------------------------------------------------------------|----------|------------|-----|---------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
| | 16 | ъ | | Connector Type | RH18FB-AJZ8-RH | Connector Type 24347_9F900 | |
| Π | 19 | ≻ ß | 1 1 | Ē | | E | • |
| IPOM E/R UNTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | 20 | - 5 | | SH | 년 1 2 <u>31415161718191 11</u> 12 13 | E S H | |
| | 22 | N | - | | | 7 | 4 |
| | 23 | | 1 | | | | 5 |
| 17 | 47 36 | <u>،</u> و | | _ | | |] |
| 100 | 27 | 3 8 | | Terminal Color Of | | Terminal Color Of | |
| 1.6 7.6 | 28 | > | - | | Signal Name [Specification] | Wire | Signal Name [Specification] |
| | 29 | ٩ | - | > | VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 2) | 1 | - |
| | 30 | œ | - | 2 L/B | VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 2) | 2 GR | |
| | 31 | В | 1 | 0 | VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1) | 3 < | г |
| Signal Name [Specification] | 32 | > | | 4 W | SENSOR GROUND [W/EL CONTROL SHAFT POSITION SENSOR : (BAMK 1)] | 5 R | |
| | 8 | J | 1 | 2 · | VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2) | | |
| | 5 | 5 B | 1 | 20 20 | SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)] | | |
| | 31 | SHIELD | - | ╉ | SENSOR POWER SUFFLY [VIEL CONTROL SHAFT POSITION SENSOR 1 (SLAKK 27) | Connector No. E17 | |
| - | 89 8 | | ' | 8 0 8 0 | POWER SUPPLY FOR VVEL CONTROL MODULE | Connector Name COOLING FAN RELAY | 4Y |
| | R 9 | 2 | | 2 < | | Т | |
| | 4 | ×≥ | | י ב ב | ENGINE COMMUNICATION LINE VALE ACTIVATOR MOTOR (HIGH LIFT) (BANK 1) | Connector Lype 24347_9F900 | |
| | 40 | <u> </u> | , | | VVEL ACTUATOR MOTOR RELAY POWER SUPPLY (BANK 1) | 1 | [[|
| | 43 | J | | 14 B/W | VVEL CONTROL MODULE GROUND | 主 | |
| | 45 | ß | 1 | 15 | VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 2) | HS. | Ē |
| | 46 | SHIELD | - | 16 R | VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1) | | 4 |
| | 47 | w | - | 17 L | SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 2 (BAAK 1)] | | 2 |
| 9 10 11 12 | 48 | BR | - | 18 G | VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2) | |] |
| 13 14 15 16 | 49 | J | - | 19 W | SENSOR GROUND [W/EL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)] | | |
| 10/20/20/20/20/20/20 | 50 | 8 | - | 20 BR | SENSOR POWER SUPPLY [VAL. CONTROL SHAFT POSITION SENSOR 2 (BANK 21) | al Color Of | Cinnel Mame [Cassification] |
| 28 29 30 31 22 33 34 | 51 | SB | - | 21 V | VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL | No. Wire Orgunation | |
| 23 1 25 20 AUT AUT DE SEC 122 | 52 | œ | | 22 P | SENSOR POWER SUPPLY [W/BL CONTROL SHAFT POSITION SENSOR 2 (SAMK 1)] | 8 | |
| 06 47 48 49 50 51 52 | | | | 23 GR | VVEL ACTUATOR MOTOR RELAY | 2 P | |
| | | | | | ENGINE COMMUNICATION LINE | 3 W | |
| Simal Name [Snecification] | | | | 25 BR | VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 1) | 5 R | |
| n www.iinado | | | | | | | |
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| | E |
| E67 Icc Sensor INTEGRATED UNT Records - Price Signal Nume (Specification) Signal Nume (Specification) Iconition E17 Iconition E17 Iconition E17 Iconition E17 Iconition Broaren Iconition Signal Name (Specification) Iconition Signal Name (Specification) Iconition | F |
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| Connector Name INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK I) | Connector Name MASS AIR FLOW SENSOR (BANK 1) | Connector Name | me ENGINE OIL TEMPERATURE SENSOR | 7 66 | - د ا | |
| Connector Type E02FG-RS-LGY | Connector Type RH06FB | Connector Type | pe E02FGY-RS | 2 2 | . 9 | |
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| Connector Name INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) | | Connector Name | me WIRE TO WIRE | 45 | 0 | - |
| Connector Type E02FG-RS-LGY | Connector No. F35 | Connector Type | pe SAA36FB-RS8-SHZ8 | 46 | SHIELD | |
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| Connector No. | | M67 LINIEED METER AND A/C AMP | Connec | Connector No. | M107 FCM | Connector No. | | M108 DOWED STEEPING CONTROL LINIT | 36 37 | ∝ ≻ | | |
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| Connector Type | | TH32FW-NH | Conner | Connector Type | RH24FGY-RZ8-R-LH-Z | Connector Type | | TH12FW-NH | 43 | <u>-</u> - | 1 1 | |
| £ | | | Æ | | | Æ | | | 45 | BR | | |
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| No. | Wire | Signal Name [Specification] | Ŷ | _ | Signal Name [Specification] | | Wire | Signal Name [Specification] | 200 | Colliector Type | | _ |
| 41 | > | ACC POWER SUPPLY | 97 | œ | ACCELERATOR PEDAL POSITION SENSOR 1 | | ŋ | EPS SOL+ | Æ | | | |
| 42 | Y | FUEL LEVEL SENSOR SIGNAL | 98 | ٩ | ACCELERATOR PEDAL POSITION SENSOR 2 [Without ICC] | e | σ | IGN | Ť | | 1 8 11 12 12 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13 | |
| 43 | æ | INTAKE SENSOR SIGNAL | 98 | > | ACCELERATOR PEDAL POSITION SENSOR 2 [With ICC] | S | æ | EPS SOL- | | Ń | 40 00 00 00 00 00 00 00 00 00 00 00 00 0 | |
| 44 | ΓC | IN-VEHICLE SENSOR SIGNAL | 66 | σ | SENSOR POWER SUPPLY [With ICC] | 9 | в | GROUND | | | (x) 10 10 10 10 10 10 10 10 10 10 10 10 10 | |
| 45 | ٩ | AMBIENT SENSOR SIGNAL | 66 | | SENSOR POWER SUPPLY [Without ICC] | | | VEHICLE SPEED(2P) | | | | |
| 46 | BG | SUNLOAD SENSOR SIGNAL | 100 | W | SENSOR GROUND | 10 | я | ENG TACHO | | | | |
| 47 | σ | EXHAUST GAS / OUTSIDE ODOR DETECTING SENSOR SIGNAL | 101 | SB | ASCD/ICC STEERING SWITCH | | | | | | | |
| 53 | σ | IGNITION POWER SUPPLY | 102 | LG | EVAP CONTROL SYSTEM PRESS SENSOR | | | | Terminal | o | f Simal Nama [Snarification] | |
| 54 | γ | BATTERY POWER SUPPLY | 103 | 9 | SENSOR POWER SUPPLY [Without ICC] | Connector No. | | M116 | No. | Wire | OBTIGN INVELIE LODGOTIORIOUI | |
| 55 | в | GROUND | 103 | | SENSOR POWER SUPPLY [With ICC] | Connotor Nome | | | - | L | - | |
| 56 | | CAN-H | 104 | BR | SENSOR GROUND [With ICC] | | | | 2 | J | - | |
| 57 | M | BRAKE FLUID LEVEL SWITCH SIGNAL | 104 | GR | SENSOR GROUND [Without ICC] | Connector Type | | TK36MW-NS10 | e | GR | 1 | |
| 58 | BR | FUEL LEVEL SENSOR GROUND | 105 | - | REFRIGERANT PRESS SENSOR | ٥ | | | 4 | SB | - | |
| 59 | ЧG | INTAKE SENSOR GROUND | 106 | × | FUEL TANK TEMPERATURE SENSOR | f | | [| 2 | × | 1 | |
| 99 | | | 107 | BG | SENSOR POWER SUPPLY | | | | 10 | - | | _ |
| 61 | æ | | 108 | > | SENSOR GROUND | | | 1 2 3 4 5 11 (113) 4 (15 11) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (13 14) (| 15 | SB | | _ |
| 62 | SB | SUNLOAD SENSOR GROUND | 109 | G | PNP SIGNAL | | | 6 7 8 9 10 212222222222222222 | 16 | + | | _ |
| 63 | æ | | 110 | æ | ENGINE SPEED OUTPUT SIGNAL | | 1 | | 17 | + | | _ |
| 65 | BG | ECV SIGNAL | 112 | > | SENSOR GROUND | | | | 26 | + | | _ |
| 69 | _ | | 113 | ۵ | CAN COMMUNICATION LINE | | | | 27 | P | - | |
| 70 | н | EACH DOOR MOTOR POWER SUPPLY | 114 | | CAN COMMUNICATION LINE | le. | Color Of | Simal Nama [Snarifination] | 28 | × | - | |
| 71 | 8 | GROUND | 117 | > | DATA LINK CONNECTOR | No. | Wire | | 29 | ۲ | - | |
| 72 | ٩ | CAN-L | 121 | ΓC | EVAP CAP | 2 | ٩ | - | 30 | > | - | |
| ļ | | | 122 | ٩ | STOP LAMP SWITCH | | - | | 31 | я | | _ |
| | | | 123 | в | ECM GROUND | 4 | В | - | 32 | BR | - | _ |
| | | | 124 | ۵ | ECM GROUND | 9 | 8 | 1 | 33 | σ | - | _ |
| | | | 125 | œ | POWER SUPPLY FOR ECM | 6 | æ | - | 51 | ч | - | |
| | | | 126 | BR | ASCD/ICC BRAKE SWITCH | 10 | œ | | 55 | | - | _ |
| | | | 127 | | ECM GROUND | 19 | BG | - | 56 | | - | _ |
| | | | 128 | œ | ECM GROUND | 20 | > | | 57 | | T | _ |
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NON DTC RELATED ITEM

Fail safe

| Engine operating condition in fail-safe mode | Detected items | Remarks | Reference page |
|--------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Engine speed will not rise more than 2,500 rpm due to the fuel cut | Malfunction indicator lamp circuit | When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction. | <u>EC-521</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 minimum 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 timing control solenoid valve and the valve control does not function. | | | | | | | |
| P0102 P0103 P010C P010D | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | | | | |
| P0117 P0118 | Engine coolant tempera- ture sensor circuit | Engine coolant temperature will be determined by ECM based on the following CONSULT displays the engine coolant temperature decided by ECM. | | | | | | | |
| | | 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 en- gine starting | 80°C (176°F) | | | | | | |
| | | Except as shown above 40 - 80°C (104 - 176°F) (Depends on the time) | | | | | | | |
| | | When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running. | | | | | | | |
| P0122 P0123 P0222 P0223 P0227 P0228 P1239 P2132 P2133 P2135 | Throttle position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor. | | | | | | | |
| 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 timing control solenoid valve and the valve control does not function. Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | | | | |
| 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 VVEL value is become at a minimum angle. Engine speed will not rise more than 2,500 rpm due to the fuel cut. | | | | | | | |
| P0643 | Sensor power supply | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | | |

Revision: February 2015

< ECU DIAGNOSIS INFORMATION >

| DTC No. | Detected items | Engine opera | ating condition in fail-safe mode | | | | | |
|-------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--|--|--|--|
| P1087 P1088 | VVEL control function | VVEL of normal bank is controlled Engine speed will not rise more that | | | | | | |
| P1089 P1092 | VVEL control shaft position sensor | VVEL value is maintained at a fixed Engine speed will not rise more that | | E | | | | |
| P1608 | VVEL control shaft position sensor | | VEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Ingine 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 turne Engine speed will not rise more that | d off, and VVEL value is become at a minimum angle. an 3,500 rpm due to the fuel cut. | | | | | |
| P1091 | VVEL actuator motor relay | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | | | | | |
| P1233 P2101 | Electric throttle control function | | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | |
| P1236 P2118 | Throttle control motor | | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | |
| P1238 P2119 | Electric throttle control ac- tuator | (When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm. | | | | | | |
| | | (When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less. | | | | | | |
| | | vehicle stops, the engine stalls. | lve is stuck open:) slows down gradually because of fuel cut. After the sition, and engine speed will not exceed 1,000 rpm or | | | | | |
| P1290 P2100 P2103 | Throttle control motor relay | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | |
| P1606 | VVEL control module | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | | | | | |
| P1805 | Brake switch | ECM controls the electric throttle co small range. Therefore, acceleration will be poo | ontrol actuator by regulating the throttle opening to a r. | | | | | |
| | | Vehicle condition | Driving condition | | | | | |
| | | When engine is idling | Normal | | | | | |
| | | When accelerating | Poor acceleration | | | | | |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor. | | | | | | |

DTC Inspection Priority Chart

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 | U0100 U0101 U1001 U1003 CAN communication line |
| | U1024 VVEL CAN communication line |
| | P0102 P0103 P010C P010D Mass air flow sensor |
| | P0111 P0112 P0113 P0127 Intake air temperature sensor |
| | P0117 P0118 P0125 Engine coolant temperature sensor |
| | P0122 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throttle position sensor |
| | P0128 Thermostat function |
| | P0181 P0182 P0183 Fuel tank temperature sensor |
| | P0196 P0197 P0198 Engine oil temperature sensor |
| | P0327 P0328 P0332 P0333 Knock sensor |
| | P0335 Crankshaft position sensor (POS) |
| | P0340 P0345 Camshaft position sensor (PHASE) |
| | P0460 P0461 P0462 P0463 Fuel level sensor |
| | P0500 Vehicle speed sensor |
| | • P0605 P0607 ECM |
| | P0643 Sensor power supply |
| | • P0700 TCM |
| | P0705 Transmission range switch |
| | P0850 Park/neutral position (PNP) switch |
| | P1089 P1092 P1608 VVEL control shaft position sensor |
| | P1606 P1607 VVEL control module |
| | P1550 P1551 P1552 P1553 P1554 Battery current sensor |
| | • P1610 - P1615 NATS |
| | P1806 Brake booster pressure sensor |
| | P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor |

< 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 | A |
| | 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 | EC |
| | P0441 EVAP control system purge flow monitoring P0443 P0444 P0445 EVAP canister purge volume control solenoid valve P0447 P0448 EVAP canister vent control valve P0451 P0452 P0453 EVAP control system pressure sensor | С |
| | P0550 Power steering pressure sensor P0603 ECM power supply P0710 P0717 P0720 P729 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1730 P1734 P2713 P2712 P2731 P2807 A/T related sensors, solenoid valves and switches | D |
| | P1087 P1088 VVEL system P1090 P1093 VVEL actuator motor P1091 VVEL actuator motor relay P1217 Engine over temperature (OVERHEAT) | E |
| | P1233 P2101 Electric throttle control function P1236 P2118 Throttle control motor P1290 P2100 P2103 Throttle control motor relay P1805 Brake switch | F |
| 3 | P0011 P0021 Intake valve timing control P0101 P010B Mass air flow sensor P0171 P0172 P0174 P0175 Fuel injection system function P0300 - P0306 Misfire | G |
| | P0420 P0430 Three way catalyst function P0456 EVAP control system (VERY SMALL LEAK) P0506 P0507 Idle speed control system P050A P050B P050E Cold start control | 1 |
| | P0524 Engine oil pressure P100A P100B VVEL system P1148 P1168 Closed loop control P1211 TCS control unit | J |
| | 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 | K |
| | P219A P219B Air fuel ratio | L |

DTC Index

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\times :Applicable —: Not applicable \mathbb{M}

| DTC [*] | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group ^{*4} | Reference page | |
|-------------------|--------------------|------------------------------------------------------------|-------------|--------|------------------------|--------------------------------------|-------------------|---|
| GST ^{*2} | ECM ^{*3} | | couc | | | group | page | Ν |
| U0100 | 0100 | COMMUNICATION ERROR (LOST) | _ | 1 | × | _ | <u>TM-69</u> | 0 |
| U0101 | 0101 ^{*5} | CAN COMM CIRCUIT | _ | 1 | × | В | <u>EC-169</u> | 0 |
| U1001 | 1001 ^{*5} | CAN COMM CIRCUIT | _ | 1 or 2 | _ | | <u>EC-170</u> | |
| U1003 | 1003 | CAN COMM CIRCUIT | | 2 | _ | _ | <u>EC-171</u> | Ρ |
| U1024 | 1024 | VVEL CAN COMM CIRCUIT | _ | 1 | × | В | <u>EC-173</u> | |
| P0000 | 0000 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | _ | _ | Flashing ^{*8} | _ | _ | |
| P0011 | 0011 | INT/V TIM CONT-B1 | × | 2 | × | В | <u>EC-175</u> | |
| P0021 | 0021 | INT/V TIM CONT-B2 | × | 2 | × | В | <u>EC-175</u> | _ |

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[VQ37VHR]

| DTC ^{*1} | | ltomo | ODT | | | Permanent DTC | Deference |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-----------------------|------------------------------------------------|----------------|
| CONSULT | ECM ^{*3} | Items (CONSULT screen terms) | SRT code | Trip | MIL | group ^{*4} | Reference page |
| GST ^{*2} | | | | - | | | 50.170 |
| P0031 | 0031 | A/F SEN1 HTR (B1) | | 2 | × | В | <u>EC-179</u> |
| P0032 | 0032 | A/F SEN1 HTR (B1) | | 2 | × | В | <u>EC-179</u> |
| P0037 | 0037 | HO2S2 HTR (B1) | — | 2 | × | В | <u>EC-182</u> |
| P0038 | 0038 | HO2S2 HTR (B1) | — | 2 | × | В | <u>EC-182</u> |
| P0051 | 0051 | A/F SEN1 HTR (B2) | — | 2 | × | В | <u>EC-179</u> |
| P0052 | 0052 | A/F SEN1 HTR (B2) | | 2 | × | В | <u>EC-179</u> |
| P0057 | 0057 | HO2S2 HTR (B2) | | 2 | × | В | <u>EC-182</u> |
| P0058 | 0058 | HO2S2 HTR (B2) | | 2 | × | В | <u>EC-182</u> |
| P0075 | 0075 | INT/V TIM V/CIR-B1 | | 2 | × | В | <u>EC-185</u> |
| P0081 | 0081 | INT/V TIM V/CIR-B2 | — | 2 | × | В | <u>EC-185</u> |
| P0101 | 0101 | MAF SEN/CIRCUIT-B1 | — | 2 | × | В | <u>EC-188</u> |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | | 1 | × | В | <u>EC-194</u> |
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | — | 1 | × | В | <u>EC-194</u> |
| P010B | 010B | MAF SEN/CIRCUIT-B2 | — | 2 | × | В | <u>EC-188</u> |
| P010C | 010C | MAF SEN/CIRCUIT-B2 | — | 1 | × | В | <u>EC-194</u> |
| P010D | 010D | MAF SEN/CIRCUIT-B2 | — | 1 | × | В | <u>EC-194</u> |
| P0111 | 0111 | IAT SENSOR1 B1 | — | 2 | × | A | <u>EC-200</u> |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | | 2 | × | В | <u>EC-203</u> |
| P0113 | 0113 | IAT SEN/CIRCUIT-B1 | — | 2 | х | В | <u>EC-203</u> |
| P0116 | 0116 | ECT SEN/CIRC | _ | 2 | × | A | <u>EC-206</u> |
| P0117 | 0117 | ECT SEN/CIRC | — | 1 | × | В | EC-209 |
| P0118 | 0118 | ECT SEN/CIRC | _ | 1 | × | В | EC-209 |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | | 1 | × | В | EC-212 |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | _ | 1 | × | В | EC-212 |
| P0125 | 0125 | ECT SENSOR | _ | 2 | × | В | <u>EC-216</u> |
| P0127 | 0127 | IAT SENSOR-B1 | _ | 2 | × | В | <u>EC-219</u> |
| P0128 | 0128 | THERMSTAT FNCTN | _ | 2 | × | A | <u>EC-221</u> |
| P0130 | 0130 | A/F SENSOR1 (B1) | | 2 | × | A | <u>EC-224</u> |
| P0131 | 0131 | A/F SENSOR1 (B1) | _ | 2 | × | В | EC-228 |
| P0132 | 0132 | A/F SENSOR1 (B1) | _ | 2 | × | В | <u>EC-231</u> |
| P0137 | 0137 | HO2S2 (B1) | × | 2 | × | A | EC-234 |
| P0138 | 0138 | HO2S2 (B1) | × | 2 | × | A | EC-240 |
| P0139 | 0139 | HO2S2 (B1) | × | 2 | × | A | EC-249 |
| P014C | 014C | A/F SENSOR1 (B1) | × | 2 | × | A | EC-256 |
| P014D | 014D | A/F SENSOR1 (B1) | × | 2 | × | A | <u>EC-256</u> |
| P014E | 014E | A/F SENSOR1 (B2) | × | 2 | × | A | EC-256 |
| P014F | 014F | A/F SENSOR1 (B2) | × | 2 | × | A | EC-256 |
| P0150 | 0150 | A/F SENSOR1 (B2) | | 2 | × | А | EC-224 |
| P0151 | | | | 2 | × | В | EC-228 |
| | | | | | | | EC-231 |
| P0157 | | | | | | A | <u>EC-234</u> |
| | | | | | | | <u>EC-240</u> |
| P0138 P0139 P014C P014D P014E P014F P0150 P0151 P0152 | 0138 0139 014C 014D 014E 014F | HO2S2 (B1) HO2S2 (B1) A/F SENSOR1 (B1) A/F SENSOR1 (B1) A/F SENSOR1 (B2) A/F SENSOR1 (B2) | × × × × × × × × · | 2 2 2 2 2 2 2 2 2 2 2 | × × × × × × × × × × × | A A A A A A A B B B | |

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< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| DTC* | 1 | lteree | ODT | | | Permanent DTC | Deference | Δ |
|------------------------------|-------------------|---------------------------------|-------------|--------|-----|---------------------|-------------------|-----|
| CONSULT GST ^{*2} | ECM ^{*3} | Items (CONSULT screen terms) | SRT code | Trip | MIL | group ^{*4} | Reference page | A |
| P0159 | 0159 | HO2S2 (B2) | × | 2 | × | А | <u>EC-249</u> | EC |
| P015A | 015A | A/F SENSOR1 (B1) | × | 2 | × | А | <u>EC-256</u> | |
| P015B | 015B | A/F SENSOR1 (B1) | × | 2 | × | A | <u>EC-256</u> | |
| P015C | 015C | A/F SENSOR1 (B2) | × | 2 | × | А | <u>EC-256</u> | С |
| P015D | 015D | A/F SENSOR1 (B2) | × | 2 | × | А | <u>EC-256</u> | |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | _ | 2 | × | В | <u>EC-262</u> | D |
| P0172 | 0172 | FUEL SYS-RICH-B1 | _ | 2 | × | В | <u>EC-266</u> | |
| P0174 | 0174 | FUEL SYS-LEAN-B2 | | 2 | × | В | <u>EC-262</u> | |
| P0175 | 0175 | FUEL SYS-RICH-B2 | _ | 2 | × | В | <u>EC-266</u> | E |
| P0181 | 0181 | FTT SENSOR | _ | 2 | × | A and B | <u>EC-270</u> | |
| P0182 | 0182 | FTT SEN/CIRCUIT | _ | 2 | × | В | <u>EC-274</u> | F |
| P0183 | 0183 | FTT SEN/CIRCUIT | _ | 2 | × | В | <u>EC-274</u> | |
| P0196 | 0196 | EOT SENSOR | — | 2 | × | A and B | <u>EC-277</u> | |
| P0197 | 0197 | EOT SEN/CIRC | — | 2 | × | В | EC-281 | G |
| P0198 | 0198 | EOT SEN/CIRC | — | 2 | × | В | EC-281 | |
| P0222 | 0222 | TP SEN 1/CIRC-B1 | _ | 1 | × | В | <u>EC-284</u> | |
| P0223 | 0223 | TP SEN 1/CIRC-B1 | _ | 1 | × | В | <u>EC-284</u> | Н |
| P0227 | 0227 | TP SEN 2/CIRC-B2 | _ | 1 | × | В | <u>EC-212</u> | |
| P0228 | 0228 | TP SEN 2/CIRC-B2 | _ | 1 | × | В | <u>EC-212</u> | |
| P0300 | 0300 | MULTI CYL MISFIRE | _ | 1 or 2 | × | В | <u>EC-288</u> | |
| P0301 | 0301 | CYL 1 MISFIRE | _ | 1 or 2 | × | В | <u>EC-288</u> | |
| P0302 | 0302 | CYL 2 MISFIRE | _ | 1 or 2 | × | В | <u>EC-288</u> | J |
| P0303 | 0303 | CYL 3 MISFIRE | _ | 1 or 2 | × | В | <u>EC-288</u> | |
| P0304 | 0304 | CYL 4 MISFIRE | | 1 or 2 | × | В | <u>EC-288</u> | K |
| P0305 | 0305 | CYL 5 MISFIRE | _ | 1 or 2 | × | В | <u>EC-288</u> | 1. |
| P0306 | 0306 | CYL 6 MISFIRE | _ | 1 or 2 | × | В | <u>EC-288</u> | |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | _ | 2 | _ | | <u>EC-294</u> | L |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | _ | 2 | _ | | <u>EC-294</u> | |
| P0332 | 0332 | KNOCK SEN/CIRC-B2 | _ | 2 | _ | | <u>EC-294</u> | Μ |
| P0333 | 0333 | KNOCK SEN/CIRC-B2 | _ | 2 | _ | | <u>EC-294</u> | IVI |
| P0335 | 0335 | CKP SEN/CIRCUIT | | 2 | × | В | <u>EC-297</u> | |
| P0340 | 0340 | CMP SEN/CIRC-B1 | | 2 | × | В | <u>EC-301</u> | Ν |
| P0345 | 0345 | CMP SEN/CIRC-B2 | | 2 | × | В | <u>EC-301</u> | |
| P0420 | 0420 | TW CATALYST SYS-B1 | × | 2 | × | А | <u>EC-305</u> | 0 |
| P0430 | 0430 | TW CATALYST SYS-B2 | × | 2 | × | А | <u>EC-305</u> | 0 |
| P0441 | 0441 | EVAP PURG FLOW/MON | × | 2 | × | А | <u>EC-310</u> | |
| P0443 | 0443 | PURG VOLUME CONT/V | _ | 2 | × | А | <u>EC-315</u> | Р |
| P0444 | 0444 | PURG VOLUME CONT/V | | 2 | × | В | <u>EC-320</u> | |
| P0445 | 0445 | PURG VOLUME CONT/V | _ | 2 | × | В | <u>EC-320</u> | |
| P0447 | 0447 | VENT CONTROL VALVE | _ | 2 | × | В | <u>EC-323</u> | |
| P0448 | 0448 | VENT CONTROL VALVE | | 2 | × | В | <u>EC-327</u> | |
| P0451 | 0451 | EVAP SYS PRES SEN | _ | 2 | × | Α | <u>EC-331</u> | |
| | 1 | l | | 1 | | | | |

< ECU DIAGNOSIS INFORMATION >

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| DTC ^{*1} | | | 0.0.7 | | | Permanent DTC | 5 (|
|-------------------|-------------------|-----------------------------------|-------------|--------|---------------|---------------------|-------------------|
| CONSULT | ECM ^{*3} | Items (CONSULT screen terms) | SRT code | Trip | MIL | group ^{*4} | Reference page |
| GST ^{*2} | ECIM ° | | | | | 3.000 | 1 0 |
| P0452 | 0452 | EVAP SYS PRES SEN | — | 2 | × | В | <u>EC-335</u> |
| P0453 | 0453 | EVAP SYS PRES SEN | — | 2 | × | В | <u>EC-340</u> |
| P0456 | 0456 | EVAP VERY SML LEAK | ×*7 | 2 | × | A | <u>EC-346</u> |
| P0460 | 0460 | FUEL LEV SEN SLOSH | — | 2 | × | A | <u>EC-352</u> |
| P0461 | 0461 | FUEL LEVEL SENSOR | — | 2 | × | В | <u>EC-354</u> |
| P0462 | 0462 | FUEL LEVL SEN/CIRC | — | 2 | × | В | <u>EC-356</u> |
| P0463 | 0463 | FUEL LEVL SEN/CIRC | | 2 | × | В | <u>EC-356</u> |
| P0500 | 0500 | VEH SPEED SEN/CIRC ^{*6} | | 2 | × | В | <u>EC-358</u> |
| P0506 | 0506 | ISC SYSTEM | | 2 | × | В | <u>EC-360</u> |
| P0507 | 0507 | ISC SYSTEM | — | 2 | × | В | <u>EC-362</u> |
| P050A | 050A | COLD START CONTROL | — | 2 | × | A | <u>EC-364</u> |
| P050B | 050B | COLD START CONTROL | — | 2 | × | A | <u>EC-364</u> |
| P050E | 050E | COLD START CONTROL | — | 2 | × | A | <u>EC-364</u> |
| P0524 | 0524 | ENGINE OIL PRESSURE | — | 2 | × | В | <u>EC-367</u> |
| P0550 | 0550 | PW ST P SEN/CIRC | — | 2 | | _ | <u>EC-370</u> |
| P0603 | 0603 | ECM BACK UP/CIRCUIT | — | 2 | × | В | <u>EC-373</u> |
| P0605 | 0605 | ECM | _ | 1 or 2 | \times or — | В | <u>EC-375</u> |
| P0607 | P0607 | ECM | — | 1 | × | В | <u>EC-377</u> |
| P0643 | 0643 | SENSOR POWER/CIRC | — | 1 | × | В | <u>EC-378</u> |
| P0705 | 0705 | T/M RANGE SWITCH A | — | 1 | × | В | <u>TM-74</u> |
| P0710 | 0710 | FLUID TEMP SENSOR A ^{*9} | — | 2 | × | В | <u>TM-76</u> |
| P0717 | 0717 | INPUT SPEED SENSOR A | — | 2 | × | В | <u>TM-79</u> |
| P0720 | 0720 | OUTPUT SPEED SENSOR ^{*6} | — | 2 | × | В | <u>TM-81</u> |
| P0729 | 0729 | 6GR INCORRECT RATIO ^{*9} | _ | 2 | × | В | <u>TM-85</u> |
| P0730 | 0730 | INCORRECT GR RATIO | | 2 | × | В | <u>TM-87</u> |
| P0731 | 0731 | 1GR INCORRECT RATIO ^{*9} | | 2 | × | В | <u>TM-89</u> |
| P0732 | 0732 | 2GR INCORRECT RATIO ^{*9} | — | 2 | × | В | <u>TM-91</u> |
| P0733 | 0733 | 3GR INCORRECT RATIO ^{*9} | | 2 | × | В | <u>TM-93</u> |
| P0734 | 0734 | 4GR INCORRECT RATIO ^{*9} | _ | 2 | × | В | <u>TM-95</u> |
| P0735 | 0735 | 5GR INCORRECT RATIO ^{*9} | _ | 2 | × | В | <u>TM-97</u> |
| P0740 | 0740 | TORQUE CONVERTER | _ | 2 | × | В | <u>TM-99</u> |
| P0744 | 0744 | TORQUE CONVERTER | _ | 2 | × | В | <u>TM-101</u> |
| P0745 | 0745 | PC SOLENOID A | _ | 2 | × | В | <u>TM-103</u> |
| P0750 | 0750 | SHIFT SOLENOID A | _ | 2 | × | В | <u>TM-104</u> |
| P0775 | 0775 | PC SOLENOID B | _ | 2 | × | В | <u>TM-105</u> |
| P0780 | 0780 | SHIFT | | 1 | × | В | <u>TM-106</u> |
| P0795 | 0795 | PC SOLENOID C | | 2 | × | В | <u>TM-108</u> |
| P0850 | 0850 | P-N POS SW/CIRCUIT | | 2 | × | В | <u>EC-381</u> |
| P100A | 100A | VVEL SYSTEM-B1 | | 2 | × | В | <u>EC-384</u> |
| P100B | 100B | VVEL SYSTEM-B2 | | 2 | × | В | <u>EC-384</u> |
| P1087 | 1087 | VVEL SYSTEM-B1 | | 1 | × | В | EC-388 |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| DTC ^{*1} | 1 | | 0.D.T | | | Permanent DTC | 5 (| Δ |
|------------------------------|-------------------|---------------------------------|-------------|--------|---------------|---------------------|-------------------------------------------------------------|----|
| CONSULT GST ^{*2} | ECM ^{*3} | Items (CONSULT screen terms) | SRT code | Trip | MIL | group ^{*4} | Reference page | A |
| P1088 | 1088 | VVEL SYSTEM-B2 | | 1 | × | В | <u>EC-388</u> | EC |
| P1089 | 1089 | VVEL POS SEN/CIRC-B1 | | 1 | × | В | <u>EC-389</u> | |
| P1090 | 1090 | VVEL ACTR MOT-B1 | | 1 | × | В | <u>EC-393</u> | |
| P1091 | 1091 | VVEL ACTR MOT PWR | | 1 or 2 | × | В | <u>EC-397</u> | С |
| P1092 | 1092 | VVEL POS SEN/CIRC-B2 | | 1 | × | В | <u>EC-389</u> | |
| P1093 | 1093 | VVEL ACTR MOT-B2 | | 1 | × | В | <u>EC-393</u> | D |
| P1148 | 1148 | CLOSED LOOP-B1 | | 1 | × | А | <u>EC-400</u> | D |
| P1168 | 1168 | CLOSED LOOP-B2 | | 1 | × | A | <u>EC-400</u> | |
| P1211 | 1211 | TCS C/U FUNCTN | | 2 | | _ | <u>EC-401</u> | Е |
| P1212 | 1212 | TCS/CIRC | | 2 | _ | _ | <u>EC-402</u> | |
| P1217 | 1217 | ENG OVER TEMP | | 1 | × | В | <u>EC-403</u> | F |
| P1225 | 1225 | CTP LEARNING-B1 | | 2 | _ | | <u>EC-407</u> | F |
| P1226 | 1226 | CTP LEARNING-B1 | | 2 | | | <u>EC-409</u> | |
| P1233 | 1233 | ETC FNCTN/CIRC-B2 | | 1 | × | В | <u>EC-411</u> | G |
| P1234 | 1234 | CTP LEARNING-B2 | | 2 | | | <u>EC-407</u> | |
| P1235 | 1235 | CTP LEARNING-B2 | | 2 | _ | | <u>EC-409</u> | |
| P1236 | 1236 | ETC MOT-B2 | | 1 | × | В | <u>EC-415</u> | Н |
| P1238 | 1238 | ETC ACTR-B2 | | 1 | × | В | <u>EC-418</u> | |
| P1239 | 1239 | TP SENSOR-B2 | | 1 | × | В | <u>EC-420</u> | |
| P1290 | 1290 | ETC MOT PWR-B2 | | 1 | × | В | <u>EC-423</u> | |
| P1550 | 1550 | BAT CURRENT SENSOR | | 2 | _ | _ | EC-425 | |
| P1551 | 1551 | BAT CURRENT SENSOR | | 2 | _ | _ | <u>EC-428</u> | J |
| P1552 | 1552 | BAT CURRENT SENSOR | | 2 | _ | | <u>EC-428</u> | |
| P1553 | 1553 | BAT CURRENT SENSOR | | 2 | _ | _ | <u>EC-431</u> | K |
| P1554 | 1554 | BAT CURRENT SENSOR | | 2 | _ | _ | <u>EC-434</u> | |
| P1564 | 1564 | ASCD SW | _ | 1 | | | <u>EC-438</u> (with ASCD) <u>EC-441</u> (with ICC) | L |
| P1568 | 1568 | ICC COMMAND VALUE | | 1 | | _ | <u>EC-444</u> | Μ |
| P1572 | 1572 | ASCD BRAKE SW | | 1 | _ | _ | <u>EC-445</u> (with ASCD) <u>EC-450</u> (with ICC) | N |
| P1574 | 1574 | ASCD VHL SPD SEN | _ | 1 | _ | _ | <u>EC-457</u> (with ASCD) <u>EC-459</u> (with ICC) | 0 |
| P1606 | 1606 | VVEL CONTROL MODULE | | 1 or 2 | \times or — | В | <u>EC-461</u> | |
| P1607 | 1607 | VVEL CONTROL MODULE | | 1 | × | В | <u>EC-463</u> | Ρ |
| P1608 | 1608 | VVEL SENSOR POWER/CIRC | | 1 | × | В | <u>EC-465</u> | |
| P1610 | 1610 | LOCK MODE | | 2 | | _ | <u>SEC-33</u> | |
| P1611 | 1611 | ID DISCARD, IMM-ECM | | 2 | | | <u>SEC-34</u> | |
| P1612 | 1612 | CHAIN OF ECM-IMMU | | 2 | | | <u>SEC-35</u> | |
| P1614 | 1614 | CHAIN OF IMMU-KEY | — | 2 | — | | <u>SEC-36</u> | |

< ECU DIAGNOSIS INFORMATION >

| [VQ37VHR] |
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| DTC ^{*1} | 1 | Items | SRT | | | Permanent DTC | Reference | |
|------------------------------|-------------------|-----------------------------------|------|------|-----|---------------------|---------------|--|
| CONSULT GST ^{*2} | ECM ^{*3} | (CONSULT screen terms) | code | Trip | MIL | group ^{*4} | page | |
| P1615 | 1615 | DIFFERENCE OF KEY | _ | 2 | — | — | <u>SEC-39</u> | |
| P1730 | 1730 | INTERLOCK | _ | 2 | × | В | <u>TM-113</u> | |
| P1734 | 1734 | 7GR INCORRECT RATIO ^{*9} | — | 2 | × | В | <u>TM-115</u> | |
| P1805 | 1805 | BRAKE SW/CIRCUIT | _ | 2 | _ | — | <u>EC-468</u> | |
| P1806 | 1806 | BRAKE BSTR PRES SEN/CIRC | | 2 | × | В | BRC-103 | |
| P2096 | 2096 | POST CAT FUEL TRIM SYS B1 | _ | 2 | × | А | <u>EC-471</u> | |
| P2097 | 2097 | POST CAT FUEL TRIM SYS B1 | _ | 2 | × | А | <u>EC-471</u> | |
| P2098 | 2098 | POST CAT FUEL TRIM SYS B2 | _ | 2 | × | А | <u>EC-471</u> | |
| P2099 | 2099 | POST CAT FUEL TRIM SYS B2 | _ | 2 | × | А | <u>EC-471</u> | |
| P2100 | 2100 | ETC MOT PWR-B1 | _ | 1 | × | В | <u>EC-423</u> | |
| P2101 | 2101 | ETC FNCTN/CIRC-B1 | _ | 1 | × | В | <u>EC-411</u> | |
| P2103 | 2103 | ETC MOT PWR | _ | 1 | × | В | <u>EC-423</u> | |
| P2118 | 2118 | ETC MOT-B1 | _ | 1 | × | В | <u>EC-415</u> | |
| P2119 | 2119 | ETC ACTR-B1 | _ | 1 | × | В | <u>EC-418</u> | |
| P2122 | 2122 | APP SEN 1/CIRC | _ | 1 | × | В | <u>EC-476</u> | |
| P2123 | 2123 | APP SEN 1/CIRC | _ | 1 | × | В | <u>EC-476</u> | |
| P2127 | 2127 | APP SEN 2/CIRC | _ | 1 | × | В | <u>EC-480</u> | |
| P2128 | 2128 | APP SEN 2/CIRC | _ | 1 | × | В | <u>EC-480</u> | |
| P2132 | 2132 | TP SEN 1/CIRC-B2 | _ | 1 | × | В | <u>EC-284</u> | |
| P2133 | 2133 | TP SEN 1/CIRC-B2 | _ | 1 | × | В | <u>EC-284</u> | |
| P2135 | 2135 | TP SENSOR-B1 | _ | 1 | × | В | <u>EC-420</u> | |
| P2138 | 2138 | APP SENSOR | _ | 1 | × | В | <u>EC-485</u> | |
| P219A | 219A | AIR FUEL RATIO B1 | _ | 2 | × | А | <u>EC-490</u> | |
| P219B | 219B | AIR FUEL RATIO B2 | _ | 2 | × | А | <u>EC-490</u> | |
| P2713 | 2713 | PC SOLENOID D | | 2 | × | В | <u>TM-120</u> | |
| P2722 | 2722 | PC SOLENOID E | _ | 2 | × | В | <u>TM-121</u> | |
| P2731 | 2731 | PC SOLENOID F | _ | 2 | × | В | <u>TM-122</u> | |
| P2807 | 2807 | PC SOLENOID G | _ | 2 | × | В | <u>TM-123</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-32. "Description", "PERMANENT DIAGNOSTIC TROUBLE CODE (PERMANENT DTC)".

*5: The troubleshooting for this DTC needs CONSULT.

*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

*7: SRT code will not be set if the self-diagnostic result is NG.

*8: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status".

*9: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:000000012088260

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.



< ECU DIAGNOSIS INFORMATION >

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)

| ltem | OBD- | Self-diagnostic test item | DTC | li | e and Test mit display) | Description |
|------|------|-------------------------------------------|-------------------------------------------------|----------------------------------------------|----------------------------------------------|-----------------------------------------------------------|
| | MID | | | TID | Unitand Scaling ID | |
| | | | P0131 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0131 84H 0BH Maximum sensor outp test cycle | Maximum sensor output voltage for test cycle | | |
| | | P0130 | 85H | 0BH | Minimum sensor output voltage for test cycle | |
| | | P0130 | 86H | 0BH | Maximum sensor output voltage for test cycle | |
| | | P0133 | 87H | 04H | Response rate: Response ratio (lean to rich) | |
| | | | P0133 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2A00 or P2096 | 89H | 84H | The amount of shift in air fuel ratio (too lean) |
| | | | P2A00 or P2097 | 8AH | 84H | The amount of shift in air fuel ratio (too rich) |
| | | | P0130 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0133 | 8CH | 83H | Response gain at the limited frequency |
| HO2S | 01H | Air fuel ratio (A/F) sensor 1 (Bank 1) | P014C | 8DH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014C | 8EH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014D | 8FH | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P014D | 90H | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P015A | 91H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015A | 92H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015B | 93H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P015B | 94H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P0133 | 95H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0133 | 96H | 84H | Response rate: Response ratio (rich to lean) |

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< ECU DIAGNOSIS INFORMATION >

| | 000 | | | li | e and Test mit display) | |
|------|-------------|------------------------------------|----------------|-----|-------------------------------|-----------------------------------------------------------|
| Item | OBD- MID | Self-diagnostic test item | DTC | TID | Unitand Scaling ID | Description |
| | | | P0138 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | 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 |
| | | Air fuel ratio (A/F) sensor 1 | P0151 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0151 | 84H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0150 | 85H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0150 | 86H | 0BH | Maximum sensor output voltage for test cycle |
| HO2S | | | P0153 | 87H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0153 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2A03 or P2098 | 89H | 84H | The amount of shift in air fuel ratio (too lean) |
| | | | P2A03 or P2099 | 8AH | 84H | The amount of shift in air fuel ratio (too rich) |
| | 05H | (Bank 2) | P0150 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0153 | 8CH | 83H | Response gain at the limited frequency |
| | | | P014E | 8DH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 |
| | | | P014E | 8EH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 |
| | | | P014F | 8FH | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 |
| | | | P014F | 90H | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 |
| | | - | P015C | 91H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 |
| | | | P015C | 92H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 |
| | | | P015D | 93H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 |

< ECU DIAGNOSIS INFORMATION >

| | OBD- | Self-diagnostic test item | | li | e and Test mit display) | |
|--------|------|-------------------------------------------|-------|-----|-------------------------------|--------------------------------------------------------------------------------------------|
| Item | MID | | DTC | TID | Unitand Scaling ID | Description |
| | | Air fuel ratio (A/F) sensor 1 (Bank 2) | P015D | 94H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 |
| | 05H | | P0153 | 95H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0153 | 96H | 84H | Response rate: Response ratio (rich to lean) |
| | | | P0158 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | 06H | Heated oxygen sensor 2 | P0157 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| HO2S | 001 | (Bank 2) | P0158 | 80H | 0CH | Sensor output voltage |
| | | | P0159 | 81H | 0CH | Difference in sensor output voltage |
| | | | P0159 | 82H | 11H | Rear O2 sensor delay response diag- nosis |
| | | Heated oxygen sensor 3 (Bank2) | P0163 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | 07H | | P0164 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0166 | 80H | 0CH | Sensor output voltage |
| | | | P0165 | 81H | 0CH | Difference in sensor output voltage |
| | | Three way catalyst function (Bank1) | P0420 | 80H | 01H | O2 storage index |
| | 21H | | P0420 | 82H | 01H | Switching time lag engine exhaust in- dex value |
| | 2111 | | P2423 | 83H | 0CH | Difference in 3rd O2 sensor output voltage |
| CATA- | | | P2423 | 84H | 84H | O2 storage index in HC trap catalyst |
| LYST | | | P0430 | 80H | 01H | O2 storage index |
| | 221 | Three way catalyst function | P0430 | 82H | 01H | Switching time lag engine exhaust in- dex value |
| | 22H | (Bank2) | P2424 | 83H | 0CH | Difference in 3rd O2 sensor output voltage |
| | | | P2424 | 84H | 84H | O2 storage index in HC trap catalyst |
| | | | 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 | 31H | EGR function | P0400 | 82H | 96H | Low flow faults: Difference between max EGR temp and EGR temp under idling condition |
| SYSTEM | 311 | | P0400 | 83H | 96H | Low flow faults: Max EGR temp |
| | | | P1402 | 84H | 96H | High Flow Faults: EGR temp increase rate |
| | | | P0402 | 85H | FCH | EGR differential pressure high flow |
| | | | P0401 | 86H | 37H | EGR differential pressure low flow |
| | | | P2457 | 87H | 96H | EGR temperature |

< ECU DIAGNOSIS INFORMATION >

| | | | | | e and Test mit | |
|--------|------|-----------------------------------------------|------------------------------------|--------|--------------------------|--------------------------------------------------------------------------------------------------------|
| Item | OBD- | Self-diagnostic test item | DTC | (GST o | display) | Description |
| item | MID | Self-diagnostic test term | bio | 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) |
| | 5511 | | 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) |
| VVT | | | Advanced: P052A Retarded: P052B | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock posi- tion check diagnosis) |
| SYSTEM | | | P0021 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | | | P0024 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | 36H | VVT Monitor (Bank2) | P0021 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0024 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | 0011 | | 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 posi- tion 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 | | | P0456 | 80H | 05H | Leak area index (for more than 0.02 inch) |
| SYSTEM | 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 >

[VQ37VHR]

| Item | OBD- | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description | А |
|-------------------------|------|---------------------------------------------|---------------------------------------|-----------------------------------------------|--------------------------|----------------------------------------------------------------|----|
| | MID | | | TID | Unitand Scaling ID | Description | EC |
| | 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 | С |
| | | | P0030 | 83H | 0BH | A/F sensor heater circuit malfunction | 0 |
| | 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 | D |
| | | | P0141 | 81H | 14H | Rear O2 sensor internal impedance | |
| O2 SEN- SOR | 43H | Heated oxygen sensor 3 heat- er (Bank 1) | P0043 | 80H | 0CH | Converted value of heater electric cur- rent to voltage | Е |
| 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 | |
| | | | P0036 | 83H | 0BH | A/F sensor heater circuit malfunction | F |
| | 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 | |
| | | | P0161 | 81H | 14CH | Rear O2 sensor internal impedance | G |
| | 47H | Heated oxygen sensor 3 heat- er (Bank 2) | P0063 | 80H | 0CH | Converted value of heater electric cur- rent to voltage | |
| | | | P0411 | 80H | 01H | Secondary air injection system incor- rect flow detected | Η |
| | | | Bank1: P0491 Bank2: P0492 | 81H | 01H | Secondary air injection system insufficient flow | |
| | | | P2445 | 82H | 01H | Secondary air injection system pump stuck off | |
| SEC- OND- ARY AIR | 71H | Secondary air system | P2448 | 83H | 01H | Secondary air injection system high airflow | J |
| | | | Bank1: P2440 Bank2: P2442 | 84H | 01H | Secondary air injection system switch- ing valve stuck open | K |
| | | | P2440 | 85H | 01H | Secondary air injection system switch- ing valve stuck open | |
| | | | P2444 | 86H | 01H | Secondary air injection system pump stuck on | L |

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< ECU DIAGNOSIS INFORMATION >

| FUEL SYSTEM | OBD- | | | Test value and Test limit (GST display) | | | |
|----------------|------|--------------------------------------------|----------------|-----------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------|--|
| | MID | Self-diagnostic test item | DTC | TID | Unitand Scaling ID | Description | |
| | | | P0171 or P0172 | 80H | 2FH | Long term fuel trim | |
| | | | P0171 or P0172 | 81H | 24H | The number of lambda control clamped | |
| | | | P117A / P219A | 82H | 03H | Cylinder A/F imbalance monitoring | |
| | | | P219C | 83H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #1 cylinder parameter | |
| | | | P219D | 84H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #2 cylinder parameter | |
| | 81H | Fuel injection system function (Bank 1) | P219E | 85H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #3 cylinder parameter | |
| | | | P219F | 86H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #4 cylinder parameter | |
| FUEL | | | P21A0 | 87H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #5 cylinder parameter | |
| SYSTEM | | | P21A2 | 89H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #7 cylinder parameter | |
| | | | P0174 or P0175 | 80H | 2FH | Long term fuel trim | |
| | | | P0174 or P0175 | 81H | 24H | The number of lambda control clamped | |
| | | | P117B / P219B | 82H | 03H | Cylinder A/F imbalance monitoring | |
| | | | P219D | 84H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #2 cylinder parameter | |
| | 82H | Fuel injection system function (Bank 2) | P219F | 86H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #4 cylinder parameter | |
| | | | P21A1 | 88H | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #6 cylinder parameter | |
| | | | P21A3 | 8AH | 83H | Air-fuel ratio cylinder imbalance diag- nosis CPS (Crankshaft Position Sen- sor) method #8 cylinder parameter | |

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| | | | Test value and Test limit (GST display) | | mit | | A | |
|---------|-------------|----------------------------|-----------------------------------------------|-------|--------------------------|----------------------------------------------------------------|-------------------------------------------------------------|---|
| Item | OBD- MID | Self-diagnostic test item | 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 | |
| | | | P0307 | 86H | 24H | Misfiring counter at 1000 revolution of the seventh cylinder | | |
| | | | | 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 | |
| MIGEIDE | | | P0301 | 89H | 24H | Misfiring counter at 200 revolution of the first cylinder | | |
| MISFIRE | A1H | Multiple cylinder misfires | P0302 | 8AH | 24H | Misfiring counter at 200 revolution of the second cylinder | | |
| | | | P0303 | 8BH | 24H | Misfiring counter at 200 revolution of the third cylinder | 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 | Misfiring counter at 200 revolution of the single cylinder | | |
| | | | P0300 | 93H | 24H | Misfiring counter at 200 revolution of the multiple cylinders | 0 | |

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< ECU DIAGNOSIS INFORMATION >

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|---------|------|---------------------------|-------|------|--------------------------|----------------------------------------------------------------------------------------------|
| Item | OBD- | Self-diagnostic test item | DTC | (GST | display) | Description |
| item | MID | Sen-ulagnostic test item | DIC | TID | Unitand Scaling ID | Description |
| | A2H | No. 1 cylinder misfire | P0301 | ОВН | 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 |
| MISFIRE | 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 | 0ВН | 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

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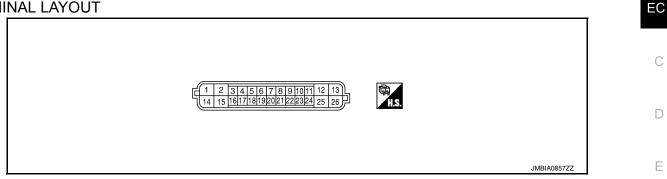
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[VQ37VHR]

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- VVEL control module is located behind the IPDM E/R. For this inspection, remove hoodledge cover (RH).
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

| Termi | inal No. | Description | | | Value |
|----------|-------------|-----------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 1 (V) | 14 (B/W) | VVEL actuator motor pow- er supply (bank 2) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 2 | 14 | VVEL actuator motor | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100µSec/div |
| (L/B) | (B/W) | (High lift) (bank 2) | Uutput | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div 5V/div JMBIA0855ZZ |
| 3 | 4 | VVEL control shaft posi- | | [Engine is running]Warm-up conditionIdle speed | Approx.0.25 - 1.40 V |
| 3 (G) | 4 (W) | tion sensor 1 (bank 1) | 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) | | Engine communication line | Input/ Output | _ | _ |
| 12 (G) | 14 (RAM) | VVEL actuator motor | Output | [Engine is running] • Warm-up condition • Idle speed | 0 - 14 V★ 100µSec/div |
| (6) | (B/W) | (High lift) (bank 1) | | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div = 5V/div JMBIA0855ZZ |
| 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 | | _ | - |

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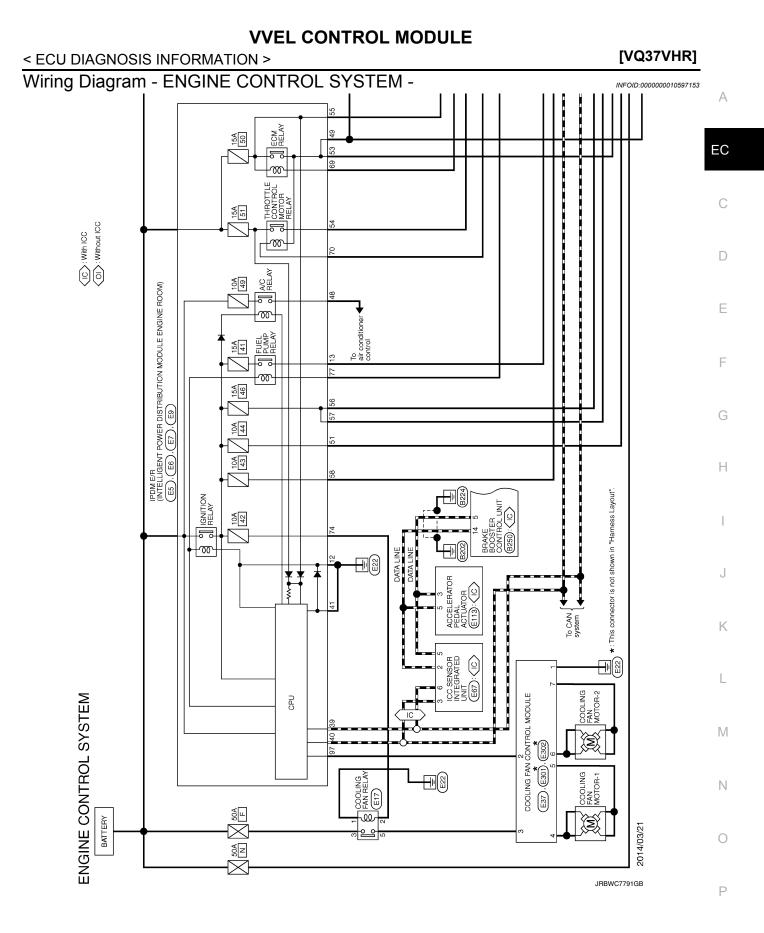
| Termi | inal No. | Description | | | Value | |
|------------|-------------|-----------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------|
| + | | Signal name | Input/ Output | Condition | (Approx.) | A |
| 15 | 14 | VVEL actuator motor (Low | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100µSec/div | EC C |
| (L/Y) | (B/W) | lift) (bank 2) | Output | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100µSec/div ÷ 5V/div JMBIA0855ZZ | E |
| 16 (P) | 17 | VVEL control shaft posi- | Input | [Engine is running]Warm-up conditionIdle speed[Engine is running] | 3.50 - 4.75 V | G |
| (R) | (L) | tion sensor 2 (bank 1) | | Warm-up condition When revving engine up to 2,000 rpm quickly | 0.25 - 4.75 V | Η |
| 17 (L) | | Sensor ground [VVEL control shaft posi- tion sensor 2 (bank 1)] | _ | _ | _ | I |
| 18 | 19 | VVEL control shaft posi- | | [Engine is running] • Warm-up condition • Idle speed | 3.50 - 4.75 V | J |
| (G) | (W) | tion sensor 2 (bank 2) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0.25 - 4.75 V | K |
| 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 | M |
| 21 (V) | 14 (B/W) | VVEL actuator motor relay abort signal | Input | [Engine is running]Warm-up conditionIdle speed | 0 V | Ν |
| 22 (P) | 17 (L) | Sensor power supply [VVEL position sensor 2 (bank 1)] | | [Ignition switch: ON] | 5 V | 0 |
| 23 (GR) | 14 (B/W) | VVEL control motor relay | Output | [Ignition switch: OFF] [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) 0 - 1.0 V | Р |
| 24 (L) | | Engine communication line | Input/ Output | | _ | |

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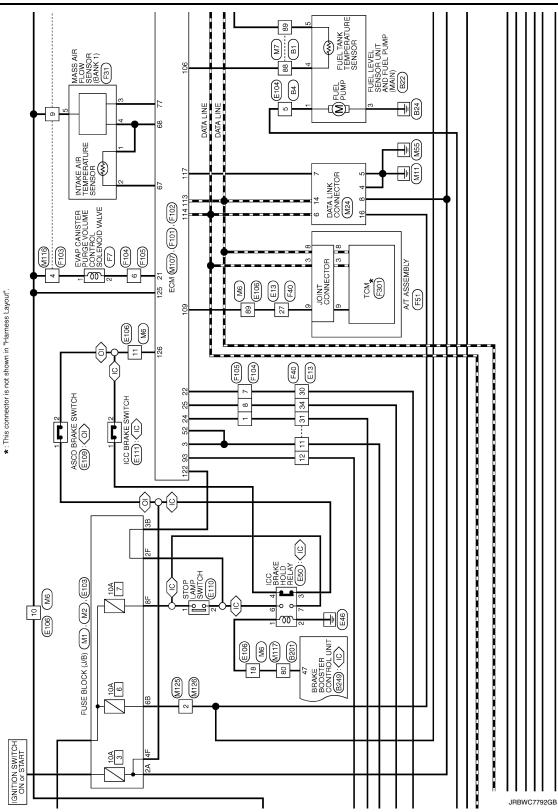
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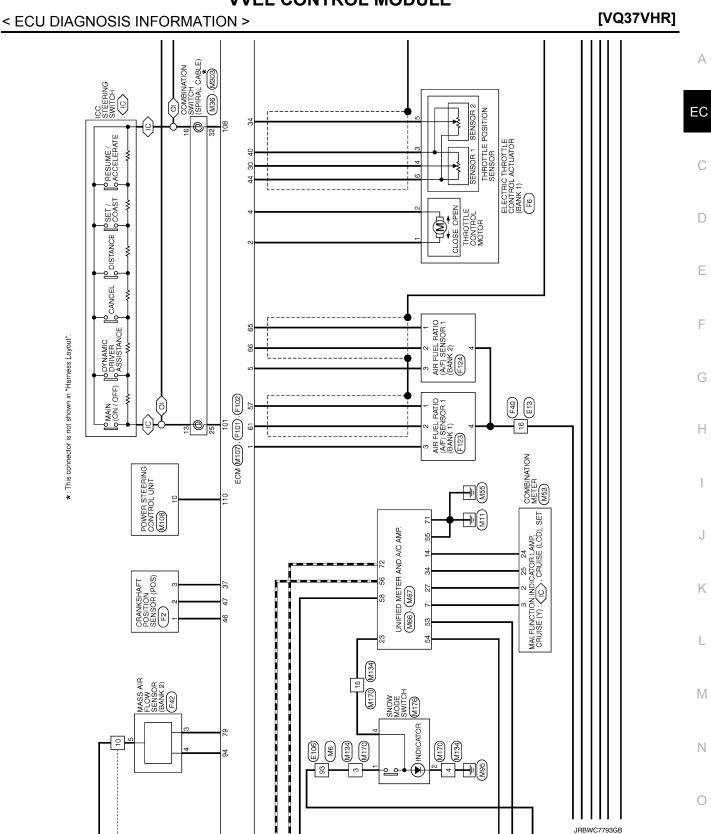
| Term | inal No. | Description | | | Value |
|------|----------|-------------------------|------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 25 | 14 | VVEL control motor (Low | Output | [Engine is running] • Warm-up condition • Idle speed | 0 - 14 V★ 100µSec/div 5V/div JMBIA0854ZZ |
| (BR) | (B/W) | lift) (bank 1) | | [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.)



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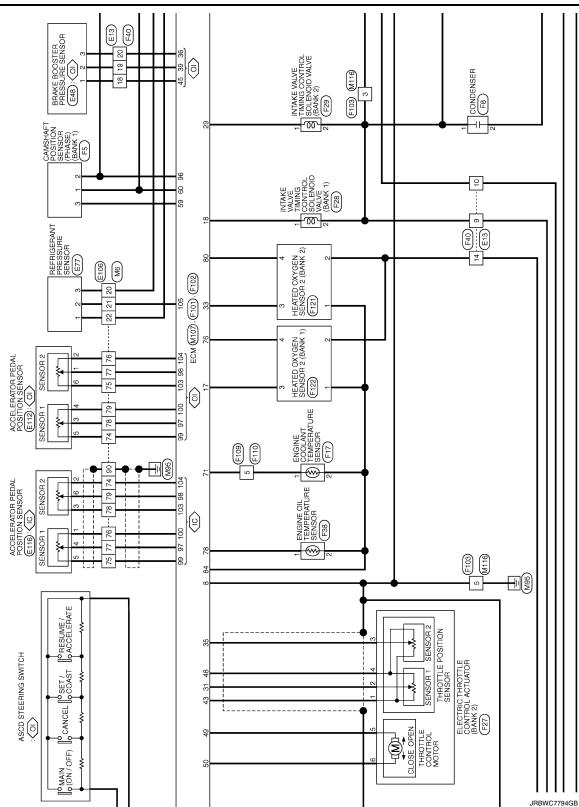
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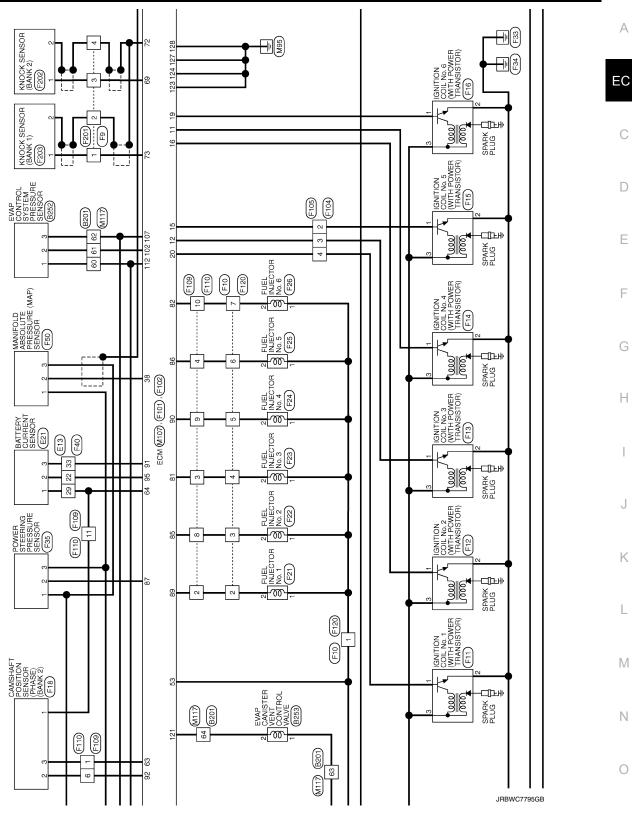
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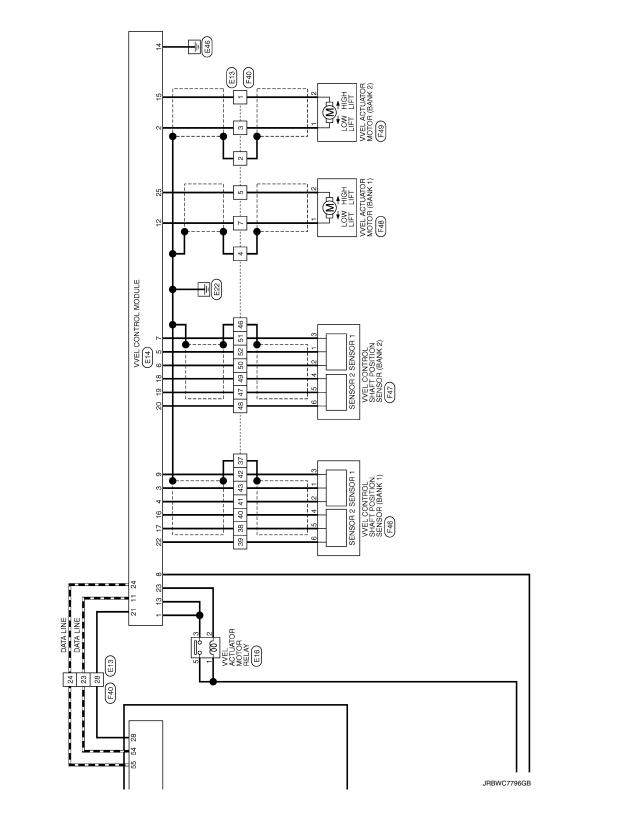
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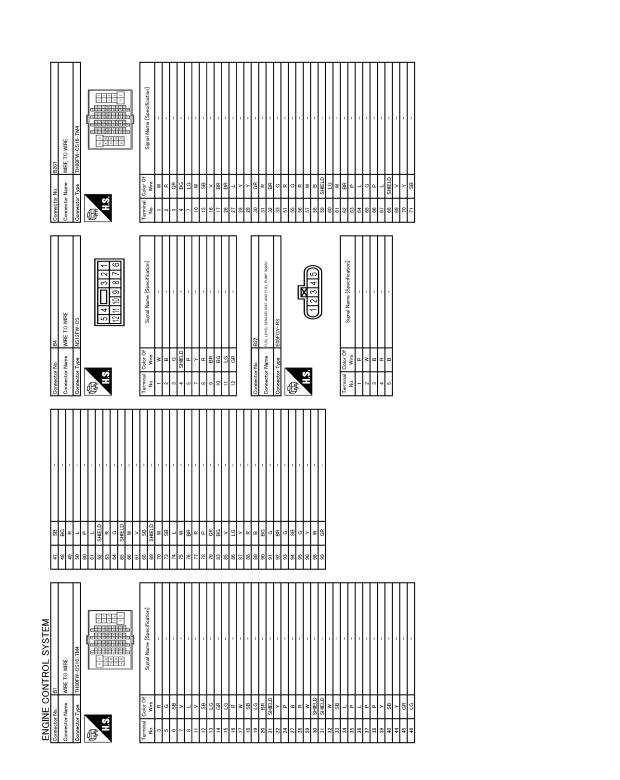
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VVEL CONTROL MODULE

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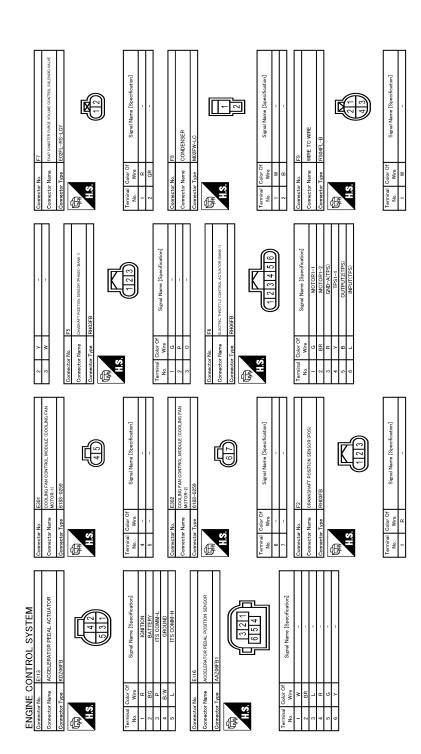
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VVEL CONTROL MODULE

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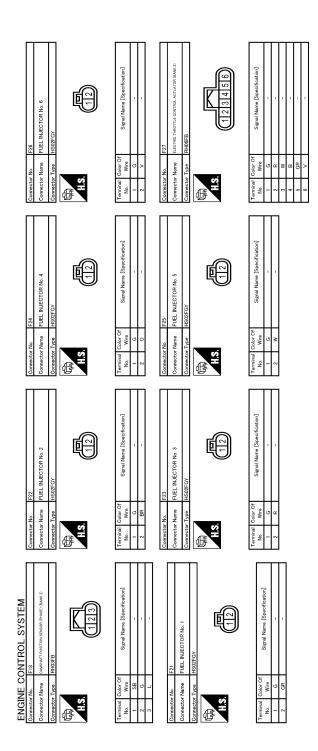
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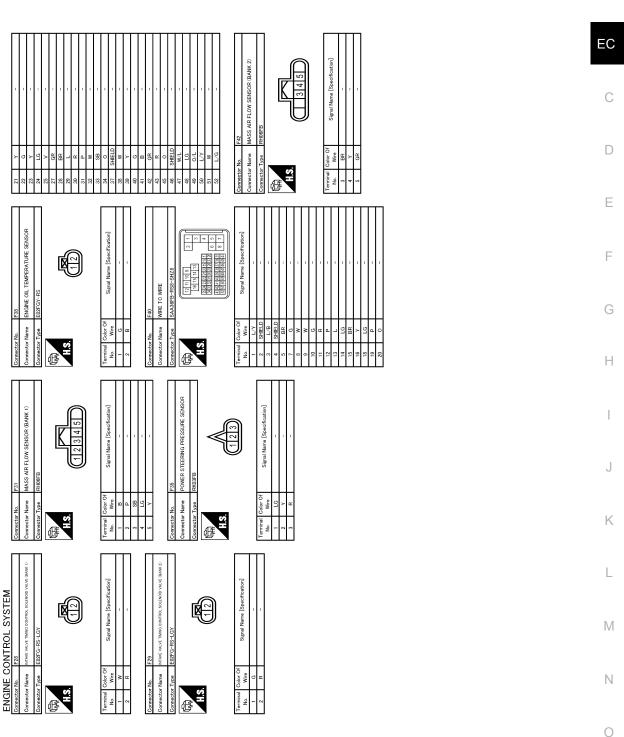
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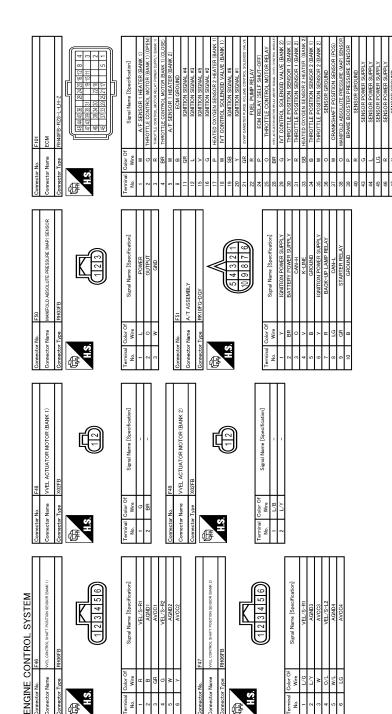


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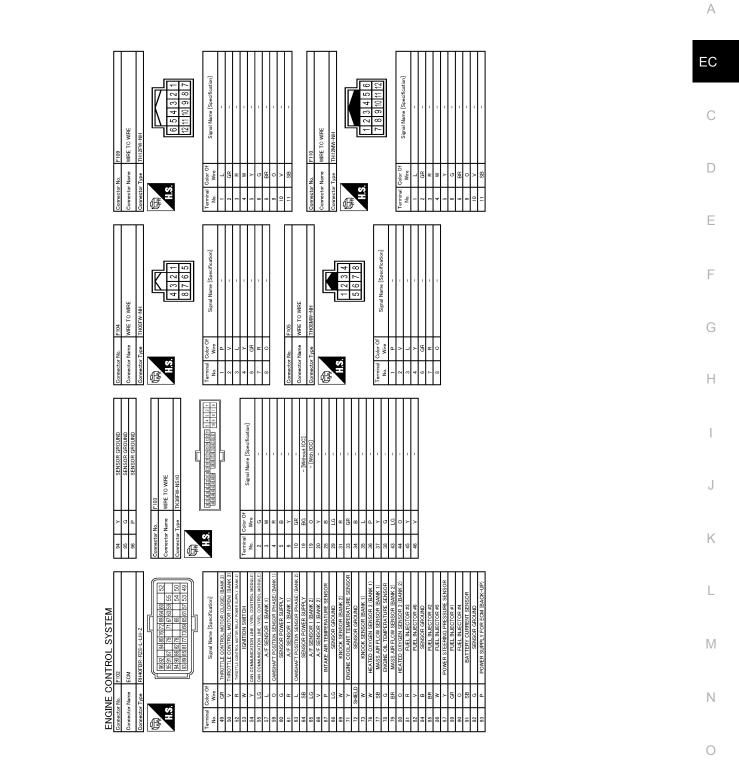
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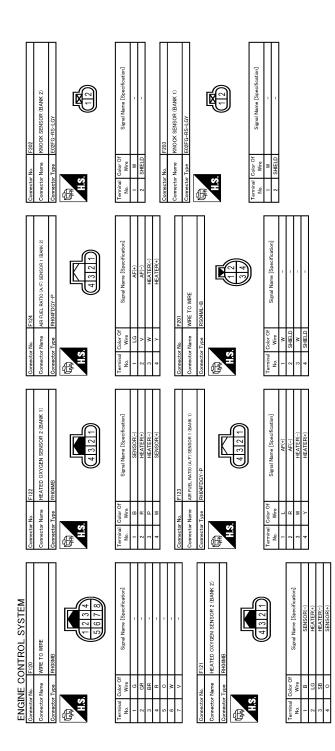
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| 13 LG | 1 | 8 | BG | - Connector No. M36 | | 24 | H | COMMUNICATION SIGNAL (LCD->AMP.) |
| 14 Y | , | 88 | P | - | | 25 | > | COMMUNICATION SIGNAL (AMP>LCD) |
| 15 G | | 86 | œ | - Connector Name | COMBINATION SMITCH (SPIRAL CABLE) | 26 | œ | VEHICLE SPEED SIGNAL (8-PULSE) |
| ╞ | | 87 | | - Connector Type TK08FGY-1V | | 27 | > | PARKING BRAKE SWITCH SIGNAL |
| 17 W | | 88 | M | , | | 28 | M | BRAKE FLUID LEVEL SWITCH SIGNAL |
| 18 SB | 1 | 89 | BR | | [| 29 | SB | SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE) |
| 19 LG | - | 6 | BG | | | 90 | σ | SEAT BELT BUCKLE SWITCH SIGNAL (PASSENGER SIDE) |
| 20 BR | | 91 | σ | | 24 25 26 | 31 | _ | WASHER LEVEL SWITCH SIGNAL |
| ŝ | | 92 | > | - | 24 20 20 | g | | ILLUMINATION CONTROL SIGNAL |
| 22 Y | | 93 | BR | , | 31 32 33 34 | 36 | ΓC | SELECT SWITCH SIGNAL |
| 24 V | | 94 | > | | | 37 | SB | ENTER SWITCH SIGNAL |
| 27 B | , | 96 | 9 | , | | 38 | - | TRIP A/B RESET SWITCH SIGNAL |
| 28 W | - | 96 | > | - Terminal Color Of Si | C | 39 | ٩ | ILLUMINATION CONTROL SWITCH SIGNAL (-) |
| 29 R | 1 | 98 | W | - No. Wire | | 40 | BG | ILLUMINATION CONTROL SWITCH SIGNAL (+) |
| 30 SHIELD | 1 | 66 | н | - 24 P | 1 | | | |
| 31 L | - | | | 25 SB | 1 | | | |
| 32 P | - | | | 26 B | - | Connector No. | or No. | M66 |
| 33 SB | - | Conne | Connector No. | M24 31 L | - | Connot | Conceter Name | INITIC METER AND A /C AMP |
| 34 L | - | ç | | DATA I BUK COMBINITOR | | | | |
| 35 P | , | 000 | CONTRECTOR INSUR | | I | Connector Type | or Type | TH40FW-NH |
| 36 L | ' | Conne | Connector Type | ╞ | 1 | | | |
| 37 P | | | ſ | | | Æ | | |
| ┝ | | ¢ | | | | 至于 | | |
| ┝ | | 手 | | | | č i | | |
| - 93 | | | ž | Т | | | 9 | |
| + | 1 1 | | į | | ON METER | | | 23 25 27 28 30 34 38 39 |
| ╀ | | | | | | | | |
| ╀ | 1 | | | Connector Lype I H4UFW-NH | | | | |
| ╉ | ' | | | 4 | | , | | |
| 8 | r | ļ | | | | erminal | > | Signal Name [Specification] |
| + | - | erminal | nal Color Of | Signal Name [Specification] | | -ON | wire | |
| ж. | | ŝ. | $^+$ | 123 56 | 6 7 10 15 16 19 20 | n 1 | - | MANUAL MODE SHIFT UP SIGNAL |
| ╉ | | " | رو. ا | = 21 22 [21 22 [21 25 26 | 26 27 28 29 30 31 33 33 36 37 38 39 40 | ` | 5 | COMMUNICATION SIGNAL (AMP>METER) |
| 60 P | 1 | 4 | ۵ ۵ | - | | | -1 | VEHICLE SPEED SIGNAL (2-PULSE) |
| 1 | 1 | ŝ | - | | | 6 | 5 | SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE) |
| 62 SHIELD | 1 | ° | - | , | | 5 | × | MANUAL MODE SIGNAL |
| 63 R | 1 | ~ | > | nal Color Of | Simal Name [Snacification] | = | σ | NON-MANUAL MODE SIGNAL |
| | - | 80 | g | - No. Wire | | 14 | BR | COMMUNICATION SIGNAL (LCD->AMP.) |
| 65 SHIELD | - | 1 | SB | - 1 GR | BATTERY POWER SUPPLY | 20 | L | ION ON/OFF SIGNAL |
| 66 SB | - | 14 | ٩. | - 2 LG | COMMUNICATION SIGNAL (METER->AMP.) | 23 | Y | AT SNOW SWITCH SIGNAL |
| 67 V | | 16 | > | - 3 GR COMMUNIC/ | COMMUNICATION SIGNAL (AMP>METER) | 25 | > | MANUAL MODE SHIFT DOWN SIGNAL |
| 68 LG | , | | | 2 8 | GROUND | 27 | гe | COMMUNICATION SIGNAL (METER->AMP.) |
| ΰ. | | | | | AI TERNATOR SIGNAL | 28 | <u>م</u> | VEHICLE SPEED SIGNAL (8-PLILSE) |
| t | | | | | AIR BAG SIGNAI | R | > | PARKING BRAKE SWITCH SIGNAL |
| | , | | | | SECURITY SIGNAL | 46 | > | COMMUNICATION SIGNAL (AMP - N CD) |
| ╞ | | | |) a | CEOLINIT | 30 | • | BLOWED MOTOD CONTROL SIGNAL |
| ╀ | | | | | CONTROL CHIEFOLD | 3 | | |
| ╉ | 1 | | | - - | MELEK CONTROL SWITCH GROUND | | | |
| ╀ | П | | | ╀ | | | | |
| ╀ | 1 | | | ╉ | | | | |
| ╉ | | | | + | IGNI I I ON SIGNAL | | | |
| 79 GR | ' | | | 22 B | GROUND | | | |

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< ECU DIAGNOSIS INFORMATION >

| | | | - | BR | 2 | | M117 | 1e WIRE TO WIRE | THROMW-CS16-TMA | 1 | | 1 8 112 244 20 89 8 8 8 9 1 9 5 | - - | 6 3 | · · · · · · · · · · · · · · · · · · · | 33 | | Color Of | Wire Signal Name [Specification] | | | | SB - | | | | | | - 10 | - | | / | R - | BR - | | | | | | 6 | | | | |
|---|---------------|-------------------------------------------|---|----|------|---------------------------------------------------------------------------------------------|---------------|-----------------|-------------------|--------------------------------------|-----------|---------------------------------|-----------------------------------------------------|--------|------------------------------------------|------------------------|---|------------------------|-------------------------------------|----------------------------------|-----------------------------|--------------------------------|--------------------------|--------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|------------------|------------------|-----------------------------|------------|-----|------|------|----------------------------|-----|---|-----|----|---|---|------------|------|
| ŀ | + | | + | 45 | | | Connector No. | Connector Name | Connector Time | | đ | AT-T | ŝ | | | | | Terminal Col | | - | 2 | - ~ | 4 | 7 | + | 2 9 | ╉ | + | ╀ | 38 | \vdash | | - | ╉ | 88 I | + | ខ្ល | + | + | 10 | t | ╀ | ╀ | 63 |
| | M108 | | | K | | | 8 10 | | | Signal Name [Specification] | EPC SOL + | IGN I | EPS SOI - | GROUND | VEHICI F SPEED(2P) | ENG TACHO | | | M116 | | | TK36MW-NS10 | | [| | 1 2 3 4 5 H1 (2113) 44 15 H6 H1 (61 H2 (23 H2 (13 H2 (13 H2 (13 H2 (23 H | | | | 5 | Signal Name [Specification] | - | | 1 | ' | 1 | 1 | 1 | | , | | | | |
| | Connector No. | Connector Name | | ぼ | H.S. | | | | Tarminal Color Of | | t | ی ر ج | с с | + |) - | 10 | | | Connector No. | | | Connector Type | ć | E | | 6 .1 | | | | Terminal Color C | Wir | 2 P | _ | + | + | х (л (| + | - | - a | ╀ | ╀ | ╀ | 2 2 2 2 | 32 P |
| | M10/ | Connector Name ECM | | | 123 | 126 122 114 110 108 103 98 | 121 | | Tarminal Color Of | | t | : 0 | 98 Y ACCELERATOR PEDAL POSITION SENSOR 2 [Webb ICC] | . c | 99 I SENSOR DOWER SLIPPI Y [Without ICC] | A | 5 | P | G SENSOR POWER SUPPLY [Without ICC] | L SENSOR POWER SUPPLY [With ICC] | BR SENSOR GROUND [With ICC] | GR SENSOR GROUND [Without ICC] | REFRIGERANT PRESS SENSOR | W FUEL TANK TEMPERATURE SENSOR | BG SENSOR POWER SUPPLY | 108 Y SENSOR GROUND | | × > | . a | ┞ | > | LG EVAP C | ٩ | 8 | | 125 R POWER SUPPLY FOR EGM | Ξ, | | • | | | • | • | |
| ŏ | | Connector Name UNIFIED METER AND A/C AMP. | | F | | 41 42 43 44 43 40 47 1 20 20 24 23 20 20 24 23 20 20 25 25 25 25 25 25 25 25 25 25 25 25 25 | | | Tarminal Color Of | No. Wire Signal Name [Specification] | t | · > | R INTAKE SENSOR SIGNA | | P AMRIENT SENSOR SIGNI | BG SUNLOAD SENSOR SIGN | 9 | G IGNITION POWER SUPPI | ╞ | 55 B GROUND | 56 L CAN-H | M | BR FUEL LEVEL SENSOR GRC | 59 GR INTAKE SENSOR GROUND | L IN-VEHICLE SENSOR GRO | 61 BR AMBIENT SENSOR GROUND | - | + | L A/C LAN SIGNAL | . œ | B GROUND | 72 P CAN-L | | | | | | | | | | | | |

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< ECU DIAGNOSIS INFORMATION >

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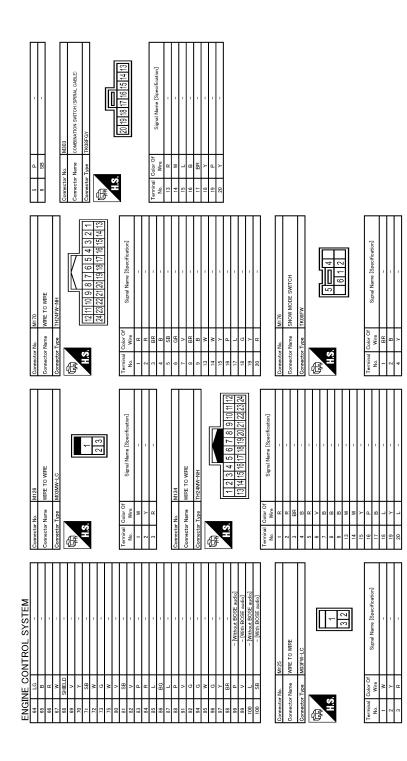
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VVEL CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >



JRBWC7850GB

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | | | | | | S | YMPT | ОМ | | | | | | | С |
|----------|--------------------------------------------|--------------------------|--------------|-------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|-----------------------------|----------------------------|---------------------------|-----------------------------|---------------------------------------------------------------------|-----|
| | | (7 | | | | NOI | | | | | HIGH | | | | | D |
| | | START/RESTART (EXCP. HA) | | LAT SPOT | TION | ACCELERAT | | | | DLE | MPERATURE | UMPTION | MPTION | (CHARGE) | | E |
| | | ART/RESTA | | surging/F | K/DETONA | VER/POOR | W IDLE | HUNTING | TION | TURN TO II | WATER TEI | IUEL CONS | IL CONSUI | AD (UNDER | Reference page | F |
| | | HARD/NO ST/ | ENGINE STALL | HESITATION/SURGING/FLAT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDRE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | 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 | EC-509 | |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-628 | |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | <u>EC-506</u> | |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | <u>EC-97</u> | |
| Air | Positive crankcase ventilation sys- tem | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | <u>EC-527</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-411,</u> <u>EC-418</u> | TX. |
| 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-516</u> | |
| Main po | wer supply and ground circuit | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | <u>EC-164</u> | |
| Mass ai | r flow sensor circuit | 1 | | | 2 | | | | | | | | | | <u>EC-188,</u> <u>EC-194</u> | M |
| Engine | coolant temperature sensor circuit | | | | | | 3 | | | 3 | | | | | <u>EC-209,</u> <u>EC-216</u> | Ν |
| Air fuel | ratio (A/F) sensor 1 circuit | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | <u>EC-224,</u> <u>EC-228,</u> <u>EC-231,</u> <u>EC-471</u> | 0 |
| Throttle | position sensor circuit | | | | | | 2 | + | | 2 | | | | | EC-212, EC-284, EC-407, EC-409, EC-420 | Ρ |
| Accelera | ator pedal position sensor circuit | | | 3 | 2 | 1 | | | | | | | | | <u>EC-476,</u> <u>EC-480,</u> <u>EC-485</u> | |
| Knock s | ensor circuit | | | 2 | | | | | | | | 3 | | | EC-294 | |

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< SYMPTOM DIAGNOSIS >

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| | | | | | | S | YMPT | OM | | | | | | |
|---------------------------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|----------------------------------|
| | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | Reference 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-282,</u> <u>EC-281</u> |
| Crankshaft position sensor (POS) circuit | 2 | 2 | | | | | | | | | | | | EC-297 |
| Camshaft position sensor (PHASE) circuit | 3 | 2 | | | | | | | | | | | | EC-301 |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | <u>EC-358</u> |
| Power steering pressure sensor circuit | | 2 | | | | | 3 | 3 | | | | | | <u>EC-370</u> |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | <u>EC-373</u> , <u>EC-375</u> |
| Intake valve timing control solenoid valve cir- cuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | <u>EC-185</u> |
| Manifold absolute pressure (MAP) sensor | | | | | | | | | | | 3 | | | - |
| Brake booster pressure sensor | | | | | | | | | | | 3 | | | - |
| VVEL control module | 3 | | 4 | 4 | 3 | | | | | | | | | <u>EC-</u> 461,EC- 463 |
| VVEL actuator motor | 3 | | 4 | 4 | 3 | | | | | | | | | EC-393 |
| VVEL actuator motor relay | 3 | | 4 | 4 | 3 | | | | | | | | | EC-397 |
| VVEL actuator shaft position sensor | 3 | | 4 | 4 | 3 | | | | | | | | | EC-389 |
| PNP signal circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-381 |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | <u>EC-529</u> |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | <u>EC-504</u> |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | HAC-4 |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | BRC-5 |

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

< SYMPTOM DIAGNOSIS >

| | | | | | | | SI | (MPT) | ОМ | | | | | | | А |
|------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|-----------------------------|----------------------------|---------------------------|-----------------------------|------------------------------------------------------------------------------------------------|-------------|
| | | . HA) | | | | RATION | | | | | RE HIGH | | | | • | EC |
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | Reference page | C D E |
| Warranty s | symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | | 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 | | | | Н |
| Air | Air duct Air cleaner Air leakage from air duct (Mass air flow sensor — electric | - | 5 | 5 | | 5 | | 5 | 5 | | - | 5 | | | EM-28 EM-28 EM-28 | I |
| | throttle control actuator) Electric throttle control actuator Air leakage from intake manifold/ Collector/Gasket | 5 | | | 5 | | 5 | | | 5 | | | | | <u>EM-29</u> <u>EM-33</u> | J K |
| Cranking | Battery Generator circuit | 1 | 1 | 1 | | 1 | | 1 | 1 | | | | | 1 | PG-114 CHG-27, CHG-28 | L |
| | Starter circuit | 3 | | | | | | | | | | 1 | | | <u>STR-2</u> (With GR8- 1200 NI), <u>STR-</u> <u>5</u> (Without GR8-1200 NI) | M |
| | Signal plate | 6 | - | | | | | | | | | | | | EM-131 | 14 |
| | PNP signal circuit | 4 | - | | | | | | | | | | | | <u>TM-74</u> | |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | <u>EM-118</u> | 0 |
| | Cylinder head gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | | 3 | | | |
| | Cylinder block | | | | | | | | | | | | | | | Ρ |
| | Piston | - | | | | | | | | | | | 4 | | | |
| | Piston ring | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | - | <u>EM-131</u> | |
| | Connecting rod | - | | | | | | | | | | | | | | |
| | Bearing Crankshaft | - | | | | | | | | | | | | | | |
| | Grankshait | | | | | | | | | | | | | | | |

< 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 | | | | | | | | | | | | | | <u>EM-66</u> |
| mecha- nism | Camshaft | | | | | | | | | | | | | | <u>EM-105</u> |
| morn | Intake valve timing control | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | <u>EM-105</u> |
| | Intake valve | | | | | | | | | | | | 3 | | EM-118 |
| | Exhaust valve | | | | | | | | | | | | 5 | | |
| 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-11, LU-</u> 13, <u>LU-15</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-23</u> |
| | Water pump | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | <u>CO-21</u> |
| | Water gallery | э | Э | Э | 5 | Э | | Э | Э | | 4 | Э | | | <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 2,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. However, if the engine speed is above 4,500 rpm, fuel will be cut off in a few seconds. Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled. NOTE:

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, EC-48, "System Description".

TORQUE CUT CONTROL (AT HIGH ENGINE OIL TEMPERATURE)

ECM receives engine oil temperature signal from engine oil temperature sensor.

Е To avoid VVEL performance, ECM performs the engine torque cut control at high engine oil temperature. If engine oil temperature is too high, engine oil viscosity will change. As a result, engine oil pressure is decreased. This control is to control the VVEL operating angle by operating the VVEL actuator sub assembly. If this control is operated, engine performance will decrease, then maximum engine speed is reduced a little, for example.

NOTE:

If the engine oil temperature sensor is deteriorated, its characteristic will change.

In this case, the operating temperature for engine torque cut control might be decrease. Perform Component Inspection of the engine oil temperature sensor to check for the deterioration.

Refer to EC-282, "Component Inspection".

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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:

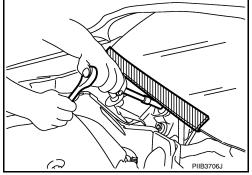
Always observe the following items for preventing accidental activation.

- 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.

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

Precautions for Removing Battery Terminal

 When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.

NOTE:

< PRECAUTION >

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

· For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch. NOTE:

If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

 After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC. NOTE:

The removal of 12V battery may cause a DTC detection error.

Precautions For Xenon Headlamp Service

WARNING:

Comply with the following warnings to prevent any serious accident.

- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)
- Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

CAUTION:

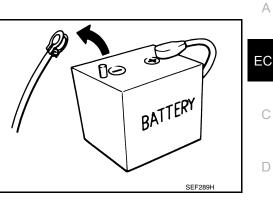
- Comply with the following cautions to prevent any error and malfunction.
- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.
- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

On Board Diagnostic (OBD) System of Engine and A/T

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 Ν the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-103, "Description".
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

EC-621



[VQ37VHR] INFOID:000000011035111

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PRECAUTIONS

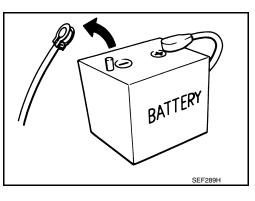
< PRECAUTION >

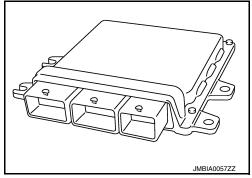
General Precautions

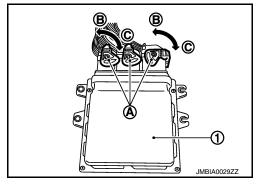
- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect negative battery cable.
- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.

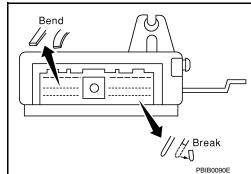
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.

- If the battery is disconnected, the following emission-related diagnostic information will be cleared within 24 hours.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.
- 1 : ECM
- C:Loosen

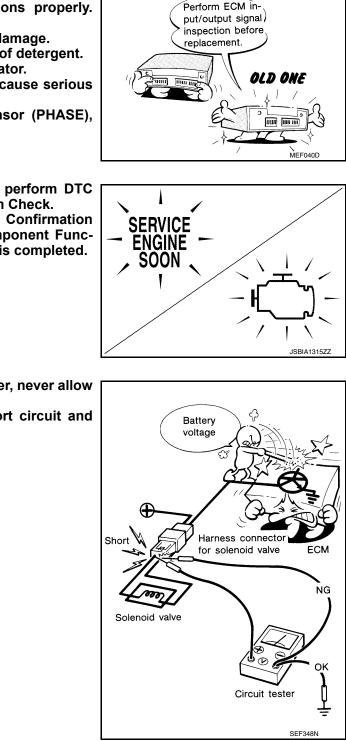








- When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break). Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
 A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.





• Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to <u>EC-534</u>, "Reference Value".

PRECAUTIONS

- 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).
- After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.

• When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.

Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

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PRECAUTIONS

- · 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. ٠

Never depress accelerator pedal when starting.

· Never rev up engine just prior to shutdown.

< PRECAUTION >



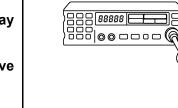
• When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.

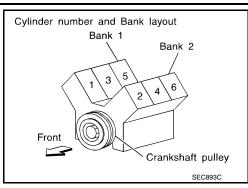
Immediately after starting, never rev up engine unnecessarily.

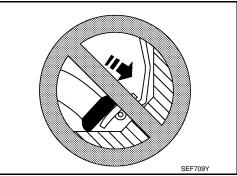
- Keep the antenna as far as possible from the electronic control units.
- Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.

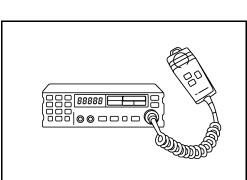
Never let them run parallel for a long distance.

- 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.









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PREPARATION

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Special Service Tools

NOTE:

The actual shapes of TechMate tools may differ from those of special service tools illustrated here.

| Tool number | | |
|--------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------|
| (TechMate No.) Tool name | | Description |
| (J-44321) Fuel pressure gauge kit | LEC642 | Checks fuel pressure |
| ommercial Service | Tools | INFOID:000000010597162 |
| Tool name (TechMate No.) | | Description |
| Leak detector .e.: (J-41416) | | Locates the EVAP leak |
| EVAP service port | S-NT703 | Applies positive pressure through EVAP service |
| adapter .e.: (J-41413-OBD) | | port |
| Fuel filler cap adapter .e.: (MLR-8382) | S-NT704 | Checks fuel tank vacuum relief valve opening |
| (IVILIN-0002) | | pressure |
| Socket wrench | S-NT815 S-NT815 19 mm (0.75 in) 19 mm (0.75 in) 19 mm (1.26 in) | Removes and installs engine coolant temperature sensor |

[VQ37VHR]

INFOID:000000010597161

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PREPARATION

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| Tool name (TechMate No.) | | Description |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12) | 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

Inspection

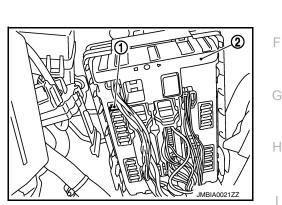
FUEL PRESSURE RELEASE

(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:

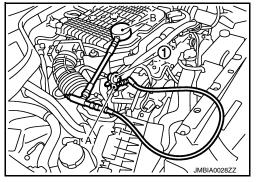
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger. NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel
 pressure cannot be completely released because this models do not have fuel return system.
- Use Fuel Pressure Gauge Kit (J-44321) to check fuel pressure.
- 1. Release fuel pressure to zero.
- 2. Install the inline fuel quick disconnected fitting (A) between fuel damper (1) and injector tube.
- 3. Connect the fuel pressure test gauge (quick connector adapter hose) (B) to the inline fuel quick disconnected fitting.
- 4. Turn ignition switch ON and check for fuel leakage.
- 5. Start engine and check for fuel leakage.
- 6. Read the indication of fuel pressure gauge.

At idling : Approximately 350 kPa (3.57 kg/cm², 51 psi)

7. If result is unsatisfactory, check fuel hoses and fuel tubes for clogging.

If OK, Replace "fuel filter and fuel pump assembly". If NG, Repair or replace.



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< PERIODIC MAINTENANCE >

EVAP LEAK CHECK

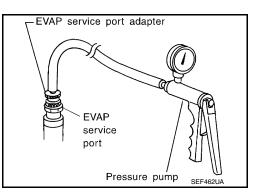
Inspection

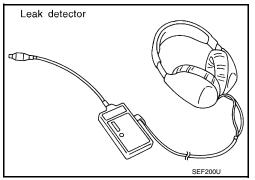
CAUTION:

- 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

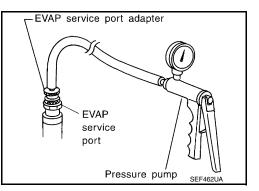
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- 3. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
- 4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 5. 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-97, "System</u> <u>Diagram"</u>.





WITHOUT CONSULT

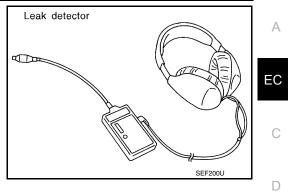
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
- To locate the leak, deliver positive pressure to the EVAP system until pressure 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.



EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

5. Locate the leak using a leak detector. Refer to <u>EC-97, "System</u> <u>Diagram"</u>.



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SERVICE DATA AND SPECIFICATIONS (SDS)

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Idle Speed

INFOID:000000010597165

[VQ37VHR]

| Condition | Specification |
|-------------------------------|----------------|
| No load* (in P or N position) | 650 ± 50 rpm |

*: Under the following conditions

A/C switch: OFF

• Electric load: OFF (Lights, heater fan & rear window defogger)

• Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:000000010597166

| Condition | Specification |
|-------------------------------|---------------------------------|
| No load* (in P or N position) | $10 \pm 5^{\circ} \text{ BTDC}$ |

*: Under the following conditions

• A/C switch: OFF

• Electric load: OFF (Lights, heater fan & rear window defogger)

Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:000000010597167

| Condition | Specification (Using CONSULT or GST) |
|--------------|--------------------------------------|
| At idle | 5 – 35 % |
| At 2,500 rpm | 5 – 35 % |

Mass Air Flow Sensor

INFOID:000000010597168

| Supply voltage | Battery voltage (11 – 14 V) |
|--------------------------------------|--------------------------------------------------------|
| Output voltage at idle | 0.7 – 1.2 V* |
| Mass air flow (Using CONSULT or GST) | 2.0 – 6.0 g/s at idle* 7.0 – 20.0 g/s at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no load.

[VQ37VHR]

SERVICE DATA AND SPECIFICATIONS (SDS)

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