# SECTION ENGINE CONTROL SYSTEM o

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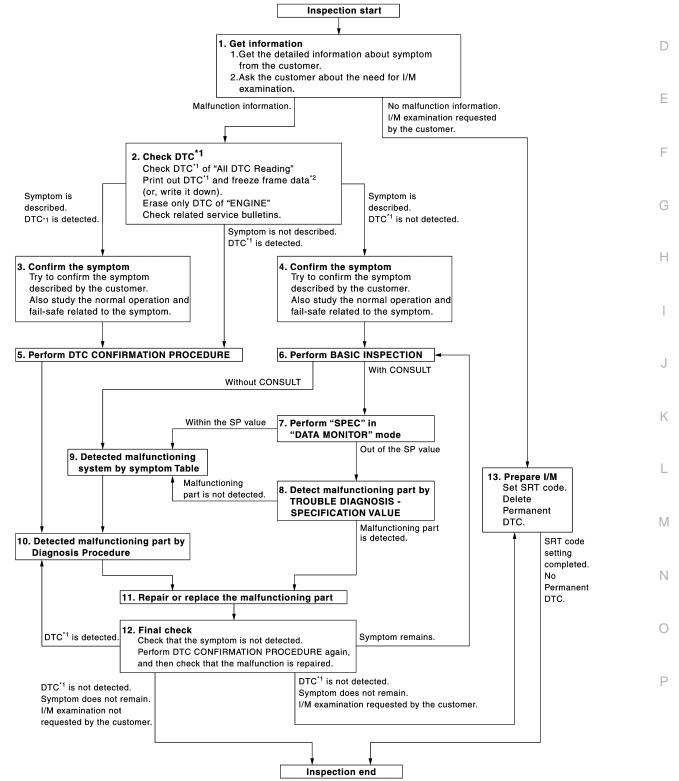
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#### BASIC INSPECTION DIAGNOSIS AND REPAIR WORKFLOW

#### Work Flow





JSBIA0123GB

INFOID:000000010839383

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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-152. "On Board Diagnosis Function" or EC-155. "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-614</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-618</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 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-618</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 INSPECTION >	[VQ37VHR]
YES >> GO TO 10. NO >> Check according to <u>GI-44, "Intermittent Incident"</u> .	
PERFORM BASIC INSPECTION	
erform EC-14, "BASIC INSPECTION : Special Repair Requirement".	
to vou have CONSULT?	
YES >> GO TO 7.	
NO >> GO TO 9.	
PERFORM SPEC IN DATA MONITOR MODE	
With CONSULT Make sure that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA-B1", 2" are within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode. Refer to ment Function Check".	
s the measurement value within the SP value?	
YES >> GO TO 9. NO >> GO TO 8.	
$3_{D}$ detect malfunctioning part by trouble diagnosis - specification val	UE
Detect malfunctioning part according to EC-166, "Diagnosis Procedure".	
s a malfunctioning part detected?	
YES >> GO TO 11. NO >> GO TO 9.	
<b>9.</b> DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	
Detect malfunctioning system according to <u>EC-614. "Symptom Table"</u> based on the conf	irmed aumetem in
step 4, and determine the trouble diagnosis order based on possible causes and symptoms	
>> GO TO 10.	
10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE	
<b>10.</b> DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE nspect according to Diagnosis Procedure of the system. NOTE:	
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#### 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 <u>EC-152, "On Board Diagnosis Function"</u> or <u>EC-155, "CONSULT Function"</u>.
- 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-28, "SRT Set Driving Pattern".
- 2. Erase permanent DTCs. Refer or EC-155, "CONSULT Function".

>> 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.



[VQ37VHR]

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

Revision: 2014 September

#### DIAGNOSIS AND REPAIR WORKFLOW

#### < BASIC INSPECTION >

#### WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN	
Engine #	e # Trans. Mileage		Mileage	
Incident Date	9	Manuf. Date	In Service Date	
Fuel and fuel	filler cap	<ul> <li>Vehicle ran out of fuel causing misfire</li> <li>Fuel filler cap was left off or incorrectly</li> </ul>	/ screwed on.	
	☐ Startability	Impossible to start No combust Partial combustion affected by th Partial combustion NOT affected Possible but hard to start Other	nrottle position I by throttle position	
Symptoms	Idling	□ No fast idle □ Unstable □ H □ Others [	High idle 🔲 Low idle	
	Driveability	Stumble Surge Knock Intake backfire Exhaust backfi Others [	Lack of power re ]	
	Engine stall	At the time of start While idling While accelerating While dece	lerating	
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	hway 🛛 Off road (up/down)	
Driving conditions		Not affected At starting While idling While accelerating While decelerating While turnin Vehicle speed	5	
		0 10 20	30 40 50 60 MPH	
Malfunction i	ndicator lamp	☐ Turned on		

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< BASIC INSPECTION >

#### INSPECTION AND ADJUSTMENT BASIC INSPECTION

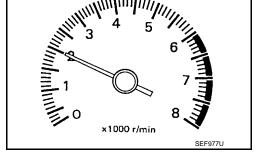
#### **BASIC INSPECTION : Special Repair Requirement**

1.INSPECTION START

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



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#### 2. REPAIR OR REPLACE

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

#### >> GO TO 3

#### 3.CHECK IDLE SPEED

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

Revision: 2014 September

[VQ37VHR]

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SEF976U

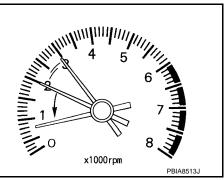
< BASIC INSPECTION >

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

 Check idle speed.
 For procedure, refer to <u>EC-19, "IDLE SPEED : Special Repair</u> <u>Requirement"</u>.
 For specification, refer to <u>EC-634, "Idle Speed"</u>.

Is the inspection result normal?

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



	x1000rpm PBIA8513J
<b>4.</b> PERFORM ACCELERATOR PEDAL RELEASED POSITION LEAF	RNING
<ol> <li>Stop engine.</li> <li>Perform <u>EC-20, "ACCELERATOR PEDAL RELEASED POSITION ment"</u>.</li> </ol>	N LEARNING : Special Repair Require-
>> GO TO 5.	
<b>5.</b> PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	F
Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING	: Special Repair Requirement"
	G
>> GO TO 6.	
<b>6.</b> PERFORM IDLE AIR VOLUME LEARNING	H
Perform EC-21, "IDLE AIR VOLUME LEARNING : Special Repair Rec	<u>quirement"</u> .
<u>Is Idle Air Volume Learning carried out successfully?</u> YES >> GO TO 7.	1
NO >> Follow the instruction of Idle Air Volume Learning. Then G	GO TO 4.
7.CHECK IDLE SPEED AGAIN	
1. Start engine and warm it up to normal operating temperature.	J
<ol> <li>Check idle speed. For procedure, refer to <u>EC-19</u>, "IDLE SPEED : Special Repair Red</li> </ol>	quirement".
For specification, refer to <u>EC-634, "Idle Speed"</u> .	K K
<u>Is the inspection result normal?</u> YES >> GO TO 10.	
YES >> GO TO 10. NO >> GO TO 8.	L
8. DETECT MALFUNCTIONING PART	
<ul> <li>Check the Following.</li> <li>Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-3</u></li> <li>Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-305</u></li> </ul>	
Is the inspection result normal?	Ν
YES >> GO TO 9. NO >> Repair or replace. Then GO TO 4.	
9. CHECK ECM FUNCTION	C
1. Substitute with a non-malfunctioning ECM to check ECM function.	
<ul> <li>although this is rare.)</li> <li>Perform initialization of NVIS (NATS) system and registration of al SEC-8, "ECM RECOMMUNICATING FUNCTION : Special Repair</li> </ul>	

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.

[VQ37VHR]

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#### < BASIC INSPECTION >

#### [VQ37VHR]

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

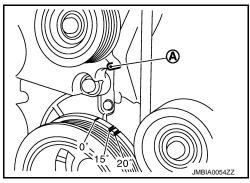
For procedure, refer to <u>EC-19</u>, "IGNITION TIMING : <u>Special</u> <u>Repair Requirement</u>".

For specification, refer to EC-634. "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 : Special Repair Requirement".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

**13.** PERFORM IDLE AIR VOLUME LEARNING

Perform EC-21, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 14.
- NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.
- **14.**CHECK IDLE SPEED AGAIN
- 1. Start engine and warm it up to normal operating temperature.
- Check idle speed. For procedure, refer to <u>EC-19, "IDLE SPEED : Special Repair Requirement"</u>. For specification, refer to <u>EC-634, "Idle Speed"</u>.

Is the inspection result normal?

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

15. CHECK IGNITION TIMING AGAIN

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

#### A :Timing indicator

For procedure, refer to <u>EC-19</u>, "IGNITION TIMING : Special <u>Repair Requirement"</u>. For specification, refer to EC-634, "Ignition Timing".

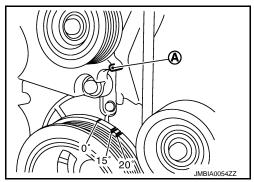
Is the inspection result normal?

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

#### 16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-57, "Removal and Installation".

- Is the inspection result normal?
- YES >> GO TO 17.
- NO >> Repair the timing chain installation. Then GO TO 4.



< BASIC INSPECTION >

1 / .DETECT MALFUNCTIONING PART	Λ
<ul> <li>Check the following.</li> <li>Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-313, "Component Inspection"</u>.</li> <li>Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-309, "Component Inspection"</u>.</li> </ul>	A
Is the inspection result normal?	EC
YES >> GO TO 18. NO >> Repair or replace. Then GO TO 4.	С
18. CHECK ECM FUNCTION	C
1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)	D
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to <u>SEC-8, "ECM RECOMMUNICATING FUNCTION : Special Repair Requirement"</u> .	
	Ε
>> GO TO 4.	
19.INSPECTION END	F
If ECM is replaced during this BASIC INSPECTION procedure, go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".	I
	G
>> INSPECTION END 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	
<b>NOTE:</b> 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	Κ
Requirement	
1.CHECK ECM PART NUMBER	L
Check ECM part number to see whether it is blank ECM or not.	
NOTE: • Part number of blank ECM is 23703 - xxxxx.	M
• Check the part number when ordering ECM or with the one included in the label on the container box.	
Is the ECM a blank ECM?	
YES >> GO TO 2.	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". <b>NOTE:</b>	
The ECM part number is saved in CONSULT.	Ρ
<ul> <li>Even when ECM part number is not saved in CONSULT, go to 3.</li> </ul>	
>> 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 NVIS (NATS) SYSTEM AND REGISTRATION OF ALL NVIS (NATS) IGNI-TION KEY IDS

Refer to SEC-8, "ECM RECOMMUNICATING FUNCTION : Special Repair Requirement".

>> GO TO 6.

**6.**PERFORM VIN REGISTRATION

Refer to EC-20, "VIN REGISTRATION : Special Repair Requirement".

>> GO TO 7.

**1.**PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 8.

8.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING ; Special Repair Requirement". Is the vehicle with SynchroRev Match mode (S-MODE)?

YES >> GO TO 9.

>> GO TO 10. NO

9. PERFORM M/T NEUTRAL POSITION LEARNING

Refer to EC-25, "M/T NEUTRAL POSITION LEARNING : Special Repair Requirement".

>> GO TO 10.

10. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE)

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

INFOID:000000010839388

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

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL

	[VQ37VHR]	
< BASIC INSPECTION > MODULE) : Special Repair Requirement	<u> </u>	
	INFOID:000000010839389	А
<b>1.</b> PERFORM IDLE AIR VOLUME LEARNING Refer to EC-21, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".		
Refer to <u>LO-21, TDEL AIR VOLOME ELARGINO : Opecial Repair Requirement</u> .		EC
>> END IDLE SPEED		С
IDLE SPEED : Description	INFOID:000000010839390	
This describes how to check the idle speed. For the actual procedure, follow the instructi INSPECTION".	ons in "BASIC	D
IDLE SPEED : Special Repair Requirement	INFOID:000000010839391	Е
1.CHECK IDLE SPEED		
With CONSULT     Check idle speed in "DATA MONITOR" mode with CONSULT.     Image: With GST		F
Check idle speed with Service \$01 of GST.		G
>> INSPECTION END		0
IGNITION TIMING		Н
IGNITION TIMING : Description	INFOID:000000010839392	
This describes how to check the ignition timing. For the actual procedure, follow the instruct INSPECTION".	ions in "BASIC	
IGNITION TIMING : Special Repair Requirement	INFOID:0000000010839393	J
1. CHECK IGNITION TIMING		-
1. Attach timing light to loop wire as shown.		K
		L
		M
	SIA0846ZZ	Ν
1. Loop wire		
A. Timing light B. Timing indicator		0
2. Check ignition timing.		Р
>> INSPECTION END VIN REGISTRATION		Г
VIN REGISTRATION : Description	INFOID:000000010839394	

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

#### < BASIC INSPECTION >

[VQ37VHR]

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

#### VIN REGISTRATION : Special Repair Requirement

INEOID-000000010839395

#### 1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to GI-24, "Information About Identification or Model Code".

#### >> GO TO 2.

2. PERFORM VIN REGISTRATION

#### (P)With CONSULT

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

#### >> END ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description INFOLD CONTINUES 200000010839396

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

#### ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement

INFOID:0000000010839397

#### 1.START

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

#### >> END THROTTLE VALVE CLOSED POSITION LEARNING

THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:000000010839398

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.

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:000000010839399

#### 1.START

#### (P)WITH CONSULT

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

Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

**WITHOUT CONSULT** 

1. Start the engine.

#### NOTE:

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

#### **EC-20**

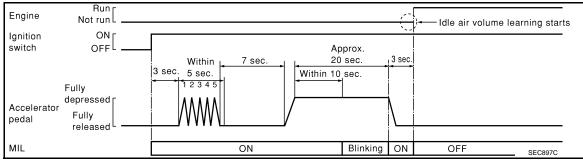
INSPECTION AND ADJUSTMENT	
< BASIC INSPECTION >	[VQ37VHR]
<ol> <li>Warm up the engine.</li> <li>NOTE:</li> <li>Raise engine coolant temperature until it reaches 65°C (149°F) or more.</li> </ol>	A
<ol> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> <li>Check that throttle valve moves during the above 10 seconds by confirming the operating s</li> </ol>	ound.
>> END IDLE AIR VOLUME LEARNING	C
IDLE AIR VOLUME LEARNING : Description	INFOID:000000010839400
<ul> <li>Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle the specific range. It must be performed under the following conditions:</li> <li>Each time electric throttle control actuator or ECM is replaced.</li> <li>Each time VVEL actuator sub assembly or VVEL control module is replaced.</li> </ul>	e speed within D
<ul> <li>Idle speed or ignition timing is out of specification.</li> </ul>	
IDLE AIR VOLUME LEARNING : Special Repair Requirement	INFOID:000000010839401
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)	G
<ul> <li>Engine coolant temperature: 70 - 105°C (158 - 221°F)</li> <li>PNP switch: ON (M/T models) Selector lever: P or N (A/T models)</li> <li>Electric load switch: OFF</li> </ul>	Н
(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.	the engine is
<ul> <li>Steering wheel: Neutral (Straight-ahead position)</li> <li>Vehicle speed: Stopped</li> <li>Transmission: Warmed-up</li> </ul>	J
<ul> <li>A/T models</li> <li>With CONSULT: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" sy less than 0.9V.</li> <li>Without CONSULT: Drive vehicle for 10 minutes.</li> </ul>	stem indicates K
<ul> <li>M/T models</li> <li>Drive vehicle for 10 minutes.</li> </ul>	L
<u>Do you have CONSULT?</u> YES >> GO TO 2.	
NO >> GO TO 3.	Μ
2.PERFORM IDLE AIR VOLUME LEARNING	
<ul> <li>With CONSULT</li> <li>Perform Accelerator Pedal Released Position Learning. Refer to <u>EC-20</u>, "ACCELER, <u>RELEASED POSITION LEARNING : Special Repair Requirement"</u>.</li> </ul>	
<ol> <li>Perform Throttle Valve Closed Position Learning. <u>EC-20, "THROTTLE VALVE CLOSE LEARNING : Special Repair Requirement"</u>.</li> <li>Start engine and warm it up to normal operating temperature.</li> </ol>	<u>O POSITION</u>
<ol> <li>Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.</li> <li>Touch "START" and wait 20 seconds.</li> </ol>	Р
<u>Is "CMPLT" displayed on CONSULT screen?</u> 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 : Special Repair Requirement"</u>.
- 2. Perform Throttle Valve Closed Position Learning. <u>EC-20, "THROTTLE VALVE CLOSED POSITION</u> <u>LEARNING : Special Repair Requirement"</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-634, "Idle Speed"</u> and <u>EC-634, "Ignition Timing"</u>.

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-165</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

#### < BASIC INSPECTION >

#### VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

#### VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description

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

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

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

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement

1.START

Do you have CONSULT?

Do you have CONSULT?

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

2. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

#### With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "VVEL POS SEN ADJ PREP" in "WORK SUPPORT" mode with CONSULT.
- 3. Touch "Start" and wait a few seconds.
- 4. Make sure the "CMPLT" is displayed on CONSULT screen.
- 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).
- 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)

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

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

#### NOTE:

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

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

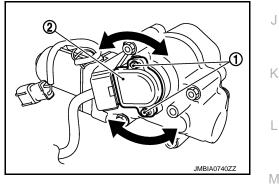
>> INSPECTION END

#### ${\it 3.}$ perform vvel control shaft position sensor adjustment

#### **Without CONSULT**

1. Disconnect VVEL control shaft position sensor harness connector.

#### EC-23



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[VQ37VHR]

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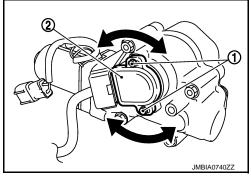
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#### < BASIC INSPECTION >

- 2. Remove VVEL actuator motor relay.
- 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
Bank Connector	Terminal	Terminal		
1	E15	3	4	500 ± 48 mV
2		5	6	500 ± 48 mV

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				
Bank	Connector	+	_	Voltage	
Darik	Bank Connector	Terminal	Terminal		
1	E15	3	4	500 ± 48 mV	
2	2	5	6	500 ± 46 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 <u>EC-21, "IDLE AIR VOLUME LEARNING : Special Repair</u> <u>Requirement"</u>.

#### >> INSPECTION END MIXTURE RATIO SELF-LEARNING VALUE CLEAR

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

INFOID:000000010839404

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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:000000010839405

1.START

#### With CONSULT

< BASIC INSPECTION >	[VQ37VHR]
<ol> <li>Start engine and warm it up to normal operating temperature.</li> <li>Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.</li> <li>Clear mixture ratio self-learning value by touching "CLEAR".</li> </ol>	
With GST <ol> <li>Start engine and warm it up to normal operating temperature.</li> </ol>	
<ol> <li>Start engine and warm it up to normal operating temperature.</li> <li>Turn ignition switch OFF.</li> </ol>	
3. Disconnect mass air flow sensor (bank 1) harness connector.	
<ol> <li>Restart engine and let it idle for at least 5 seconds.</li> <li>Stop engine and reconnect mass air flow sensor (bank 1) harness connector.</li> </ol>	
<ol><li>Select Service \$03 with GST. Make sure DTC P0102 is detected.</li></ol>	
7. Select Service \$04 with GST to erase the DTC P0102.	
>> END	
W/T NEUTRAL POSITION LEARNING	
M/T NEUTRAL POSITION LEARNING : Description	
	INFOID:000000010839406
M/T Neutral Position Learning is a function in which ECM learns the shift lever neutral position putput voltage of gear lever position sensor.	on by monitoring
This must be performed when the following conditions are fulfilled.	
Gear lever position sensor is replaced	
ECM is replaced Shift position indicator "N" is blinking	
M/T NEUTRAL POSITION LEARNING : Special Repair Requirement	INFOID:000000010839407
.START	
Do you have CONSULT?	
Do vou have CONSULT?	
YES >> GO TO 2.	
NO >> GO TO 3.	
2.PERFORM M/T NEUTRAL POSITION LEARNING	
<ol> <li>Check that there is no sticking when shifting shift lever to the neutral position.</li> <li>Turn ignition switch ON.</li> </ol>	
3. Select "M/T NEUTRAL POS LEARN" in "WORK SUPPORT" mode with CONSULT.	
I. Touch "Start" and wait a few seconds. NOTE:	
Note: Never touch shift lever. Otherwise learning may not complete normally.	
<ol> <li>Make sure the "COMPLETE" is displayed on CONSULT screen.</li> <li>NOTE:</li> </ol>	
If "INCMP" is displayed, return to step 1 and repeat the procedures again.	
>> END	
<b>3.</b> PERFORM M/T NEUTRAL POSITION LEARNING	
Without CONSULT	
NOTE:	
<ul> <li>It is better to count the time accurately with a clock.</li> <li>It is impossible to switch the learning mode when a clutch interlock switch circuit has</li> </ul>	s a malfunction.
1. Check that there is no sticking when shifting shift lever to the neutral position.	
<ol> <li>Turn ignition switch ON and wait 5 seconds.</li> <li>Within 5 seconds repeat the following operation 3 times. Fully depress and fully release c</li> </ol>	lutch pedal while
pressing and holding S-MODE switch.	

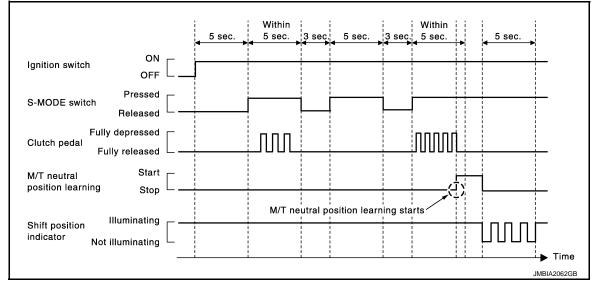
- 4. Wait 3 seconds while S-MODE switch is released.
- 5. Wait 5 seconds while pressing S-MODE switch.
- 6. Wait 3 seconds while S-MODE switch is released.

#### < BASIC INSPECTION >

- Within 5 seconds repeat the following operation 5 times. Fully depress and fully release clutch pedal while pressing and holding S-MODE switch.
  - ECM starts M/T Neutral Position Learning.

#### NOTE:

Never touch shift lever. Otherwise learning may not complete normally.



8. Shift position indicator on combination meter blinks for 5 seconds when the leaning is complete. **NOTE:** 

If shift position indicator does not blink or blinks continuously, return to step 1 and repeat the procedures again.

>> END

#### < BASIC INSPECTION >

#### HOW TO SET SRT CODE

#### Description

INFOID:000000010839408

[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 <sup>*1</sup> (CONSULT indication)	Performance Priority <sup>*2</sup>	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.	D
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	F
		Heated oxygen sensor 2	P0137, P0157	(-
		Heated oxygen sensor 2	P0138, P0158	G
		Heated oxygen sensor 2	P0139, P0159	
EGR/VVT SYSTEM	2	Intake value timing control function	P0011, P0021	Н

\*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.

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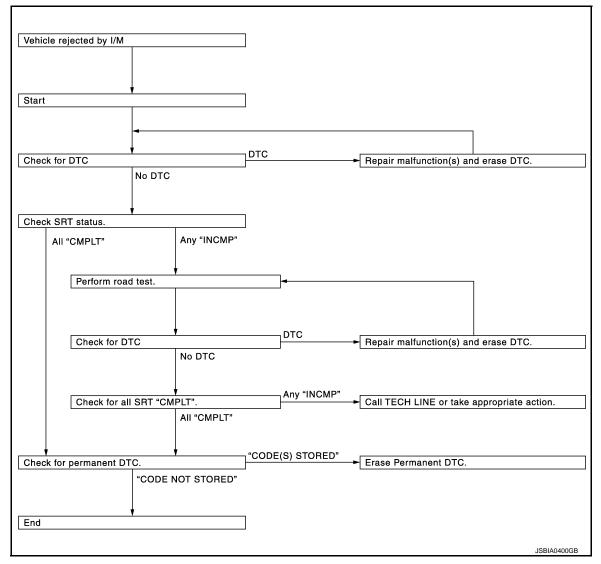
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EC

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#### < BASIC INSPECTION >



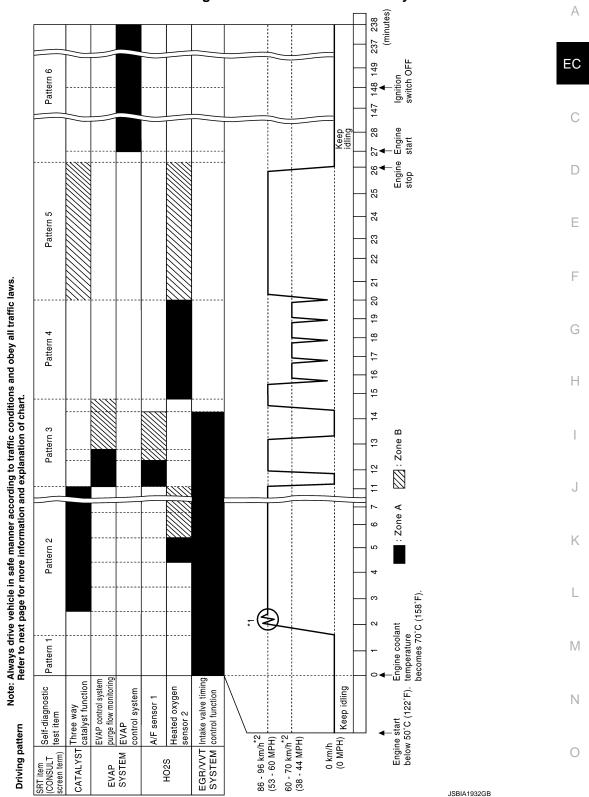
#### SRT Set Driving Pattern

INFOID:000000010839409

CAUTION:

#### < BASIC INSPECTION >

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



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

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

< BASIC INSPECTION >

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

#### NOTE:

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

#### Work Procedure

INFOID:000000010839410

1. СНЕСК DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-576, "DTC Index"</u>.

NO >> GO TO 2.

2. CHECK SRT STATUS

#### With CONSULT

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

Without CONSULT

Perform "SRT status" mode with EC-152, "On Board Diagnosis Function".

@With GST

Select Service \$01 with GST.

#### Is SRT code(s) set?

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

**3.** DTC CONFIRMATION PROCEDURE

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

- For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" according to the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-27, "Description"</u>.
- 3. Check DTC.

Is any DTC detected?

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

#### **4.**PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to EC-27, "Description".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to <u>EC-28</u>, "<u>SRT Set Driving</u> <u>Pattern</u>".

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

>> GO TO 5.

#### 5.PATTERN 1

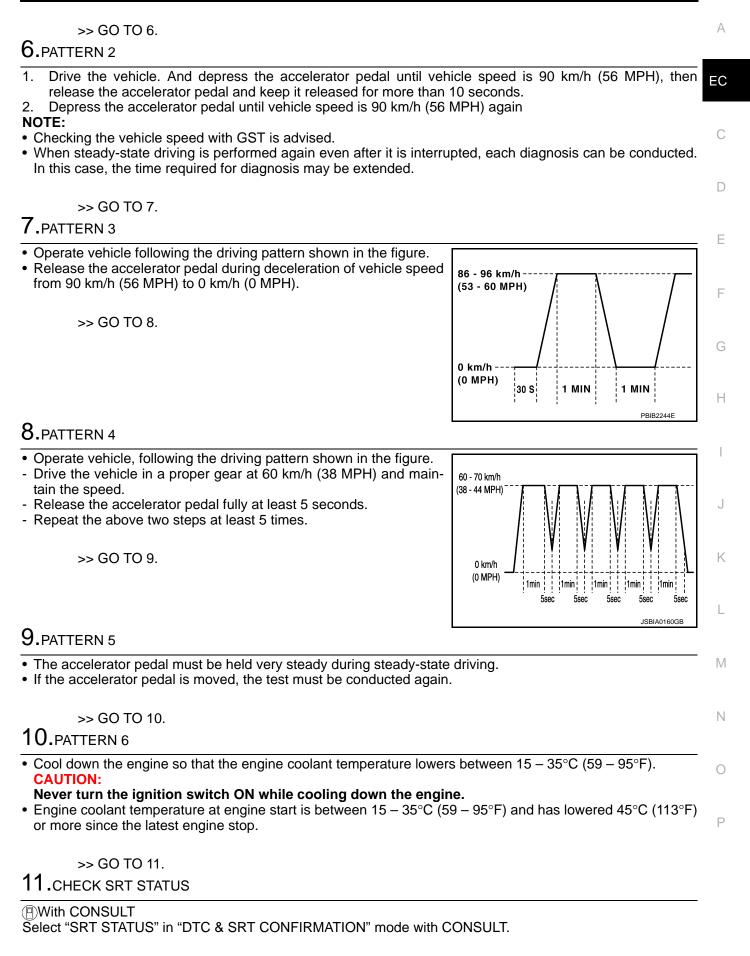
- 1. Check the vehicle condition;
- Engine coolant temperature is –10 to 35°C (14 to 95°F).
- Fuel tank temperature is more than 0°C (32°F).
- 2. Start the engine.
- 3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

#### NOTE:

- ECM terminal voltage is follows;
- Engine coolant temperature
- −10 to 35°C (14 to 95°F): 3.0 − 4.3 V
- 70°(158°F): Less than 4.1 V
- Fuel tank temperature: Less than 1.4 V
- Refer to EC-534, "Reference Value".

< BASIC INSPECTION >

#### [VQ37VHR]



**EC-31** 

< BASIC INSPECTION >

 Without CONSULT Perform "SRT status" mode with <u>EC-152. "On Board Diagnosis Function"</u>.
 With GST Select Service \$01 with GST.
 <u>Is SRT(s) set?</u>

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

**12.**CHECK PERMANENT DTC

#### NOTE:

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

YES >> Go to EC-27, "Description".

NO >> END

#### < BASIC INSPECTION >

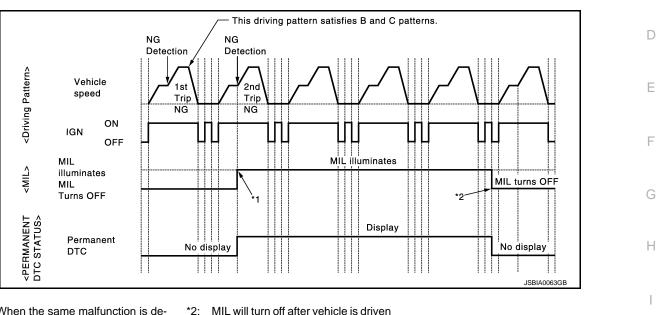
#### HOW TO ERASE PERMANENT DTC

#### Description

#### OUTLINE

#### When a DTC is stored in ECM

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



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

#### When a DTC is not stored in ECM

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

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

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

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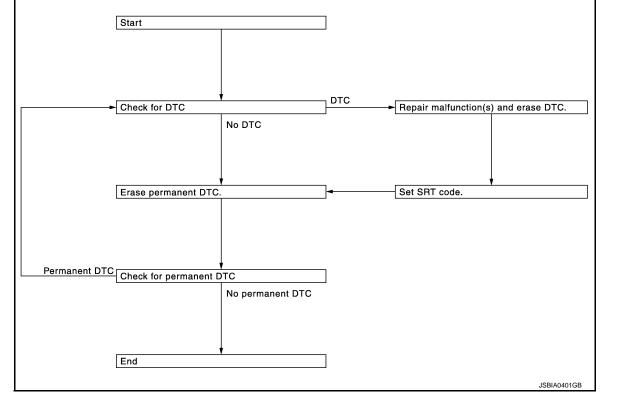
[VQ37VHR]

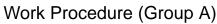
#### HOW TO ERASE PERMANENT DTC

#### < BASIC INSPECTION >

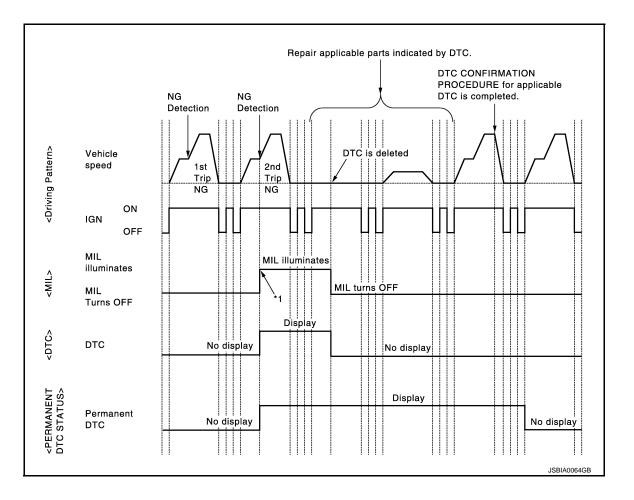
#### [VQ37VHR]

#### PERMANENT DTC SERVICE PROCEDURE





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#### HOW TO ERASE PERMANENT DTC

#### < BASIC INSPECTION >

\*1: When the same malfunction is de-А tected in two consecutive trips, MIL will illuminate. 1.CHECK DTC EC Check DTC. Is any DTC detected? YES >> Repair malfunction(s) and erase DTC. Refer to EC-152, "On Board Diagnosis Function", EC-155. "CONSULT Function". NO >> GO TO 2. D 2.CHECK PERMANENT DTC With CONSULT Е 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. 4. Turn ignition switch ON. F Select "PERMANENT DTC STATUS" mode with CONSULT. 5. With GST 1. Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. 2. 3. Turn ignition switch OFF and wait at least 10 seconds. 4. Turn ignition switch ON. 5. Select Service \$0A with GST. Н Is any permanent DTC detected? YES >> GO TO 3. NO >> END **3.** PERFORM DTC CONFIRMATION PROCEDURE Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in J ECM. Refer to EC-576, "DTC Index". >> GO TO 4. Κ **4.**CHECK PERMANENT DTC With CONSULT ĭ. L Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. 4. Turn ignition switch ON. Μ 5. Select "PERMANENT DTC STATUS" mode with CONSULT. With GST 1. Turn ignition switch OFF and wait at least 10 seconds. Ν 2. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. 3. Turn ignition switch ON. 4. Select Service \$0A with GST. 5. Is any permanent DTC detected? YES >> GO TO 1. NO Ρ >> END

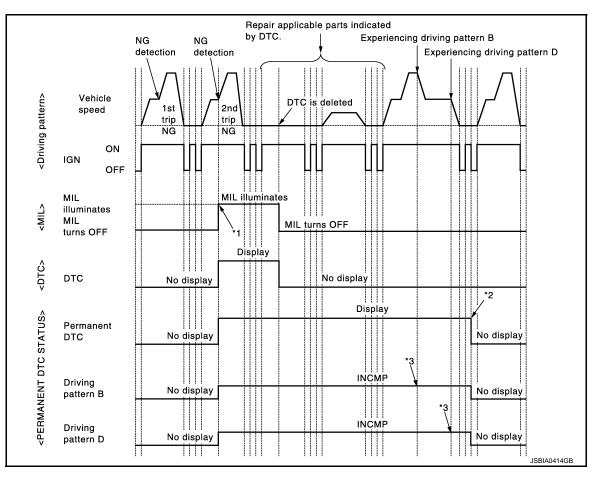
#### HOW TO ERASE PERMANENT DTC

#### < BASIC INSPECTION >

#### Work Procedure (Group B)

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[VQ37VHR]



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

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

#### NOTE:

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

#### 1.CHECK DTC

Check DTC.

#### Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-152. "On Board Diagnosis Function"</u>, <u>EC-155.</u> <u>"CONSULT Function"</u>.

NO >> GO TO 2.

#### 2. CHECK PERMANENT DTC

With CONSULT

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

#### With GST

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

## HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION > [VQ37VHR]
<ol> <li>Turn ignition switch ON.</li> <li>Select Service \$0A with GST.</li> </ol>
Is any permanent DTC detected?
YES >> GO TO 3. NO >> END EC
3. DRIVE DRIVING PATTERN B
CAUTION:
• Always drive at a safe speed.
<ul> <li>Never erase self-diagnosis results.</li> <li>If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving</li> </ul>
pattern B and D is reset.
<ol> <li>Start engine and warm it up to normal operating temperature.</li> <li>Use "PERMANENT DTC WORK SUPPORT" mode with CONSULT to drive the vehicle according to driving pattern B. Refer to <u>EC-155</u>, "CONSULT Function", <u>EC-149</u>, "DIAGNOSIS DESCRIPTION : Driving</li> </ol>
Pattern".
1. Start engine and warm it up to normal operating temperature.
<ol> <li>Drive the vehicle according to driving pattern B. Refer to <u>EC-149</u>, "<u>DIAGNOSIS DESCRIPTION</u>: <u>Driving</u> <u>Pattern</u>".</li> </ol>
G
>> GO TO 4.
<b>4.</b> CHECK PERMANENT DTC H
<ol> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> <li>Turn ignition switch ON</li> </ol>
<ol> <li>Turn ignition switch ON.</li> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> </ol>
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.
Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
<ol> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> <li>Turn ignition switch ON.</li> </ol>
5. Select Service \$0A with GST.
Is any permanent DTC detected?
YES >> GO TO 5. NO >> END
F
CAUTION: • Always drive at a safe speed.
Never erase self-diagnosis results.
<ul> <li>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.</li> </ul>
<ol> <li>Drive the vehicle according to driving pattern D. Refer to <u>EC-149</u>, "<u>DIAGNOSIS DESCRIPTION</u> : <u>Driving</u> <u>Pattern</u>".</li> </ol>
>> GO TO 6.
6. CHECK PERMANENT DTC

# With CONSULT1. Turn ignition sv

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

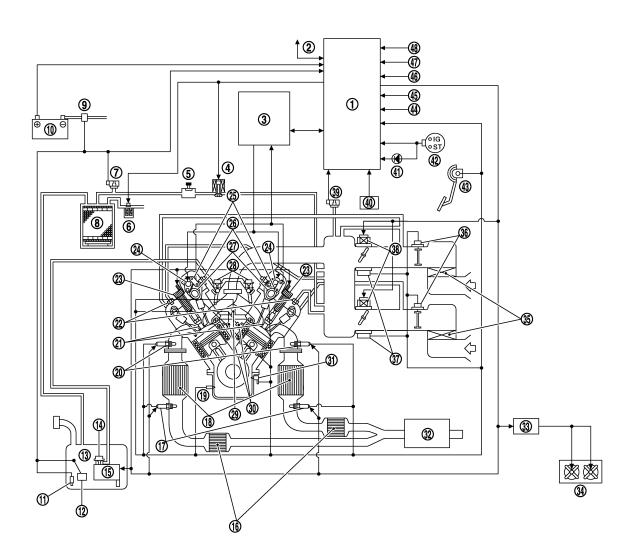
< BASIC INSPECTION >

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

#### < SYSTEM DESCRIPTION >

## SYSTEM DESCRIPTION ENGINE CONTROL SYSTEM

System Diagram



1. ECM

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

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

#### [VQ37VHR]

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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

JSBIA0157ZZ

24. VVEL actuator motor

#### < SYSTEM DESCRIPTION >

[VQ37VHR]

27. Camshaft position sensor (PHASE)

Cooling fan control module

Refrigerant pressure sensor

temperature sensor)

Input speed sensor

36. Mass air flow sensor (with intake air

Manifold absolute pressure (MAP)

Knock sensor

sensor

42. Ignition switch

30.

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- 25. VVEL control shaft position sensor 26. Intake valve timing control solenoid valve 28. Fuel damper 29. Engine coolant temperature sensor 31. Crankshaft position sensor (POS) 32. Muffler 34. Cooling fan 35. Air cleaner 37. Electric throttle control actuator 38. Throttle position sensor
- 43. Accelerator pedal position sensor
- 46. PNP signal

#### System Description

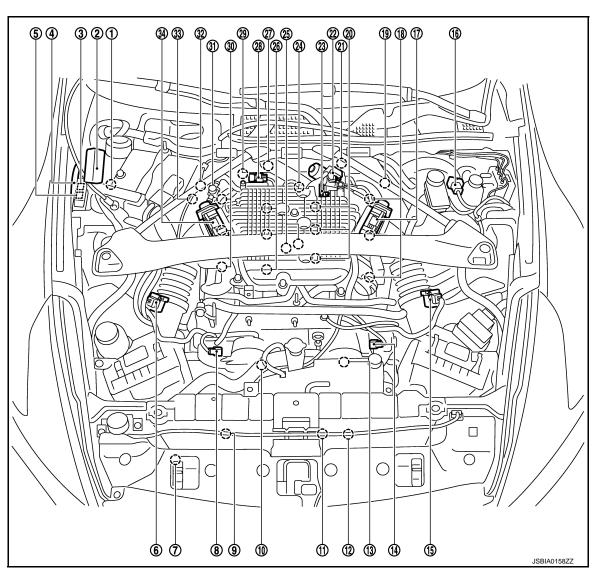
ECM performs various controls such as fuel injection control and ignition timing control.

#### **Component Parts Location**

40. Brake booster pressure sensor

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

- - 41. MIL
  - 44. Power steering pressure sensor
  - 47. Gear lever position sensor



#### < SYSTEM DESCRIPTION >

[VQ37VHR]

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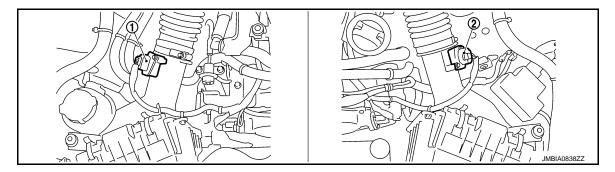
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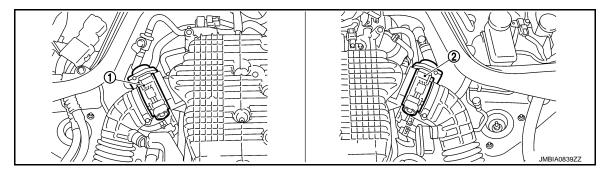
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control solenoid valve
- 31. EVAP service port
- 34. Electric throttle control actuator (bank 1)

- Camshaft position sensor (PHASE) 9. (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)
- 32. A/F sensor 1 (bank 1)

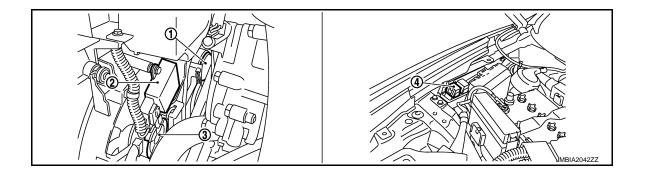
- Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- Ignition coil (with power transistor) and spark plug (bank 2)
- 21. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)
- 33. Crankshaft position sensor (POS)



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)

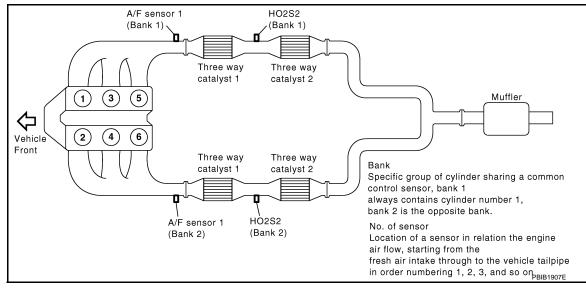


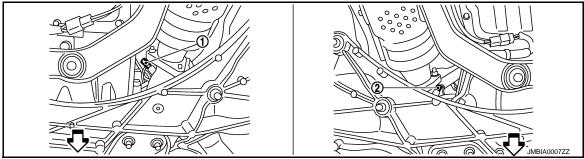
#### < SYSTEM DESCRIPTION >

#### C: Vehicle front

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

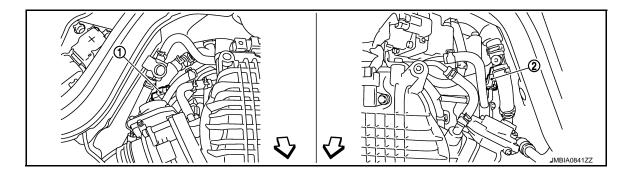
4. Cooling fan relay





C : Vehicle front

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

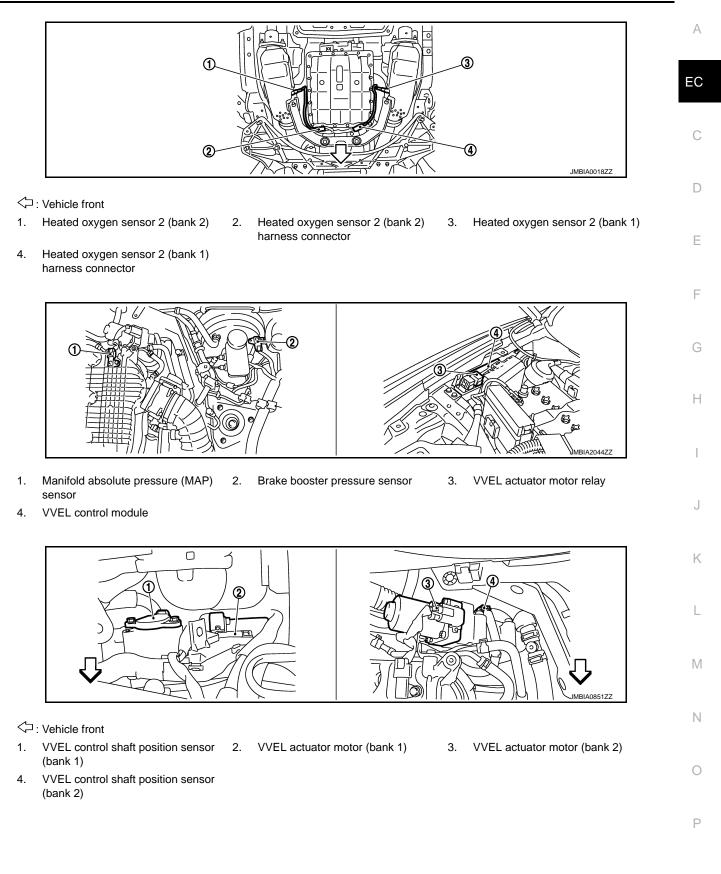


C: Vehicle front

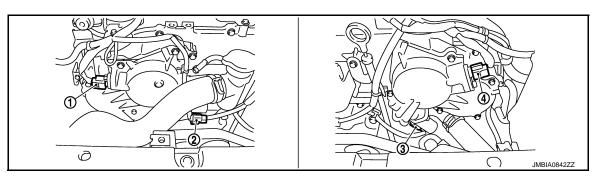
1. A/F sensor 1 (bank 1) harness con- 2. A/F nector net

A/F sensor 1 (bank 2) harness connector

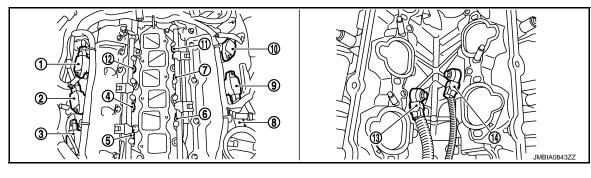
#### < SYSTEM DESCRIPTION >



#### < SYSTEM DESCRIPTION >



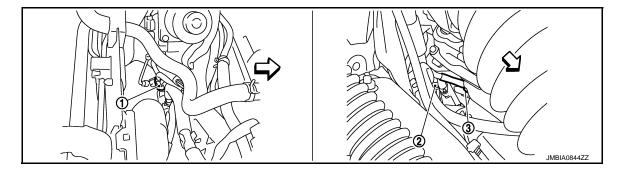
- Camshaft position sensor (PHASE) 2. 1. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid 3. valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector



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

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

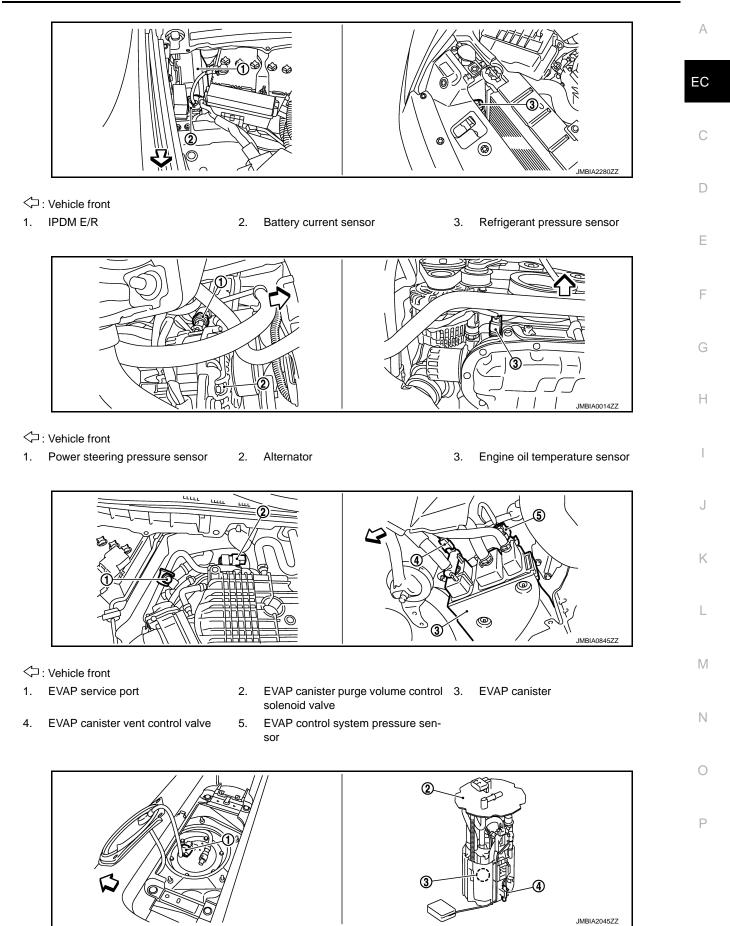
- Ignition coil No.1 (with power transistor)
- 6. Fuel injector No.2
  - Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5



C: Vehicle front

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

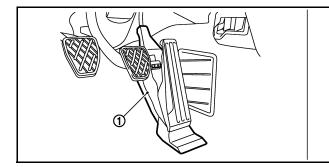
#### < SYSTEM DESCRIPTION >



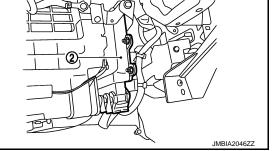
#### < SYSTEM DESCRIPTION >

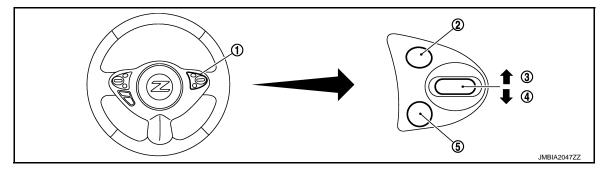
#### └─ : Vehicle front

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





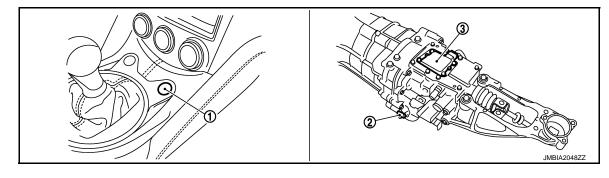




- ASCD steering switch 1.
- SET/COAST switch 4.
- CANCEL switch 2. MAIN switch

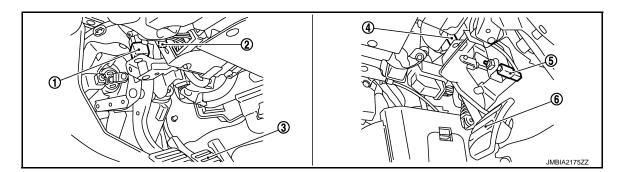
5.

**RESUME/ACCELERATE** switch 3.



1. S-mode switch

- 2. Input speed sensor
- 3. Gear lever position sensor



#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

- 1. Stop lamp switch
- 4. Clutch pedal position switch
- 2. ASCD brake switch
- 5. Clutch interlock switch
- 3. Brake pedal
  - 6. Clutch pedal

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EC

## **Component Description**

Component	Reference	
A/F sensor 1	EC-235, "Description"	
A/F sensor 1 heater	EC-188, "Description"	
Accelerator pedal position sensor	EC-481, "Description"	
ASCD brake switch	EC-457, "Description"	
ASCD steering switch	EC-454, "Description"	
Brake booster pressure sensor	EC-383, "Description"	
Camshaft position sensor (PHASE)	EC-310, "Description"	
Clutch pedal position switch	EC-406, "Description"	
Clutch interlock switch	EC-401, "Description"	
Cooling fan control module	EC-502. "Description"	
Cooling fan motor	EC-502, "Description"	
Crankshaft position sensor (POS)	EC-306, "Description"	
Electric throttle control actuator	EC-447, "Description"	
Engine coolant temperature sensor	EC-221, "Description"	
Engine oil temperature sensor	EC-287, "Description"	
EVAP canister purge volume control solenoid valve	EC-324, "Description"	
EVAP canister vent control valve	EC-332, "Description"	
EVAP control system pressure sensor	EC-340, "Description"	
Fuel injector	EC-508, "Description"	
Fuel level sensor	EC-361, "Description"	
Fuel pump	EC-511, "Description"	
Fuel tank temperature sensor	EC-280, "Description"	
Gear lever position sensor (PHASE)	EC-396, "Description"	
Heated oxygen sensor 2	EC-245. "Description"	
Heated oxygen sensor 2 heater	EC-191, "Description"	
Ignition signal	EC-514, "Description"	
Input speed sensor	EC-493, "Description"	
Intake air temperature sensor	EC-215. "Description"	
Intake valve timing control solenoid valve	EC-194, "Description"	
Knock sensor	EC-303, "Description"	
Manifold absolute pressure (MAP) sensor	EC-209, "Description"	
Mass air flow sensor	EC-197, "Description"	
PCV valve	EC-525. "Description"	
Power steering pressure sensor	EC-380, "Description"	
Refrigerant pressure sensor	EC-527, "Description"	
Stop lamp switch	EC-473. "Description"	
Throttle control motor	EC-445, "Description"	
Throttle control motor relay	EC-452, "Description"	
Throttle position sensor	EC-224, "Description"	

Revision: 2014 September

#### < SYSTEM DESCRIPTION >

Component	Reference
VVEL actuator motor	EC-423, "Description"
VVEL actuator motor relay	EC-427, "Description"
VVEL control module	EC-467, "Description"
VVEL control shaft position sensor	EC-420, "Description"

#### < SYSTEM DESCRIPTION >

## MULTIPORT FUEL INJECTION SYSTEM

## System Diagram



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[VQ37VHR]

	~		7	
Crankshaft position sensor (POS)	Engine speed <sup>*2</sup> & Piston position			
Camshaft position sensor (PHASE)				
Mass air flow sensor	Amount of intake air			
Intake air temperature sensor	Intake air temperature	•		
Engine coolant temperature sensor	Engine coolant temperature	•		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas	•		
Throttle position sensor	Throttle position		Fuel injection & mixture ratio	
Accelerator pedal position sensor	Accelerator pedal position	ECM	control Fuel inje	ctor
Park/neutral position (PNP) switch (M/T models) TCM(A/T models)	Gear position			
Battery	Battery voltage <sup>*2</sup>	•		
Knock sensor	Engine knocking condition	•		
Power steering pressure sensor	Power steering operation	•		
Heated oxygen sensor 2 <sup>*1</sup>	Density of oxygen in exhaust gas			
ABS actuator and electric unit (control unit)	VDC/TCS operation command			
Combination meter	Air conditioner operation & Vehicle speed	•		
*1 : This sensor is not used to control	the engine system under normal conditions.	L	-	
	status by the signals of engine speed and batter	y voltage.		
This signal is sent via the CAN co			JMBIA216	68GB

## System Description

## INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	Engine speed* <sup>3</sup>			
Camshaft position sensor (PHASE)	Piston position			
Mass air flow sensor	Amount of intake air			
Intake air temperature sensor	Intake air temperature			
Engine coolant temperature sensor	Engine coolant temperature			
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas			
Throttle position sensor	Throttle position			
Accelerator pedal position sensor	Accelerator pedal position	-		
Park/neutral position (PNP) switch (M/T models) TCM (A/T models)	Gear position	<ul> <li>Fuel injection</li> <li>&amp; mixture ratio</li> <li>control</li> </ul>	Fuel injector	
Battery	Battery voltage* <sup>3</sup>			
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			
Combination meter	Air conditioner operation* <sup>2</sup>			
Combination meter	Vehicle speed* <sup>2</sup>			

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

**EC-49** 

#### < SYSTEM DESCRIPTION >

[VQ37VHR]

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

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

#### SYSTEM DESCRIPTION

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

#### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

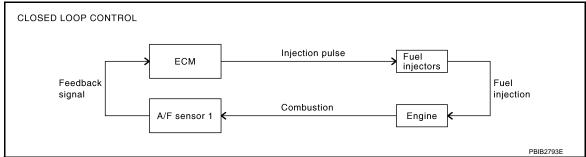
<Fuel increase>

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

<Fuel decrease>

- During deceleration
- During high engine speed operation

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



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 1 can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to <u>EC-235</u>, "<u>Description</u>". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture). This stage is referred to as the closed loop control condition.

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

Open Loop Control

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

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

#### MIXTURE RATIO SELF-LEARNING CONTROL

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

#### EC-50

#### < SYSTEM DESCRIPTION >

designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.

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

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

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

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

#### FUEL INJECTION TIMING

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

Two types of systems are used.

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

#### FUEL SHUT-OFF

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

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[VQ37VHR]

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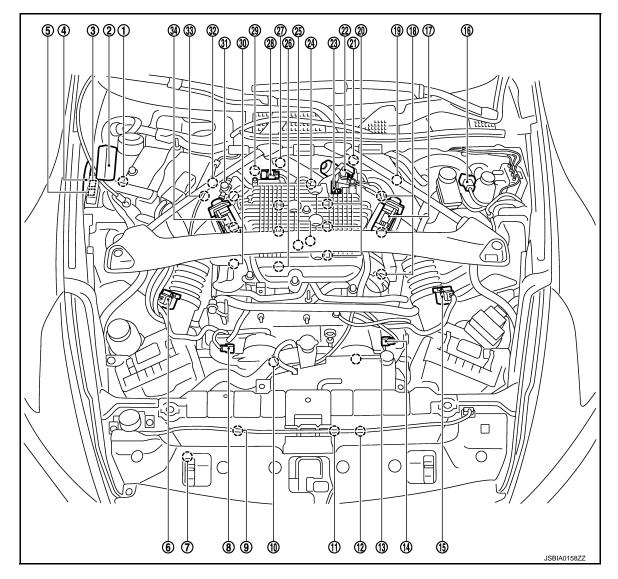
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#### < SYSTEM DESCRIPTION >

#### **Component Parts Location**

INFOID:000000010839420



- 1. Battery current sensor
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control solenoid valve

- 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. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)

- 3. Cooling fan relay
- 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. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

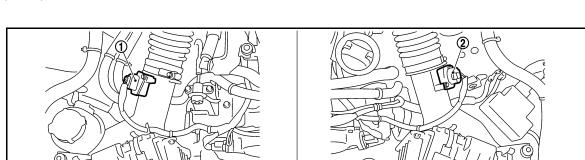
#### < SYSTEM DESCRIPTION >

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

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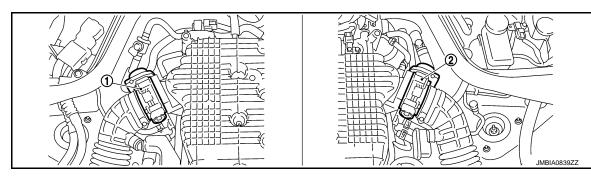
[VQ37VHR]

34. Electric throttle control actuator (bank 1)

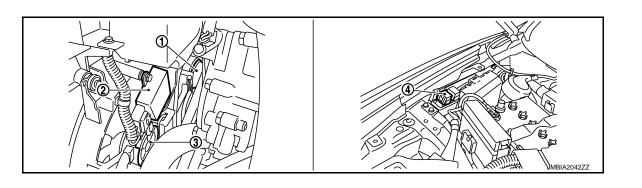


1. Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)

2.



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



Cooling fan control module

C: Vehicle front

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

Cooling fan motor-1

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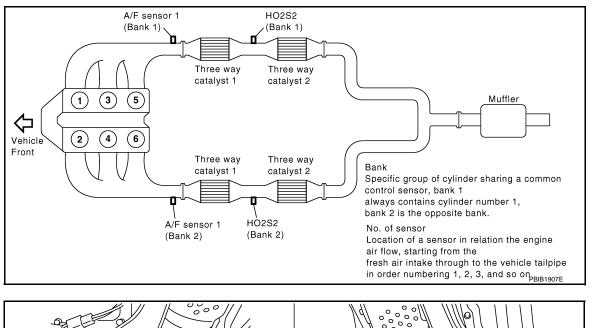
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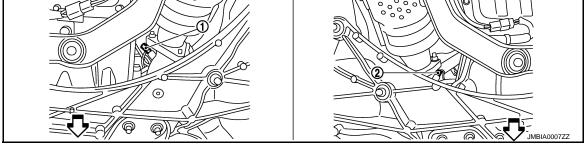
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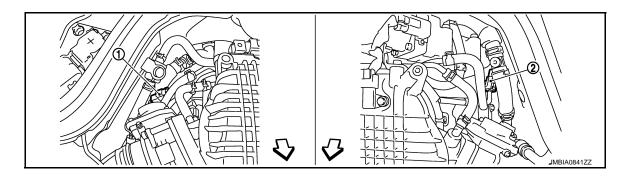
#### < SYSTEM DESCRIPTION >





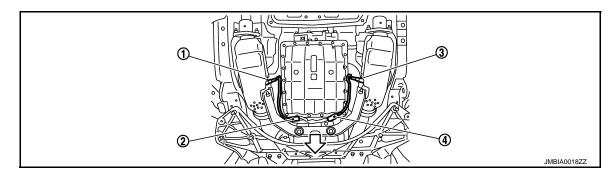
#### └□: Vehicle front

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



C: Vehicle front

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



#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

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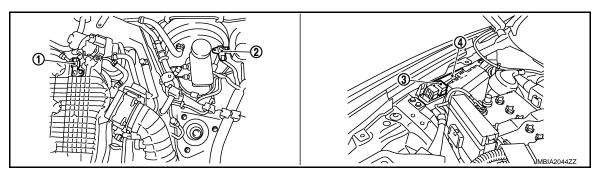
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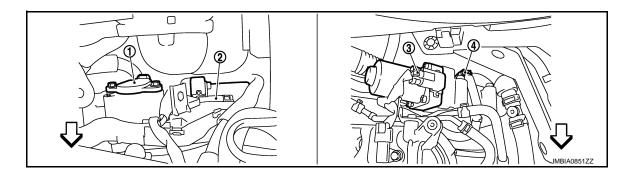
#### C: Vehicle front

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

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



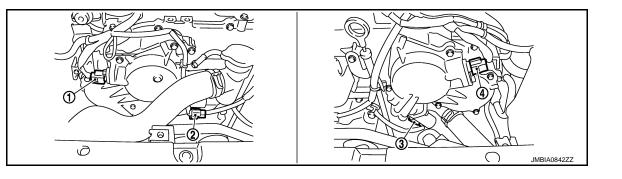
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



C: Vehicle front

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

 VVEL control shaft position sensor (bank 2)



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

#### < SYSTEM DESCRIPTION >

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

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- 7. Fuel injector No.4
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)
- Fuel injector No.1 5.
- Ignition coil No.2 (with power transis- 9. 8. tor)

Ignition coil No.3 (with power transis- 3.

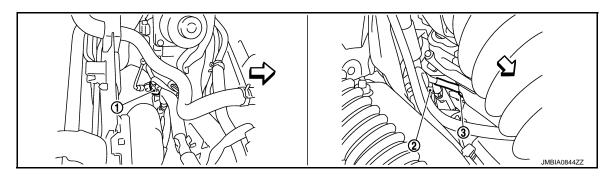
tor)

14. Knock sensor (bank 2)

Ignition coil No.1 (with power transistor)

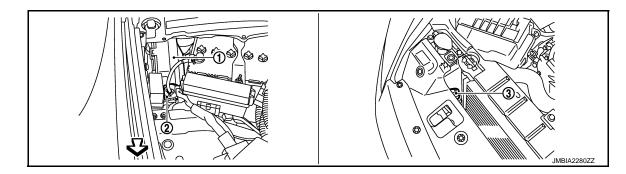
[VQ37VHR]

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



└□: Vehicle front

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



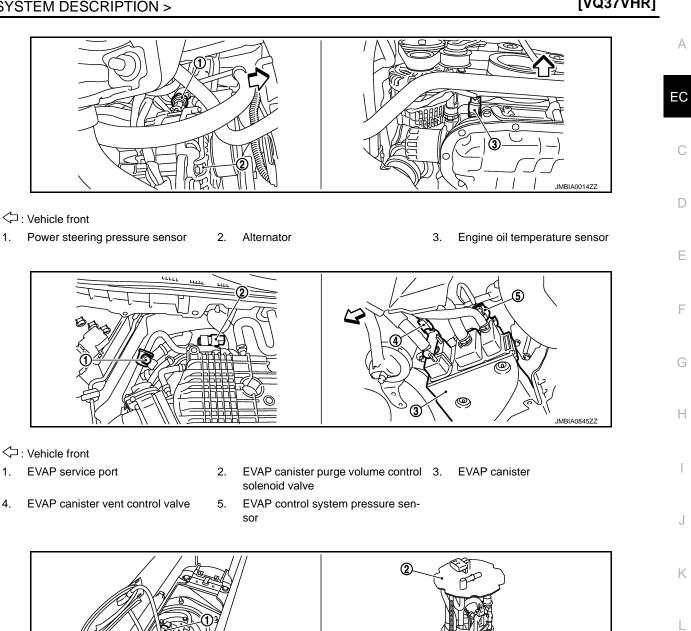
└─ : Vehicle front

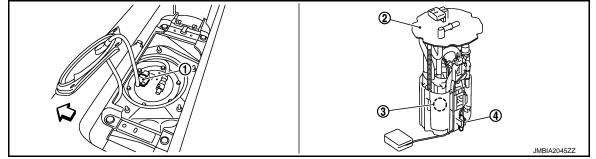
IPDM E/R 1.

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

#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]





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.

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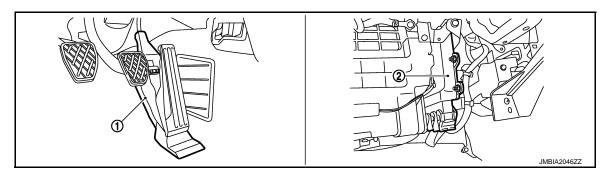
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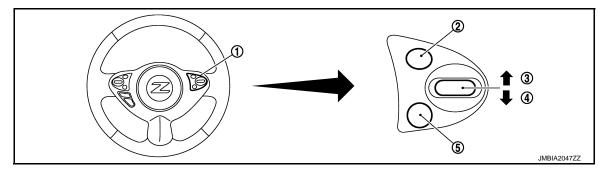
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#### < SYSTEM DESCRIPTION >

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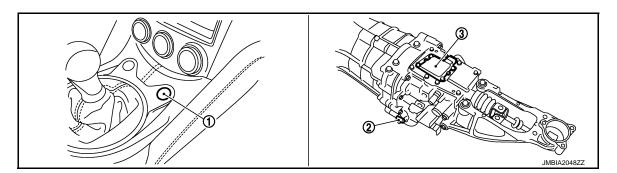


Accelerator pedal position sensor 2. ECM 1.



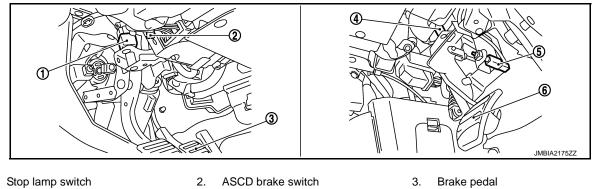
- ASCD steering switch 1.
- 2. CANCEL switch
- 4. SET/COAST switch
- 5. MAIN switch

**RESUME/ACCELERATE** switch 3.



S-mode switch 1.

- 2. Input speed sensor
- 3. Gear lever position sensor



Clutch pedal position switch 4.

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**Component Description** 

- 5. Clutch interlock switch
- - 6. Clutch pedal

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#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

Component	Reference	٨
A/F sensor 1	EC-235, "Description"	A
Accelerator pedal position sensor	EC-481, "Description"	
Camshaft position sensor (PHASE)	EC-310, "Description"	EC
Crankshaft position sensor (POS)	EC-306, "Description"	
Engine coolant temperature sensor	EC-221, "Description"	
Fuel injector	EC-508, "Description"	С
Heated oxygen sensor 2	EC-245, "Description"	
Intake air temperature sensor	EC-215, "Description"	D
Knock sensor	EC-303, "Description"	
Mass air flow sensor	EC-197, "Description"	
Power steering pressure sensor	EC-380, "Description"	E
Throttle position sensor	EC-224, "Description"	

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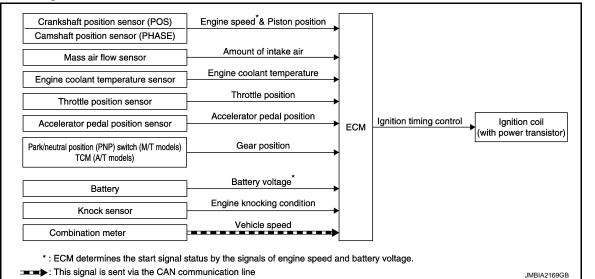
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#### < SYSTEM DESCRIPTION >

## ELECTRIC IGNITION SYSTEM

#### System Diagram



## System Description

INFOID:000000010839423

## INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed* <sup>2</sup>		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air	-	
Engine coolant temperature sensor	Engine coolant temperature	-	
Throttle position sensor	Throttle position     Ignition timing control       Accelerator pedal position     Ignition timing control       Gear position     Battery voltage*2       Engine knocking     Ignition timing control	0 0	Ignition coil (with power transistor)
Accelerator pedal position sensor			
Park/neutral position (PNP) switch (M/T models) TCM (A/T models)			
Battery		-	
Knock sensor		-	
Combination meter	Vehicle speed <sup>*1</sup>		

\*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

## EC-60

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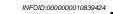
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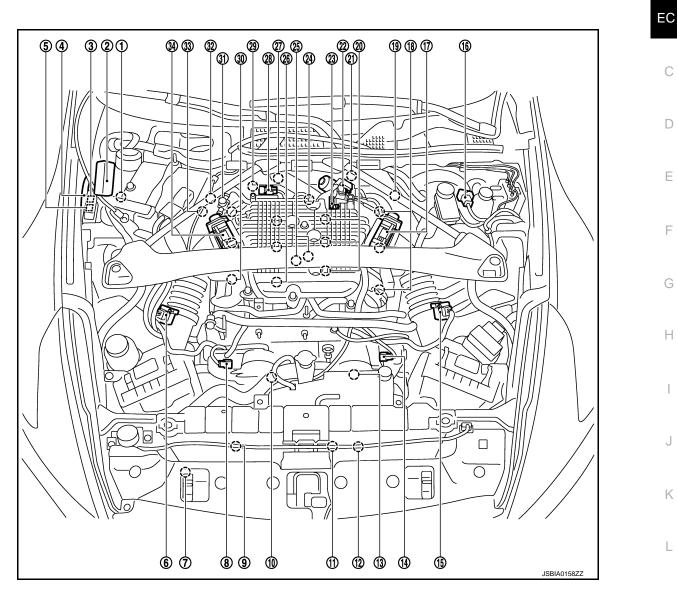
#### [VQ37VHR]

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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**





- 1. Battery current sensor
- VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control 2 solenoid valve

- 2. IPDM E/R
- 5. VVEL actuator motor relay
- Camshaft position sensor (PHASE) (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)
- Μ Cooling fan relay 3. Mass air flow sensor (with intake air 6. temperature sensor) (bank 1) 9. Cooling fan motor-2 Ν 12. Cooling fan motor-1 15. Mass air flow sensor (bank 2) 18. Ignition coil (with power transistor) Ρ and spark plug (bank 2)
- 21. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)



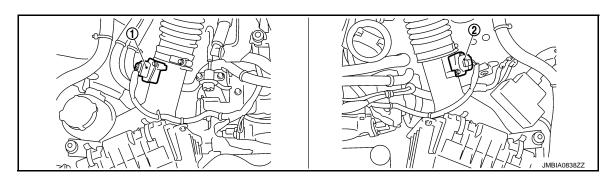
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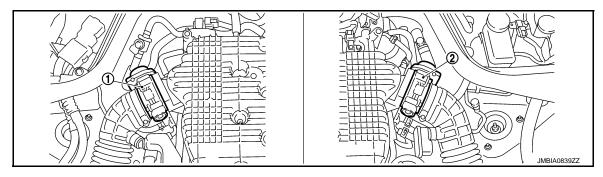
[VQ37VHR]

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

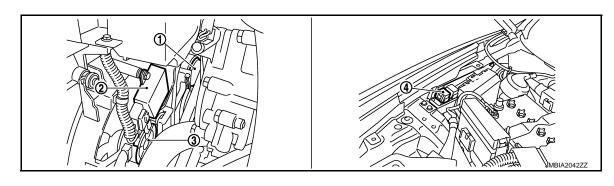
34. Electric throttle control actuator (bank 1)



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



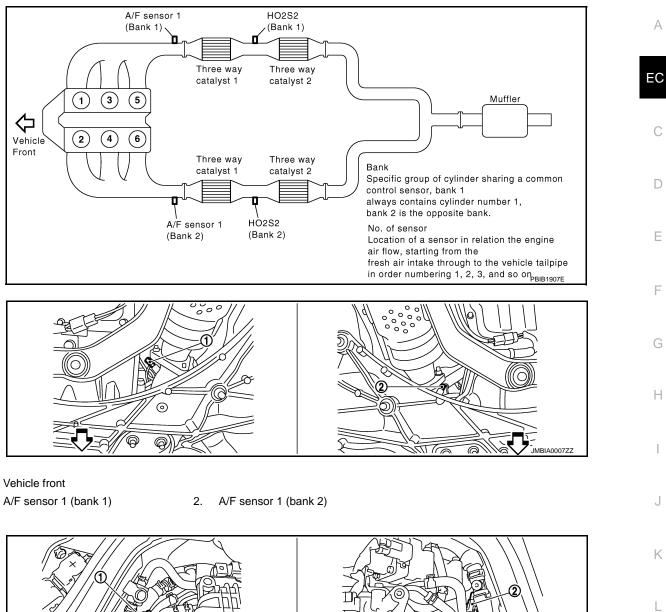
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



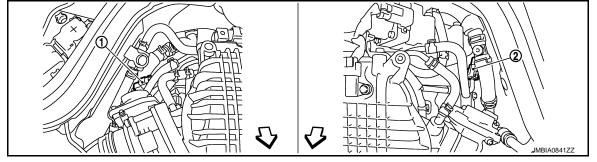
C: Vehicle front

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

#### < SYSTEM DESCRIPTION >

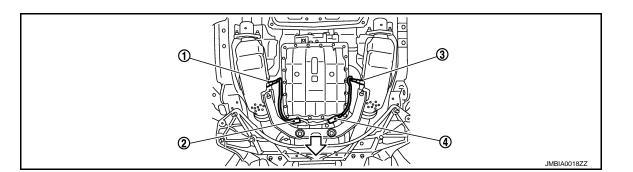


- C: Vehicle front
- 1.



C: Vehicle front

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



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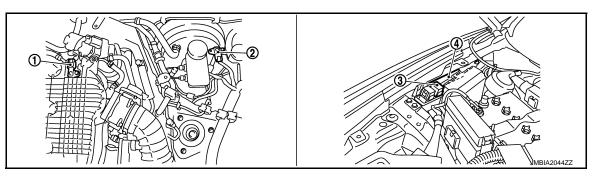
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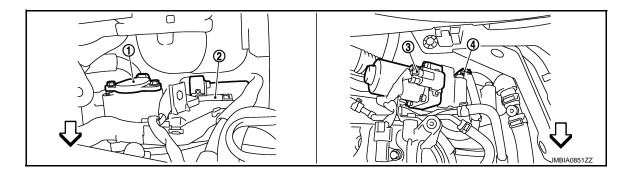
#### └─ : Vehicle front

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

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



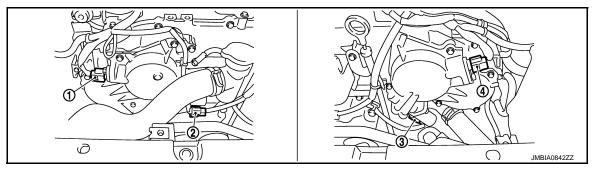
- Manifold absolute pressure (MAP) 1. 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)

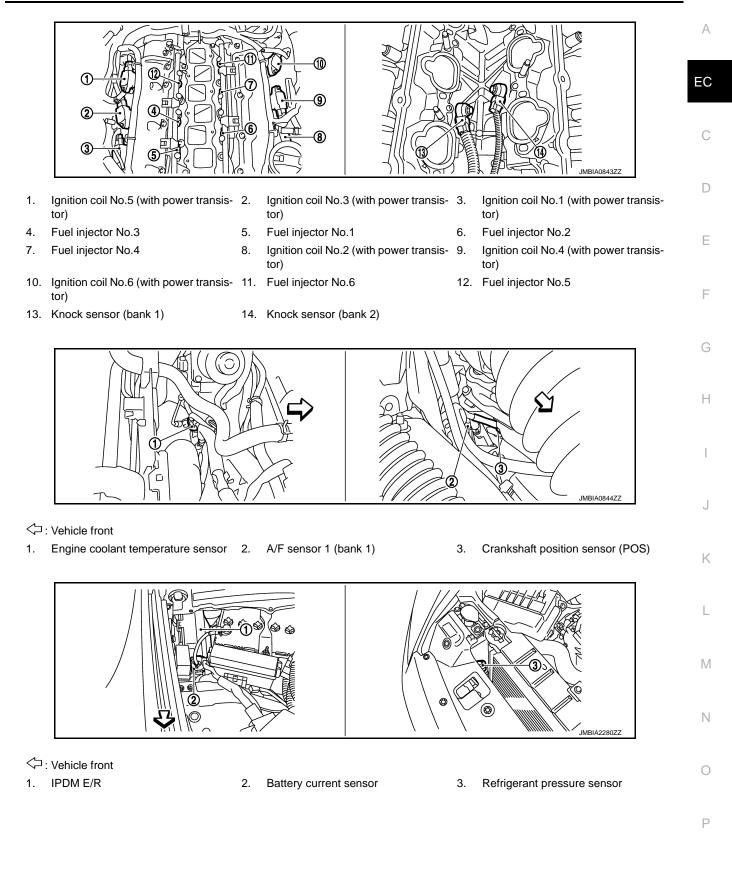


- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

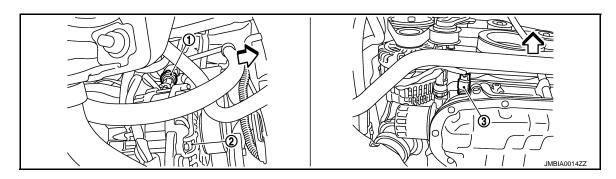
Intake valve timing control solenoid 3. valve (bank 1) harness connector

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

#### < SYSTEM DESCRIPTION >

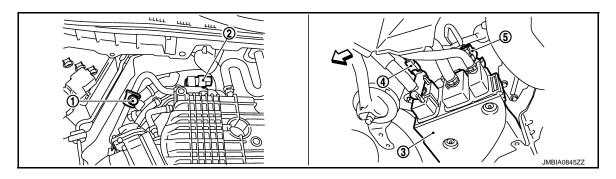


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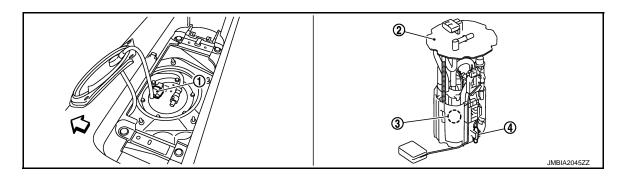


- C: Vehicle front
- 1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



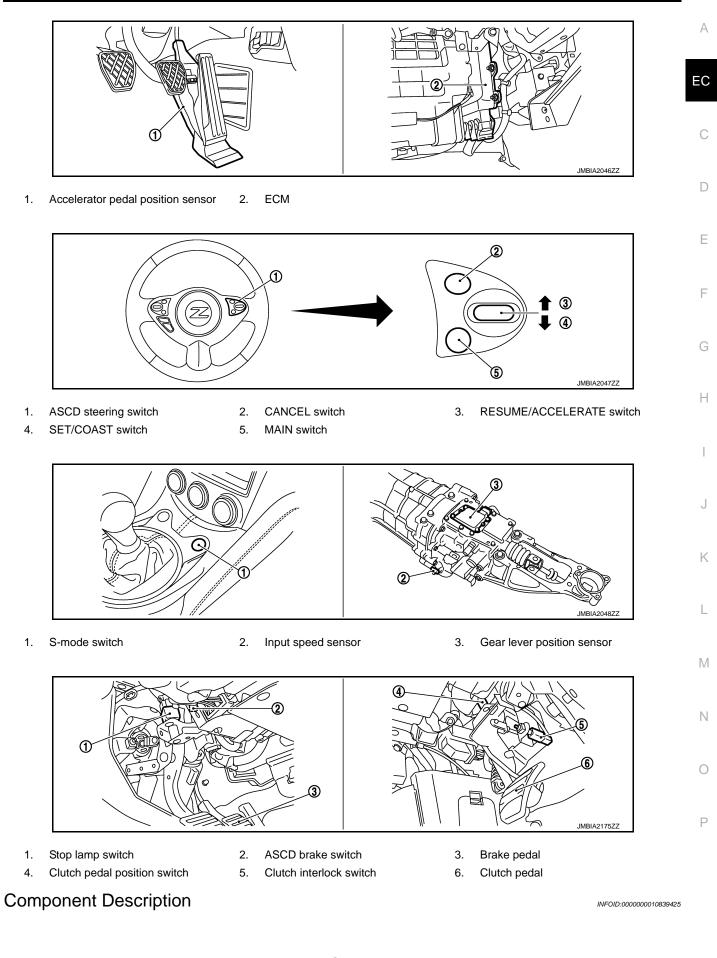
- └□: Vehicle front
- 1. EVAP service port
- 4. EVAP canister vent control valve
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 5. EVAP control system pressure sensor



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

#### < SYSTEM DESCRIPTION >



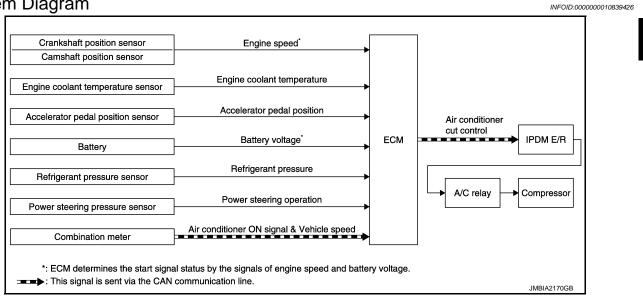
#### < SYSTEM DESCRIPTION >

Component	Reference
Accelerator pedal position sensor	EC-481, "Description"
Camshaft position sensor (PHASE)	EC-310, "Description"
Crankshaft position sensor (POS)	EC-306, "Description"
Engine coolant temperature sensor	EC-221, "Description"
Ignition signal	EC-514, "Description"
Knock sensor	EC-303, "Description"
Mass air flow sensor	EC-197, "Description"
Throttle position sensor	EC-224, "Description"

#### < SYSTEM DESCRIPTION >

## AIR CONDITIONING CUT CONTROL

## System Diagram



## System Description

INFOID:000000010839427

#### **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			
Accelerator pedal position sensor	Accelerator pedal position		IPDM E/R	
Battery	Battery voltage*2	Air conditioner	↓ A/C relay	
Refrigerant pressure sensor	Refrigerant pressure	cut control	↓ ↓	
Power steering pressure sensor	Power steering operation		Compressor	
Combination meter	Air conditioner ON signal* <sup>1</sup>			
	Vehicle speed*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. Μ SYSTEM DESCRIPTION This system improves engine operation when the air conditioner is used. Ν 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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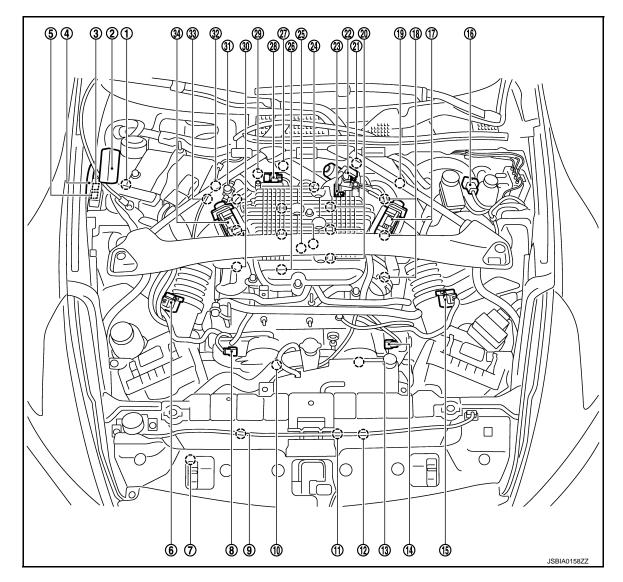
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#### < SYSTEM DESCRIPTION >

#### **Component Parts Location**

INFOID:000000010839428



- 1. Battery current sensor
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control solenoid valve

- 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. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)

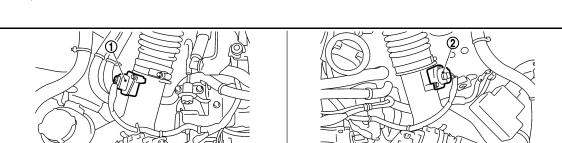
- 3. Cooling fan relay
- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- Ignition coil (with power transistor) and spark plug (bank 2)
- 21. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

#### < SYSTEM DESCRIPTION >

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

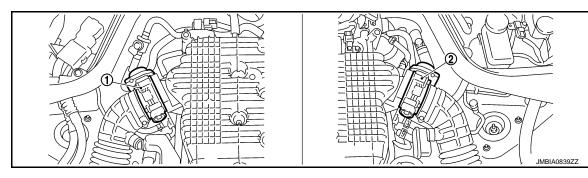
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34. Electric throttle control actuator (bank 1)

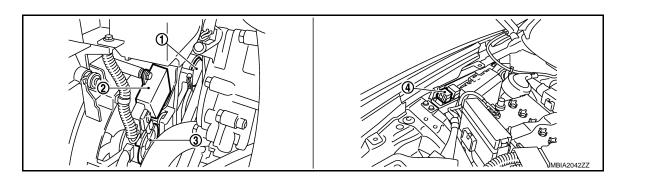


1. Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)

2.



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



Cooling fan control module

3.

Cooling fan motor-1

C: Vehicle front

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

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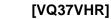
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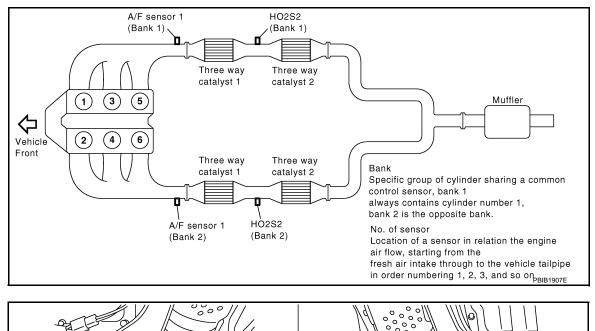
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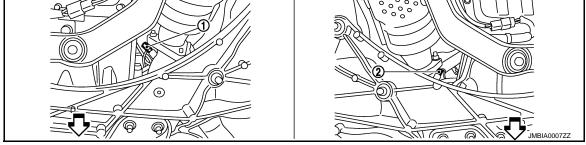
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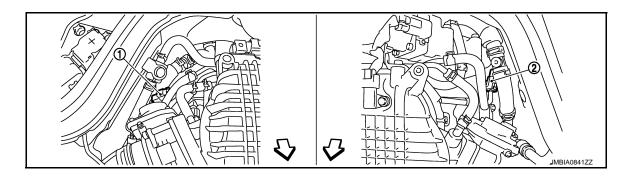
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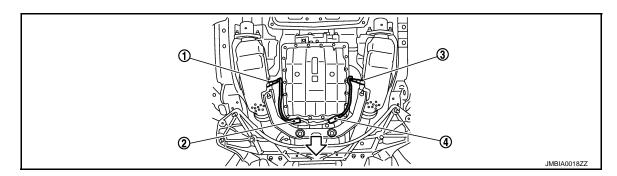


- C: Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



C : Vehicle front

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



#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

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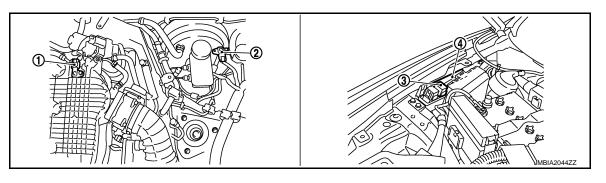
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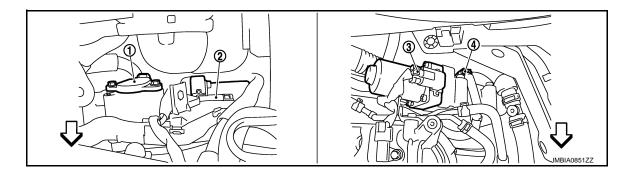
#### C: Vehicle front

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

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



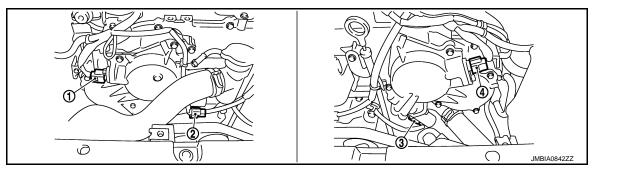
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

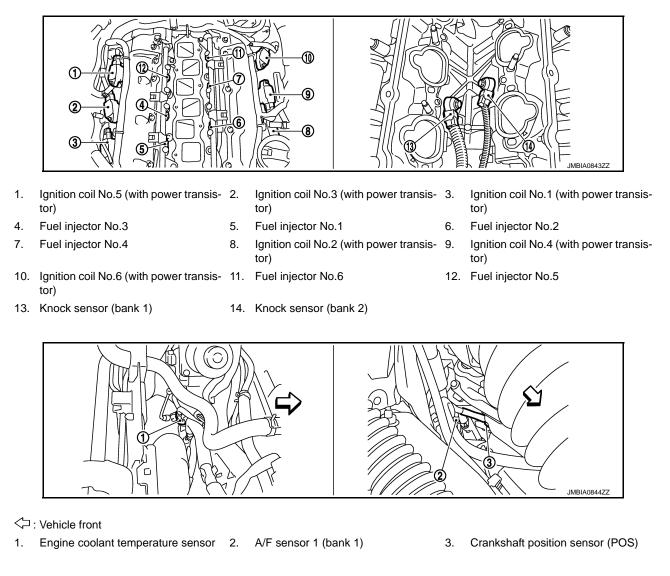
4. VVEL control shaft position sensor (bank 2)

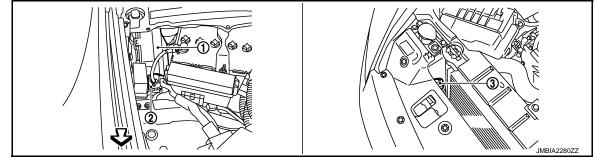


- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)
- Intake valve timing control solenoid 3. valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector

#### < SYSTEM DESCRIPTION >

### [VQ37VHR]





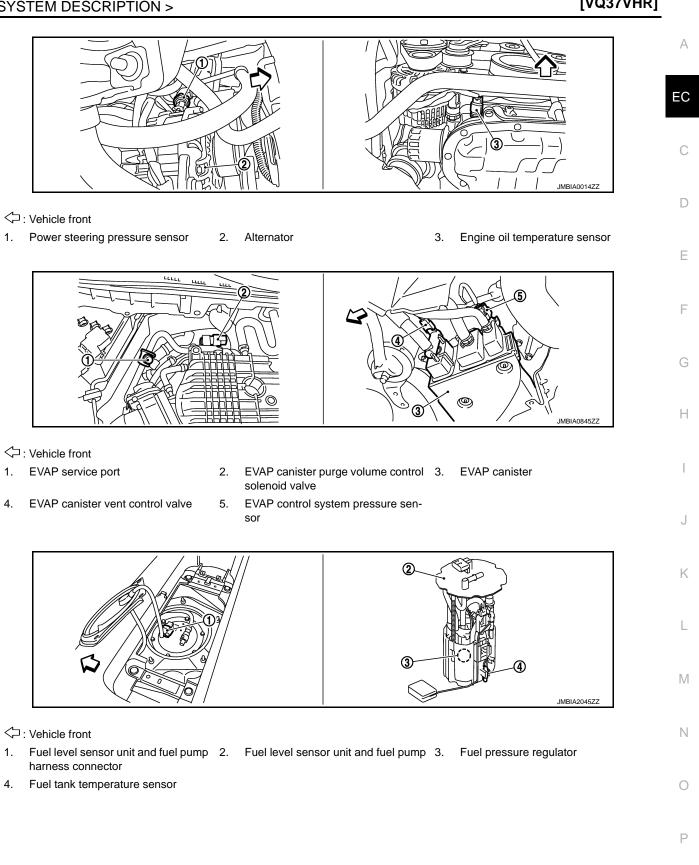
C: Vehicle front

1. IPDM E/R

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

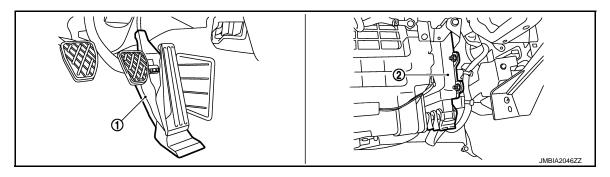
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#### [VQ37VHR]

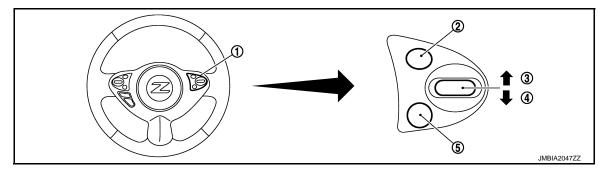


### < SYSTEM DESCRIPTION >

[VQ37VHR]

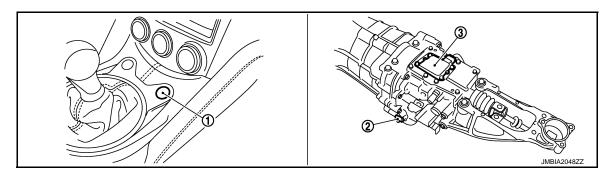


Accelerator pedal position sensor 2. ECM 1.



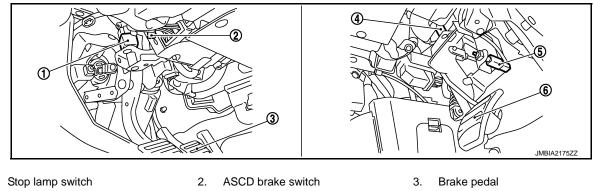
- ASCD steering switch 1.
- CANCEL switch 2.
- 4. SET/COAST switch
- 5. MAIN switch

RESUME/ACCELERATE switch 3.



S-mode switch 1.

- 2. Input speed sensor
- 3. Gear lever position sensor



Clutch pedal position switch 4.

1.

**Component Description** 

- 5. Clutch interlock switch
- - 6. Clutch pedal

INFOID:000000010839429

#### < SYSTEM DESCRIPTION >

### [VQ37VHR]

Component	Reference	0
Accelerator pedal position sensor	EC-481, "Description"	A
Camshaft position sensor (PHASE)	EC-310, "Description"	
Crankshaft position sensor (POS)	EC-306, "Description"	EC
Engine coolant temperature sensor	EC-221, "Description"	
Power steering pressure sensor	EC-380, "Description"	
Refrigerant pressure sensor	EC-527, "Description"	С

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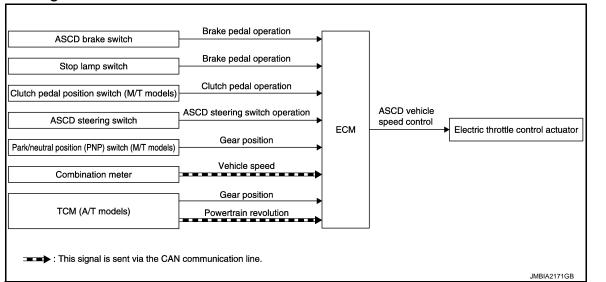
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#### < SYSTEM DESCRIPTION >

# AUTOMATIC SPEED CONTROL DEVICE (ASCD)

### System Diagram



### System Description

INFOID:000000010839431

### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
ASCD brake switch	Brake pedal operation			
Stop lamp switch	Brake pedal operation			
Clutch pedal position switch (M/T models)	Clutch pedal operation			
ASCD steering switch	ASCD steering switch operation	ACCD vahiala analysis	Electric throttle control	
Park/neutral position (PNP) switch (M/T models)	Gear position	ASCD vehicle speed control	actuator	
Combination meter	Vehicle speed*			
Gear position				
TCM (A/T models)	Powertrain revolution*			

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

#### BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

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

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

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

#### NOTE:

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

#### SET OPERATION

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

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

#### ACCELERATE OPERATION

INFOID:000000010839430

#### < SYSTEM DESCRIPTION >

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
- Clutch pedal is depressed or gear position is changed to neutral position. (M/T models)
- Selector lever is the N, P, R position (A/T models)
- · Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

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

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

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

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

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

#### COAST OPERATION

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

#### RESUME OPERATION

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

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

[VQ37VHR]

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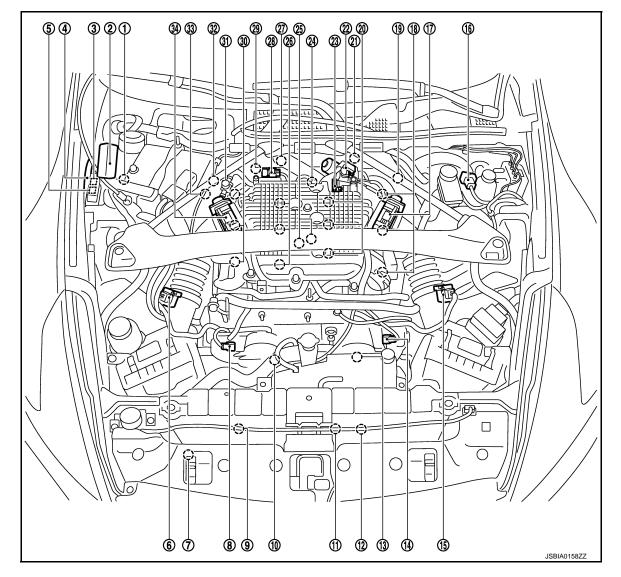
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#### < SYSTEM DESCRIPTION >

#### **Component Parts Location**

INFOID:000000010839432

[VQ37VHR]



- Battery current sensor 1.
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- A/F sensor 1 (bank 2) 19.
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control 29. VVEL control shaft position sensor solenoid valve

- IPDM E/R 2.
- 5. VVEL actuator motor relay
- 8. Camshaft position sensor (PHASE) (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- (bank 1)

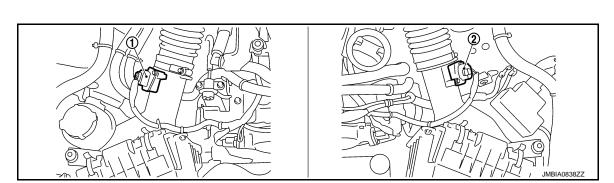
- Cooling fan relay 3.
- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

#### < SYSTEM DESCRIPTION >

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

[VQ37VHR]

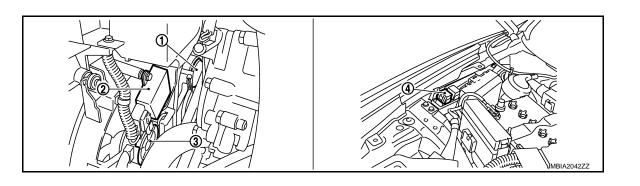
34. Electric throttle control actuator (bank 1)



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

2.

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



Cooling fan control module

3.

Cooling fan motor-1

C: Vehicle front

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

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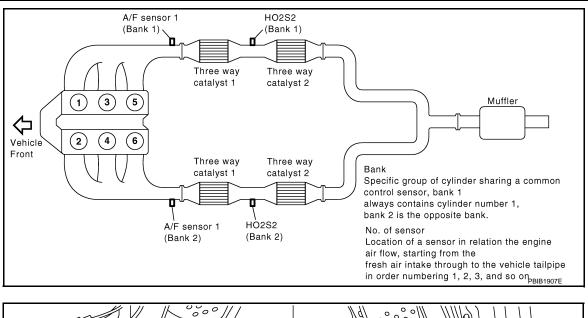
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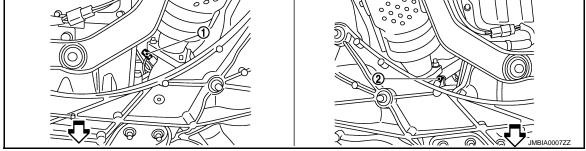
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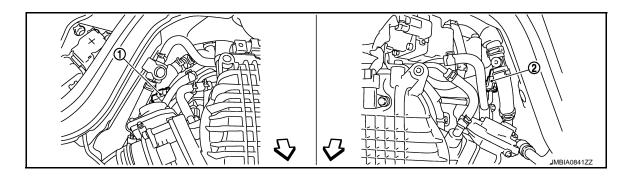
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#### < SYSTEM DESCRIPTION >



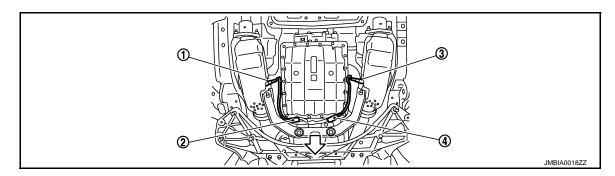


- : Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



C: Vehicle front

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



[VQ37VHR]

#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

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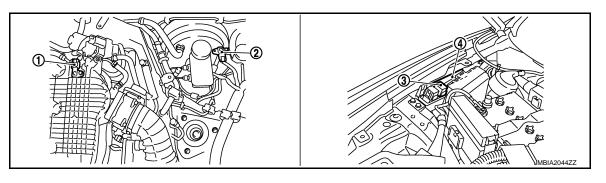
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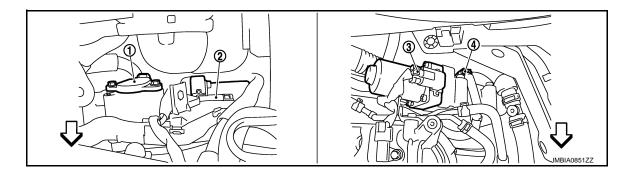
#### C: Vehicle front

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

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



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



C: Vehicle front

- VVEL control shaft position sensor 1. 2. VVEL actuator motor (bank 1) (bank 1)
- 4. VVEL control shaft position sensor (bank 2)
  - Θ  $\oslash$  $\bigcirc$  $\bigcirc$ JMBIA0842ZZ
- 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

VVEL actuator motor (bank 2)

3.

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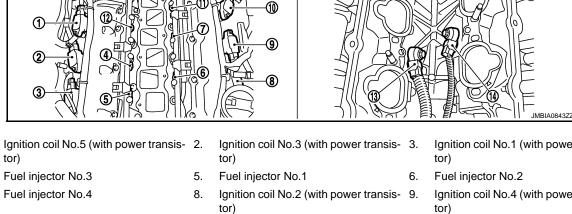
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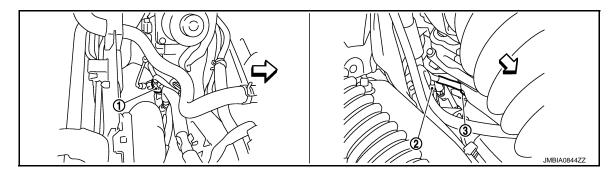


- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)
- 14. Knock sensor (bank 2)

Ignition coil No.1 (with power transis-

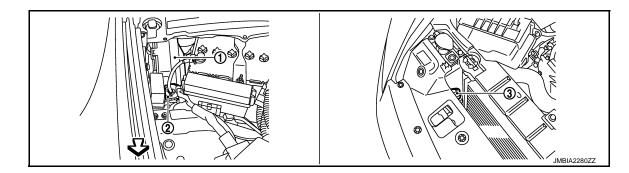
[VQ37VHR]

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



└□: Vehicle front

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



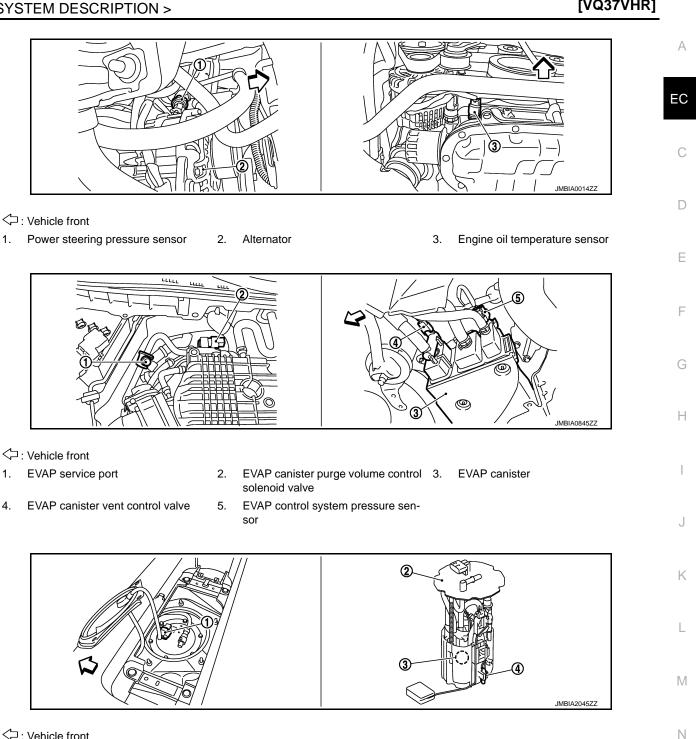
└─ : Vehicle front

IPDM E/R 1.

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

#### < SYSTEM DESCRIPTION >

### [VQ37VHR]



C: Vehicle front

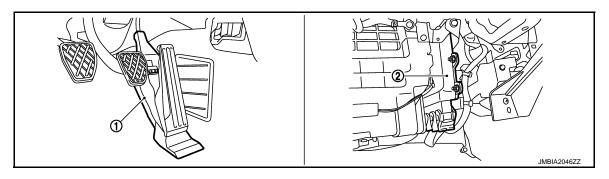
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Fuel tank temperature sensor

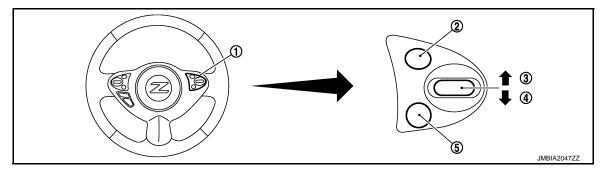
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
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### < SYSTEM DESCRIPTION >

[VQ37VHR]

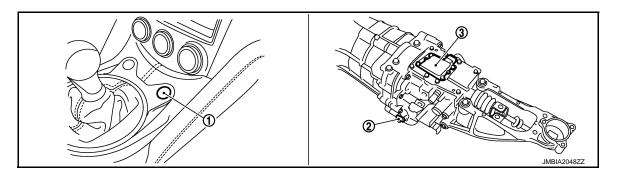


Accelerator pedal position sensor 2. ECM 1.



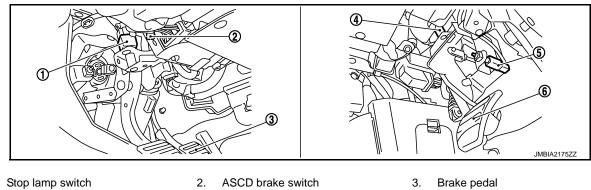
- ASCD steering switch 1.
- CANCEL switch 2.
- 4. SET/COAST switch
- 5. MAIN switch

3. RESUME/ACCELERATE switch



S-mode switch 1.

- 2. Input speed sensor
- 3. Gear lever position sensor



- 1.
- 4. Clutch pedal position switch
- 5. Clutch interlock switch
- Brake pedal
- 6. Clutch pedal

### < SYSTEM DESCRIPTION >

# Component Description

INFOID:000000010839433

[VQ37VHR]

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Component	Reference	
ASCD brake switch	EC-457, "Description"	EC
ASCD indicator	EC-501, "Description"	
ASCD steering switch	EC-454, "Description"	
Clutch pedal position switch	EC-406. "Description"	
Electric throttle control actuator	EC-452, "Description"	
Stop lamp switch	EC-457, "Description"	D

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

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[VQ37VHR]

#### < SYSTEM DESCRIPTION >

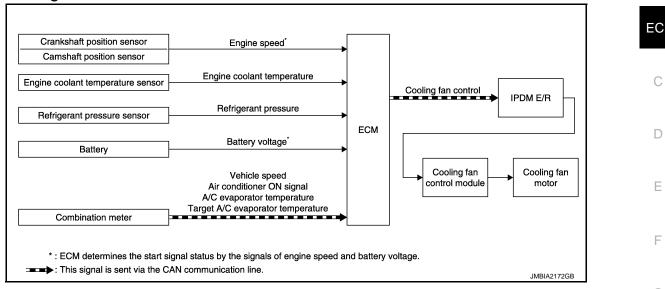
# COOLING FAN CONTROL



INFOID:000000010839435

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### System Diagram



### System Description

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INFOID:000000010839436

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed* <sup>1</sup>			
Engine coolant temperature sensor	Engine coolant temperature			
Refrigerant pressure sensor	Refrigerant pressure		IPDM E/R	
Battery	Battery voltage*1	Cooling fan	↓ Cooling fan control module	
Combination meter	Vehicle speed*2	control		
	Air conditioner ON signal*2	Cooling fan motor		
	A/C evaporator temperature* <sup>2</sup>			
	Target A/C evaporator temperature*2	1		

\*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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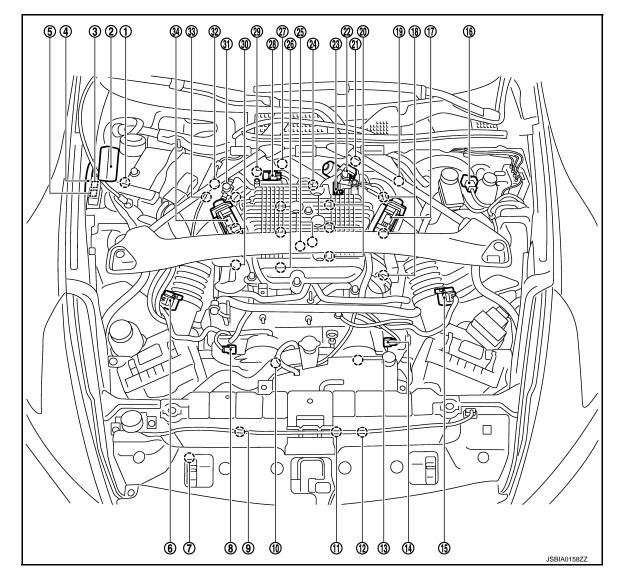
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#### < SYSTEM DESCRIPTION >

#### **Component Parts Location**

INFOID:000000010839437

[VQ37VHR]



- 1. Battery current sensor
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control solenoid valve

- 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. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)

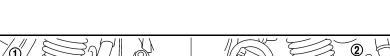
- 3. Cooling fan relay
- 6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- Ignition coil (with power transistor) and spark plug (bank 2)
- 21. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

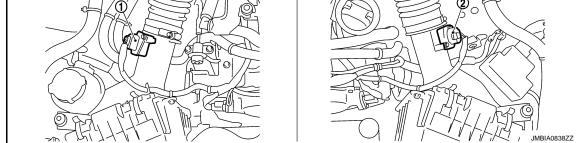
#### < SYSTEM DESCRIPTION >

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

[VQ37VHR]

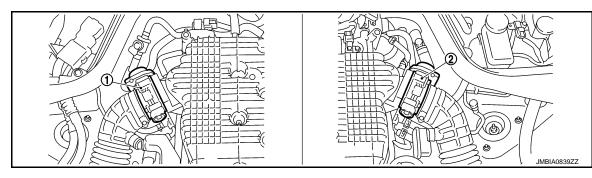
34. Electric throttle control actuator (bank 1)



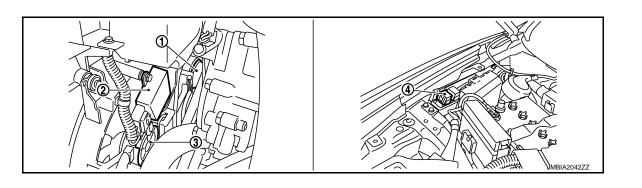


1. Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)

2.



- 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

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

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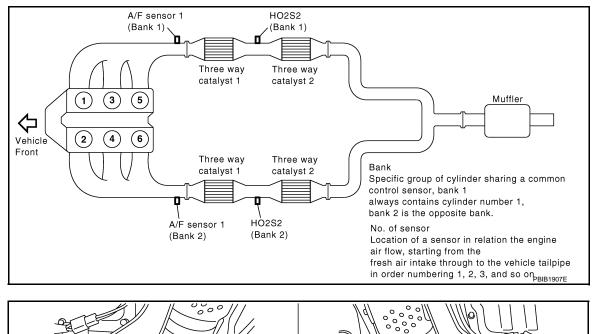
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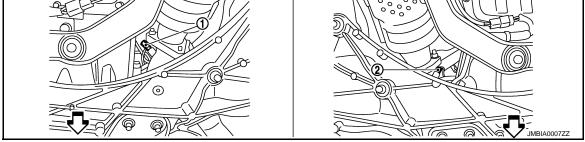
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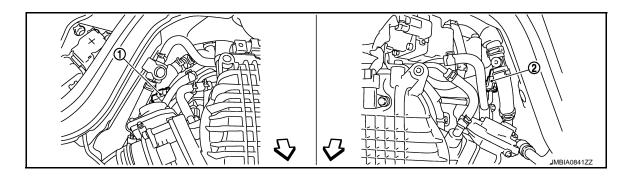
#### < SYSTEM DESCRIPTION >





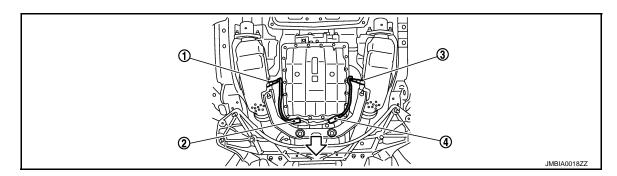


- └□: Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



C : Vehicle front

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



#### < SYSTEM DESCRIPTION >

### [VQ37VHR]

#### C: Vehicle front

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

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

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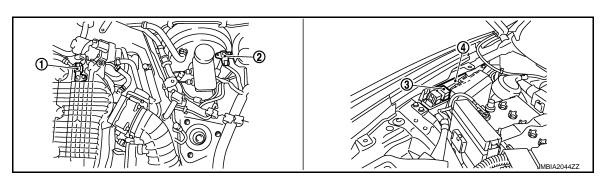
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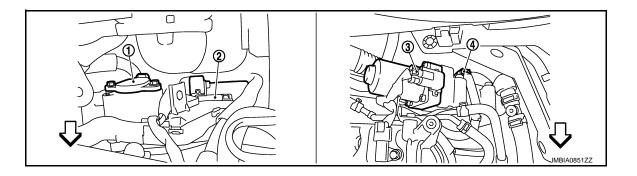
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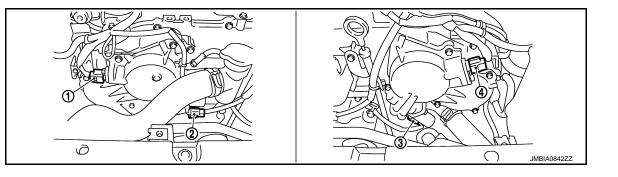
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



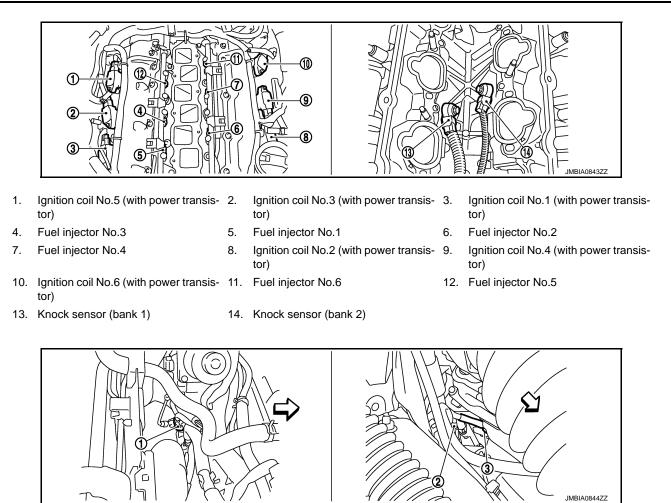
- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

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

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

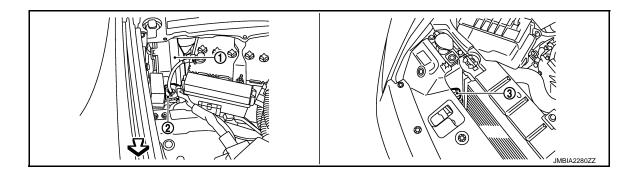
#### < SYSTEM DESCRIPTION >

### [VQ37VHR]



C: Vehicle front

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



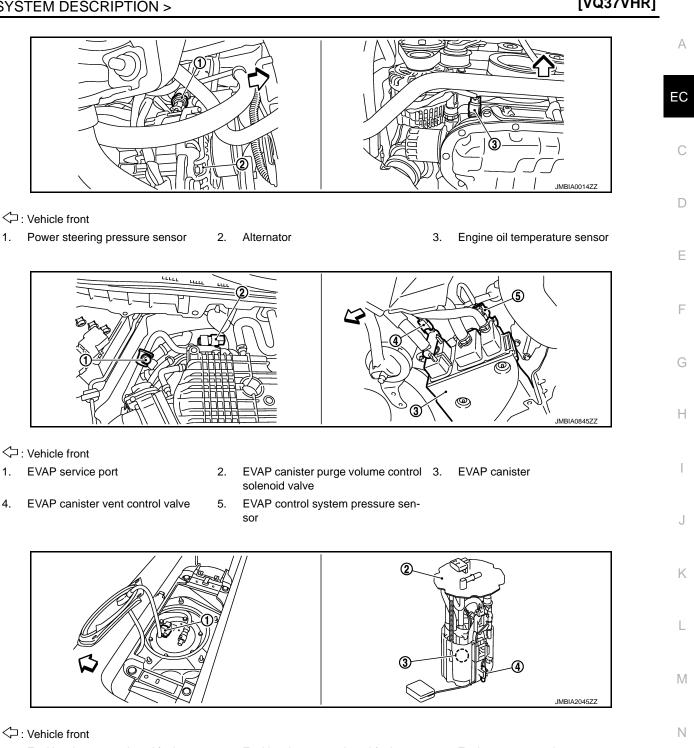
C: Vehicle front

1. IPDM E/R

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

#### < SYSTEM DESCRIPTION >

### [VQ37VHR]



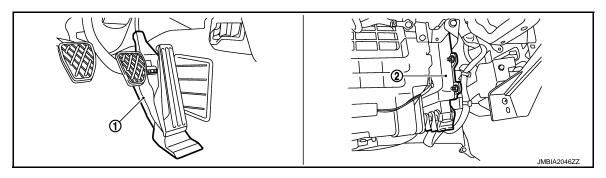
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector

Ο

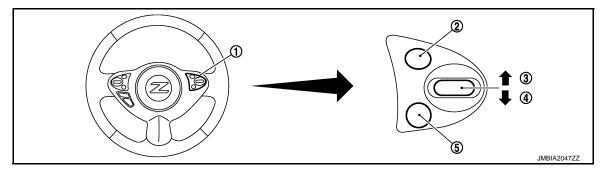
4.

Fuel tank temperature sensor

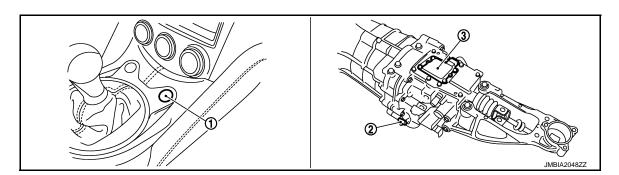
### < SYSTEM DESCRIPTION >



Accelerator pedal position sensor 2. ECM 1.

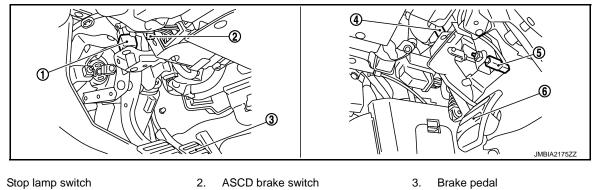


- ASCD steering switch 1.
- CANCEL switch 2.
- 4. SET/COAST switch
- 5.
  - MAIN switch
- **RESUME/ACCELERATE** switch 3.



S-mode switch 1.

- 2. Input speed sensor
- 3. Gear lever position sensor



Clutch pedal position switch 4.

1.

- **Component Description**
- 5. Clutch interlock switch
- - 6. Clutch pedal

INFOID:000000010839438

#### < SYSTEM DESCRIPTION >

### [VQ37VHR]

Component	Reference	
Camshaft position sensor (PHASE)	EC-310, "Description"	A
Cooling fan control module	EC-502. "Description"	
Cooling fan motor	EC-502. "Description"	EC
Crankshaft position sensor (POS)	EC-306. "Description"	
Engine coolant temperature sensor	EC-221, "Description"	
Refrigerant pressure sensor	EC-527, "Description"	С

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#### < 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	•	
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas	•	
Throttle position sensor	Throttle position	► ECM	EVAP canister purge flow control
Accelerator pedal position sensor	Accelerator pedal position	•	control solenoid valve
Battery	Battery voltage*	•	
Fuel tank temperature sensor	Fuel temperature in fuel tank	•	
EVAP control system pressure sensor	Pressure in purge line	•	
Combination meter	Vehicle speed		

### System Description

INFOID:000000010839440

### INPUT/OUTPUT SIGNAL CHART

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

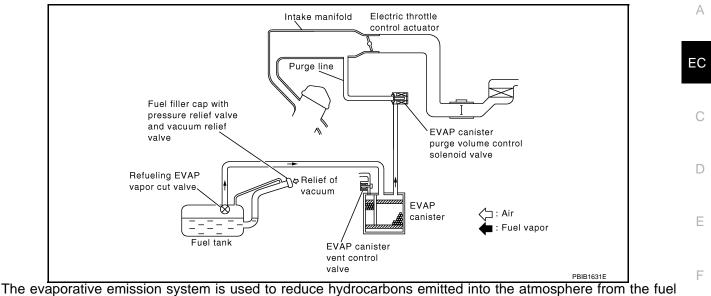
\*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

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

INFOID:000000010839439

#### < SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION



system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister. The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

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

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

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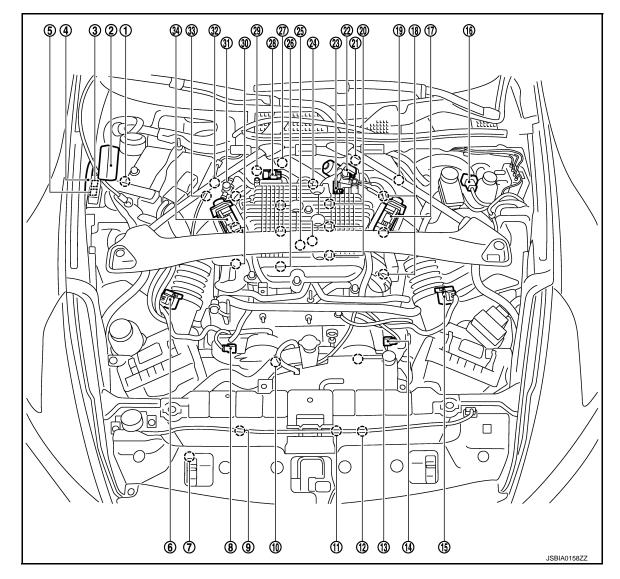
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#### < SYSTEM DESCRIPTION >

#### **Component Parts Location**

INFOID:000000010839441

[VQ37VHR]



- 1. Battery current sensor
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control solenoid valve

- 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. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)

- 3. Cooling fan relay
- 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. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

#### < SYSTEM DESCRIPTION >

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

[VQ37VHR]

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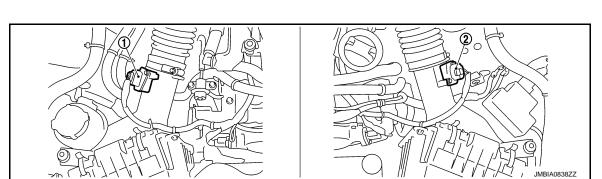
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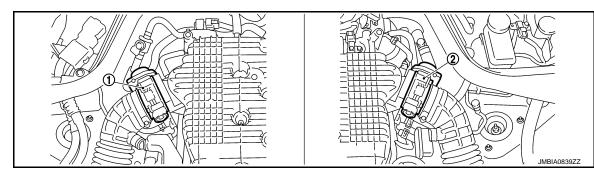
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34. Electric throttle control actuator (bank 1)

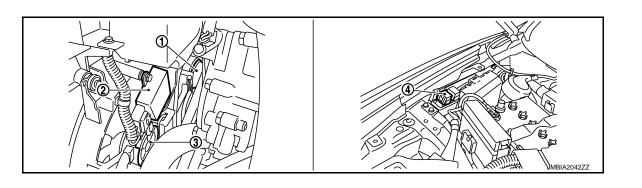


1. Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)

2.



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



Cooling fan control module

C: Vehicle front

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

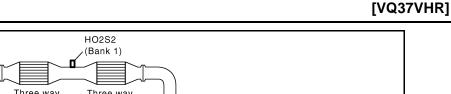
Cooling fan motor-1

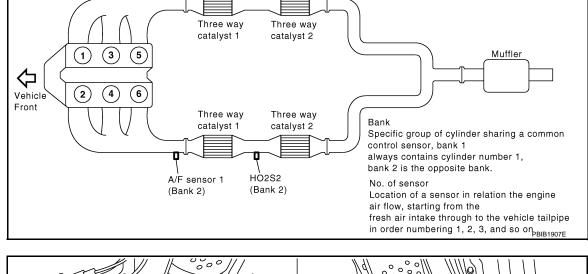
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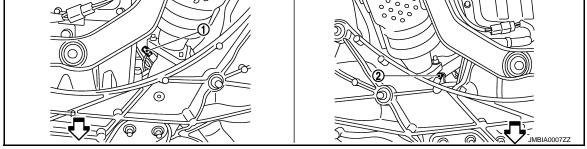
#### < SYSTEM DESCRIPTION >

A/F sensor 1

(Bank 1)

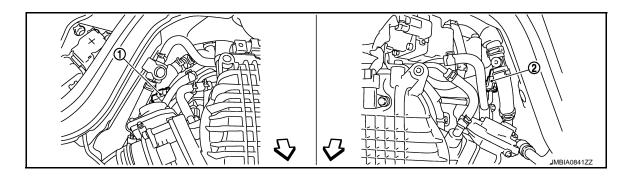






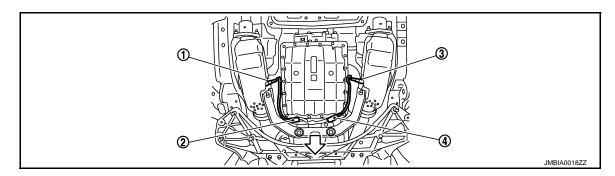
#### └□: Vehicle front

- 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



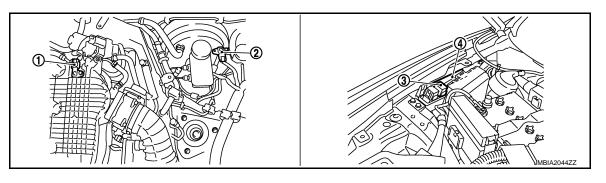
#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

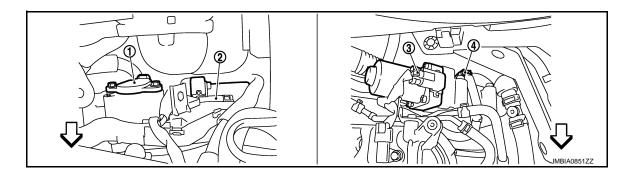
#### C: Vehicle front

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

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



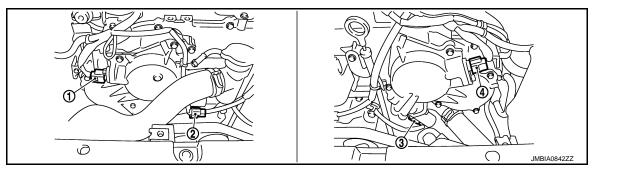
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



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

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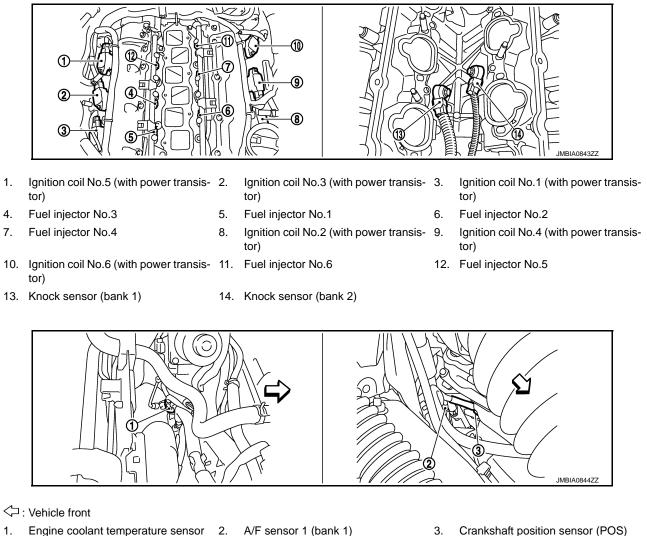
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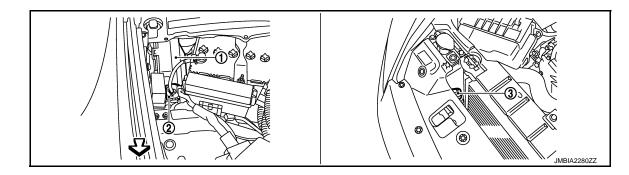
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#### < SYSTEM DESCRIPTION >

### [VQ37VHR]



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



- └─ : Vehicle front
- IPDM E/R 1.

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

#### < SYSTEM DESCRIPTION >

#### [VQ37VHR]

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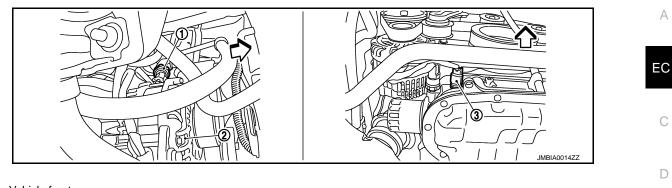
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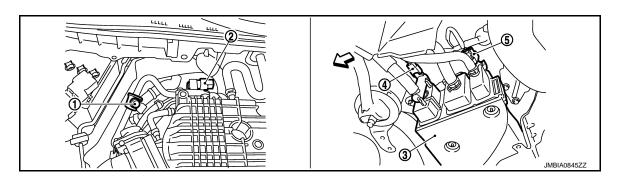
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- C: Vehicle front
- 1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



- C: Vehicle front
- 1. EVAP service port
- 4. EVAP canister vent control valve
- 2. EVAP canister purge volume control 3. **EVAP** canister solenoid valve 5. EVAP control system pressure sen-
- 2 3 JMBIA2045ZZ

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C: Vehicle front

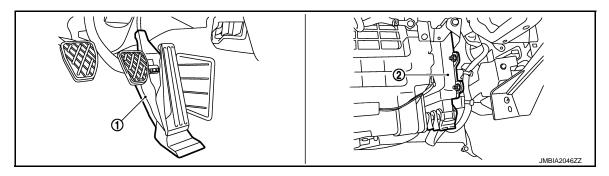
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector
- Fuel tank temperature sensor 4.

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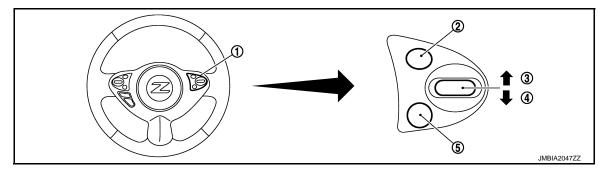
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### < SYSTEM DESCRIPTION >

[VQ37VHR]

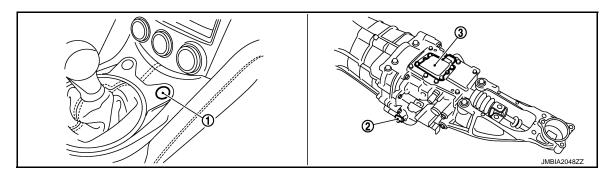


Accelerator pedal position sensor 2. ECM 1.



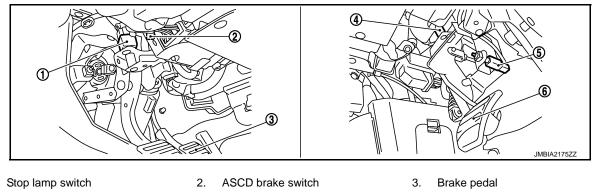
- ASCD steering switch 1.
- CANCEL switch 2.
- 4. SET/COAST switch
- 5. MAIN switch

RESUME/ACCELERATE switch 3.



S-mode switch 1.

- 2. Input speed sensor
- 3. Gear lever position sensor



Clutch pedal position switch 4.

1.

- **Component Description**
- 5. Clutch interlock switch
- 6. Clutch pedal

INFOID:000000010839442

#### < SYSTEM DESCRIPTION >

[VQ37VHR]

Component	Reference	
A/F sensor 1	EC-235, "Description"	A
Accelerator pedal position sensor	EC-481, "Description"	
Camshaft position sensor (PHASE)	EC-310. "Description"	EC
Crankshaft position sensor (POS)	EC-306. "Description"	
Engine coolant temperature sensor	EC-221, "Description"	
EVAP canister purge volume control solenoid valve	EC-324, "Description"	С
EVAP control system pressure sensor	EC-340. "Description"	
Fuel tank temperature sensor	EC-280, "Description"	D
Mass air flow sensor	EC-197, "Description"	
Throttle position sensor	EC-224, "Description"	
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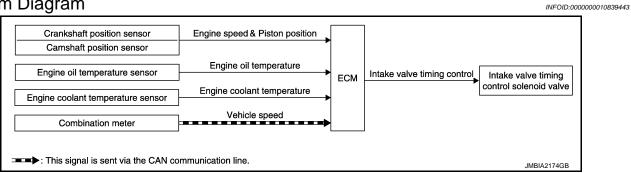
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### INTAKE VALVE TIMING CONTROL

#### < SYSTEM DESCRIPTION >

# INTAKE VALVE TIMING CONTROL

### System Diagram



## System Description

INFOID:000000010839444

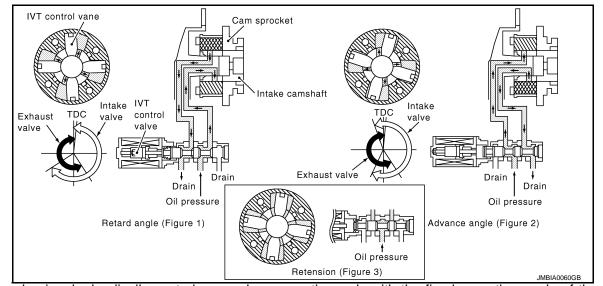
[VQ37VHR]

### **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			
Combination meter	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.

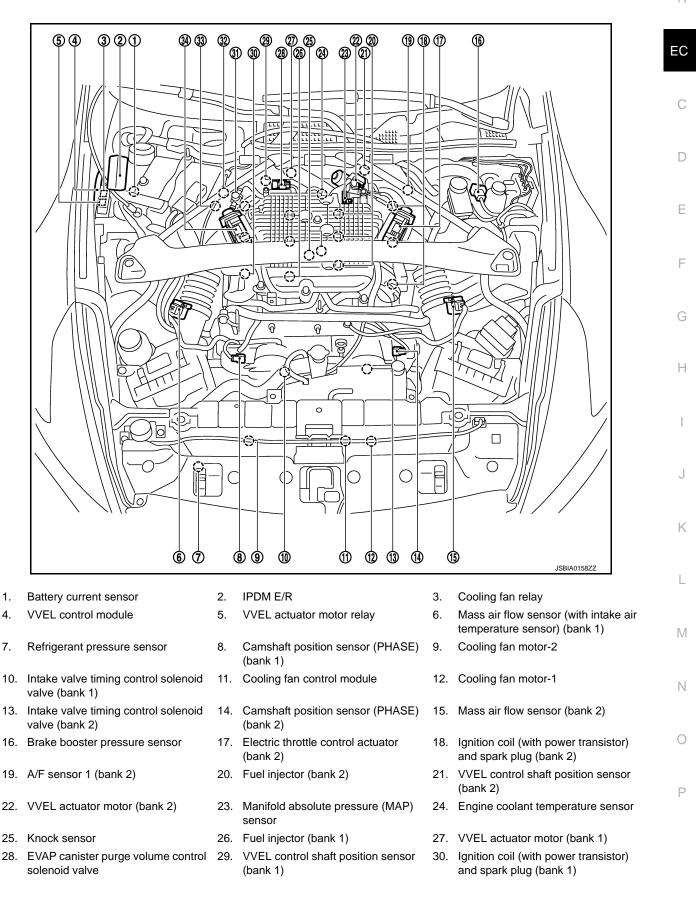
### < SYSTEM DESCRIPTION >

## **Component Parts Location**

[VQ37VHR]

INFOID:000000010839445



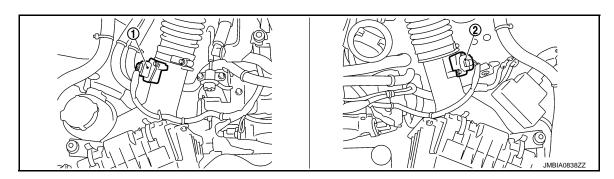


### < SYSTEM DESCRIPTION >

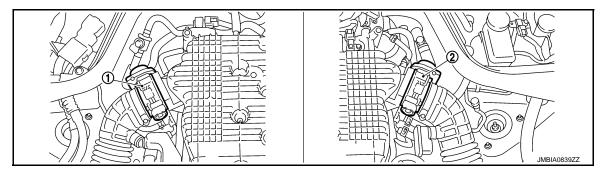
[VQ37VHR]

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

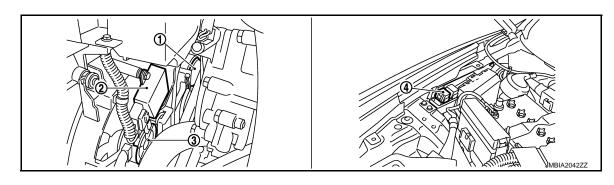
34. Electric throttle control actuator (bank 1)



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



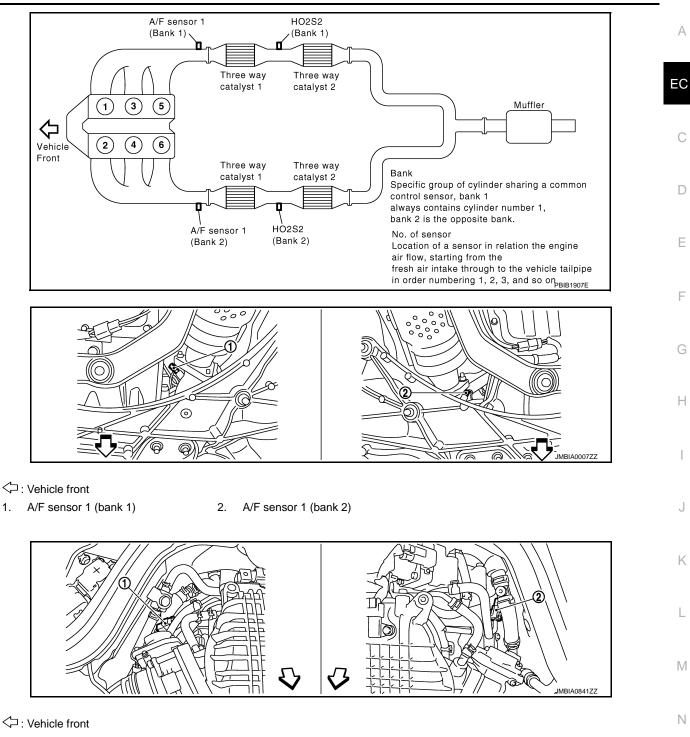
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



C: Vehicle front

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

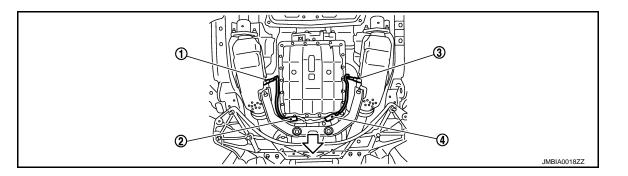
### < SYSTEM DESCRIPTION >



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

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A/F sensor 1 (bank 2) harness connector



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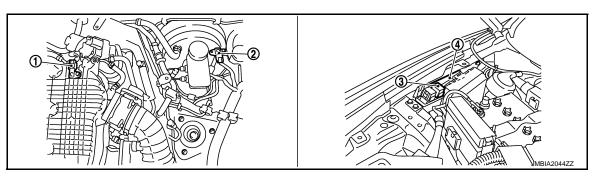
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### < SYSTEM DESCRIPTION >

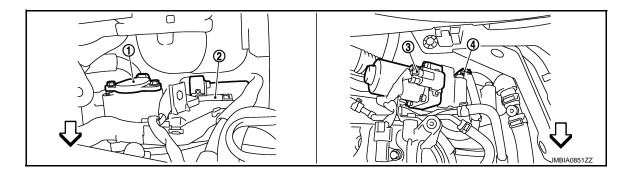
#### C: Vehicle front

- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) 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

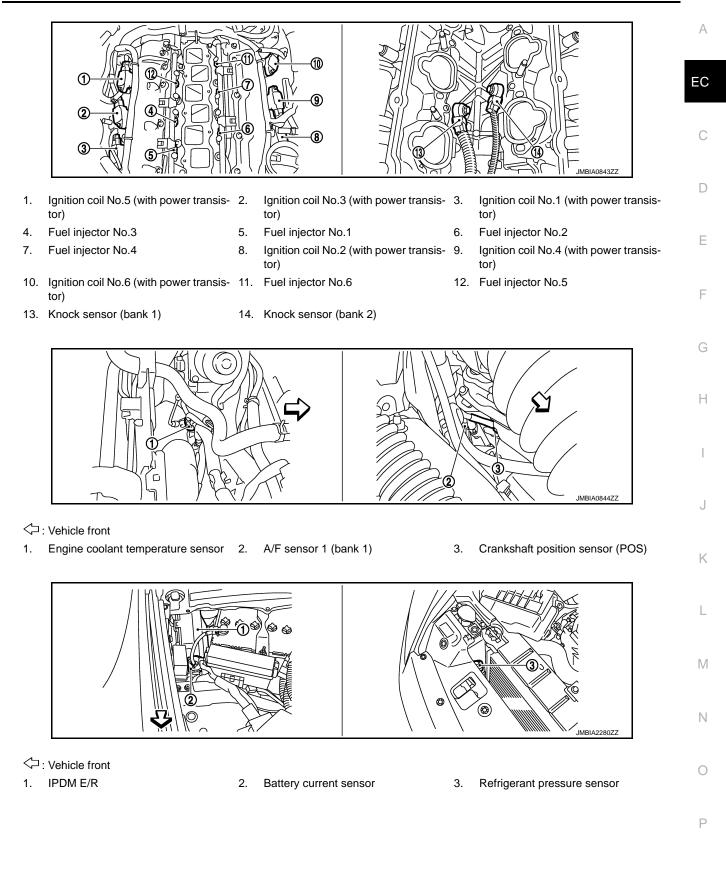
(bank 2)

4.

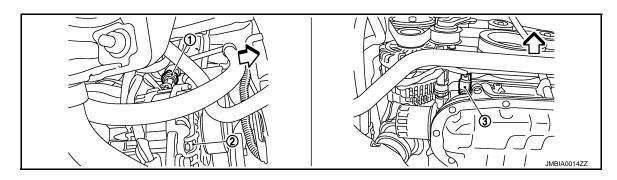
- 1. VVEL control shaft position sensor 2. VVEL actuator motor (bank 1) (bank 1)
- ) 3. VVEL actuator motor (bank 2)

- VVEL control shaft position sensor
- 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 >

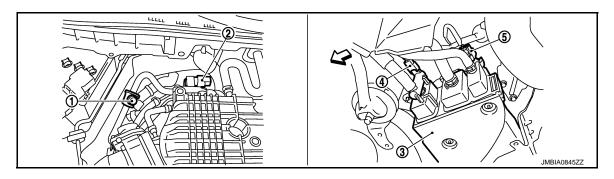


### < SYSTEM DESCRIPTION >

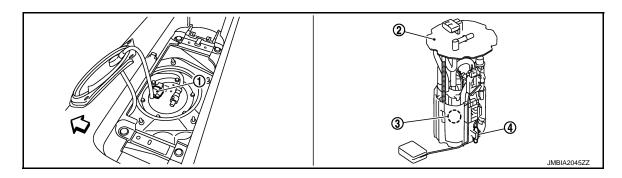


- C: Vehicle front
- 1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



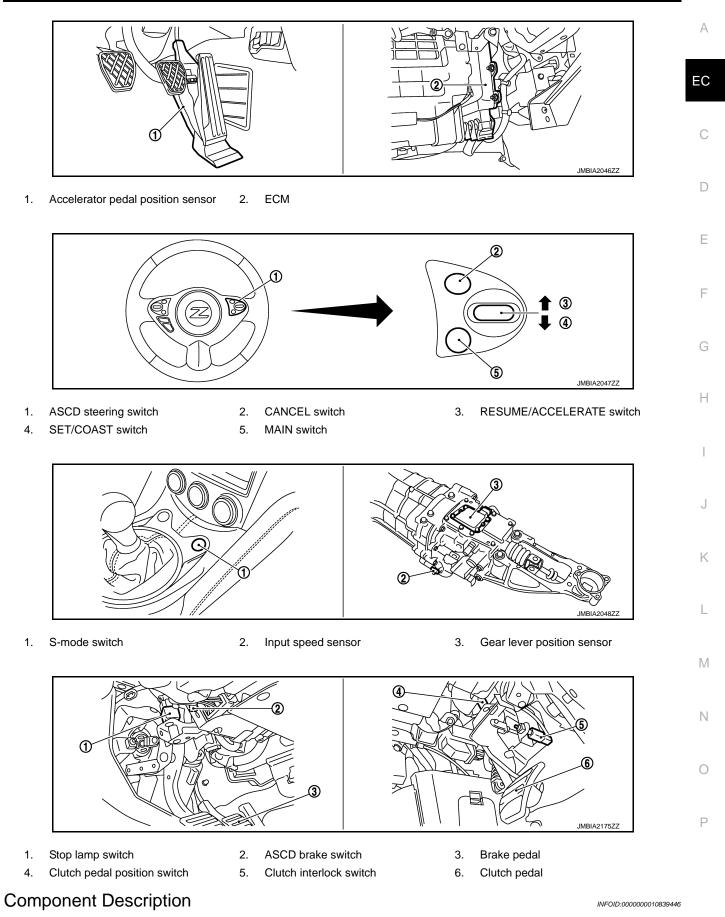
- └□: Vehicle front
- 1. EVAP service port
- 4. EVAP canister vent control valve
- 2. EVAP canister purge volume control 3. EVAP canister solenoid valve
- 5. EVAP control system pressure sensor



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

### < SYSTEM DESCRIPTION >



### < SYSTEM DESCRIPTION >

Component	Reference
Camshaft position sensor (PHASE)	EC-310, "Description"
Crankshaft position sensor (POS)	EC-306. "Description"
Engine coolant temperature sensor	EC-221, "Description"
Engine oil temperature sensor	EC-287, "Description"
Intake valve timing control solenoid valve	EC-194, "Description"

## < SYSTEM DESCRIPTION >

# VVEL SYSTEM



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#### System Diagram INFOID:000000010839447 Engine speed & Piston position Crankshaft position sensor (POS) EC VVEL control Accelerator pedal position VVEL control module ECM Accelerator pedal position sensor VVEL actuator sub Control shaft actual angle VVEL control shaft position sensor assembly \* : ECM determines the start signal status by the signals of engine speed and battery voltage. JMBIA1803GB

## System Description

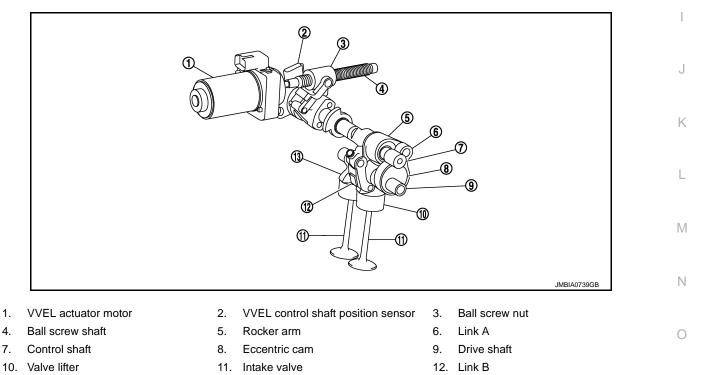
INFOID:0000000010839448

## 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 asse	VVEL actuator sub assembly	

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

## SYSTEM DESCRIPTION



13. Output cam

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

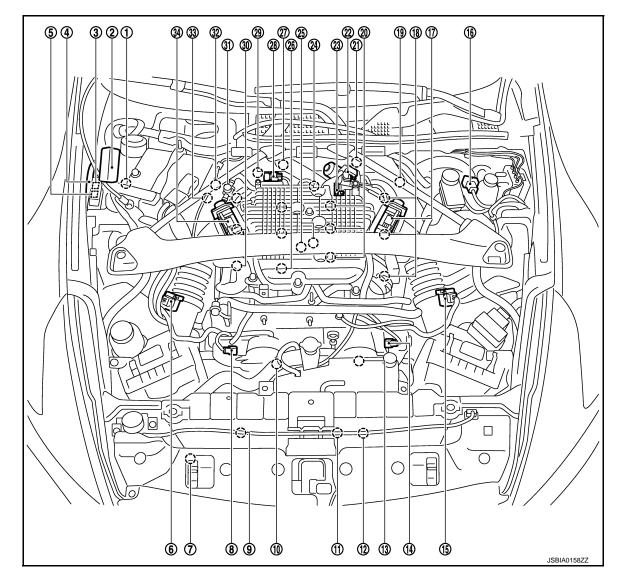
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### < SYSTEM DESCRIPTION >

### **Component Parts Location**

INFOID:000000010839449



- 1. Battery current sensor
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control solenoid valve

- 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. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)

- 3. Cooling fan relay
- 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. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

## < SYSTEM DESCRIPTION >

- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- [VQ37VHR] 33. Crankshaft position sensor (POS)
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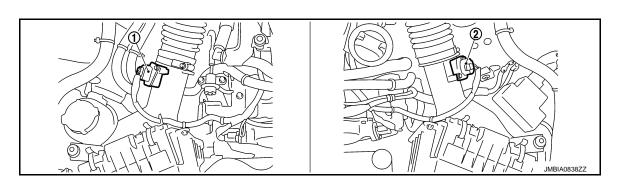
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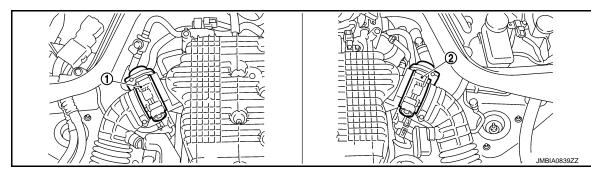
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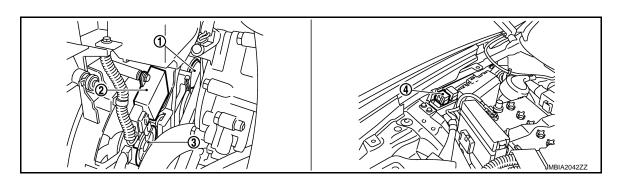
34. Electric throttle control actuator (bank 1)



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

Cooling fan control module

2.

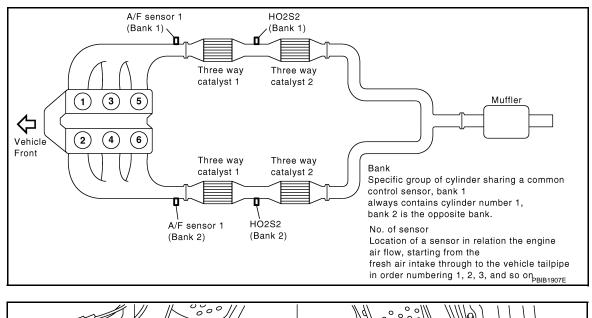
3. Cooling fan motor-1

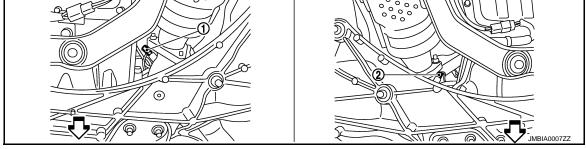
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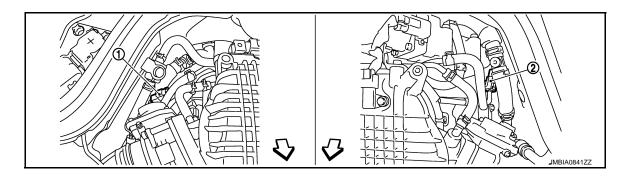
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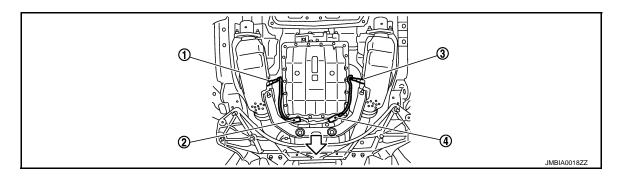


- └□: Vehicle front
- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)



C : Vehicle front

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



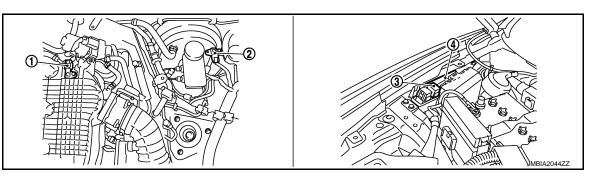
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### [VQ37VHR]

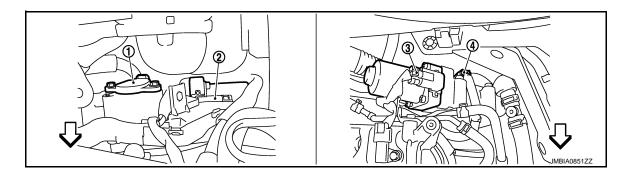
#### C: Vehicle front

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

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



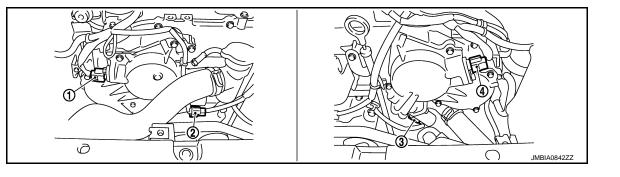
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- VVEL control module 4.



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



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

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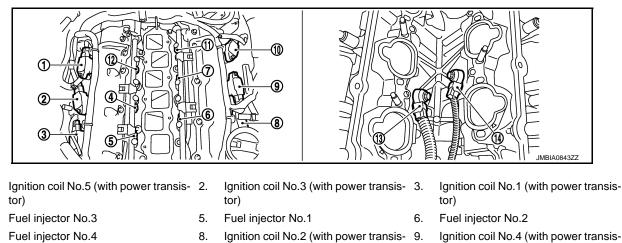
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### < SYSTEM DESCRIPTION >

## [VQ37VHR]



Fuel injector No.4 7.

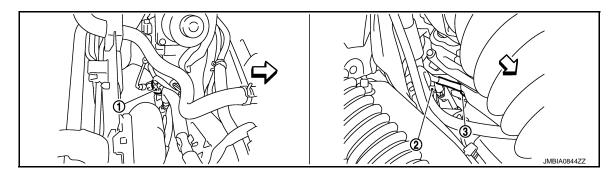
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- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6 tor)
- 13. Knock sensor (bank 1)
- 14. Knock sensor (bank 2)

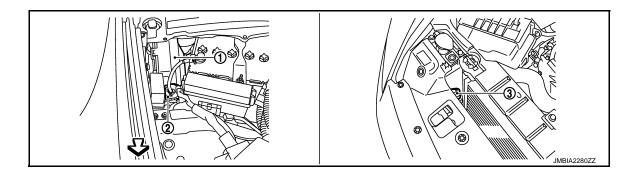
tor)

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



└□: Vehicle front

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



└─ : Vehicle front

IPDM E/R 1.

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

### < SYSTEM DESCRIPTION >

### [VQ37VHR]

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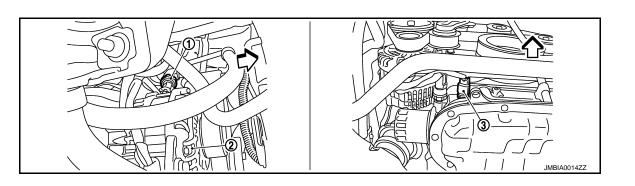
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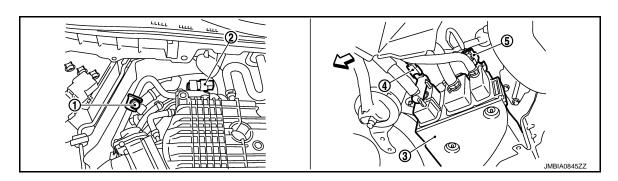
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- C: Vehicle front
- 1. Power steering pressure sensor 2. Alternator

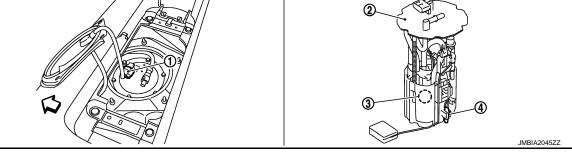
3. Engine oil temperature sensor



- C: Vehicle front
- 1. EVAP service port
- 4. EVAP canister vent control valve

Fuel tank temperature sensor

- EVAP canister purge volume control 3. EVAP canister solenoid valve
   EVAP control system pressure sen-



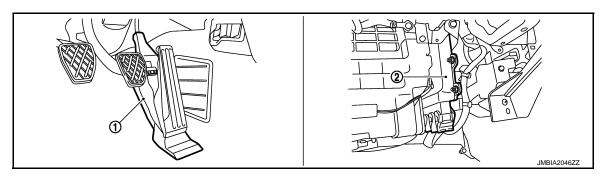
C: Vehicle front

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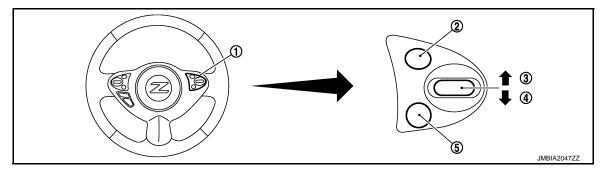
- 1. Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator harness connector

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## < SYSTEM DESCRIPTION >

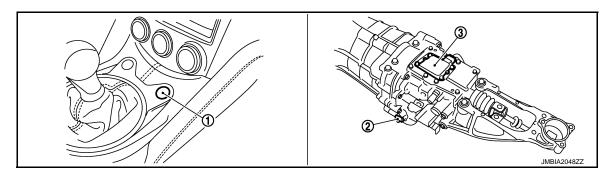


Accelerator pedal position sensor 2. ECM 1.



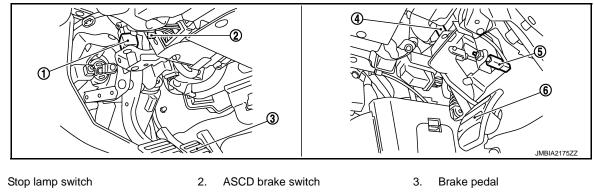
- ASCD steering switch 1.
- CANCEL switch 2.
- 4. SET/COAST switch
- 5. MAIN switch

RESUME/ACCELERATE switch 3.



S-mode switch 1.

- 2. Input speed sensor
- Gear lever position sensor 3.



Clutch pedal position switch 4.

1.

- **Component Description**
- 5. Clutch interlock switch
- - 6. Clutch pedal
- INFOID:000000010839450

## < SYSTEM DESCRIPTION >

## [VQ37VHR]

Component	Reference	
Accelerator pedal position sensor	EC-481, "Description"	A
Crankshaft position sensor (POS)	EC-306, "Description"	
VVEL actuator motor	EC-423, "Description"	EC
VVEL actuator motor relay	EC-427, "Description"	
VVEL control module	EC-467, "Description"	
VVEL control shaft position sensor	EC-420, "Description"	С

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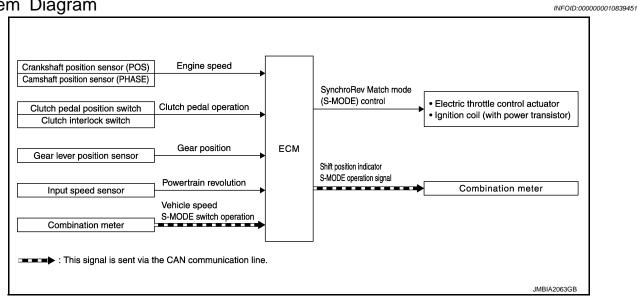
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### < SYSTEM DESCRIPTION >

## SYNCHROREV MATCH MODE (S-MODE)

System Diagram



## System Description

INFOID:000000010839452

## INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	Engine speed			
Camshaft position sensor (PHASE)	Engine speed	tch pedal operation• SynchroRev Match mode (S-MODE) control • Shift position indicator* • S-MODE operation sig- nal*•	<ul> <li>Electric throttle control actuator</li> <li>Ignition coil (with power transistor)</li> <li>Combination meter</li> </ul>	
Clutch pedal position switch	Clutch nodel energian			
Clutch interlock switch	Ciulon pedal operation			
Gear lever position sensor	Gear position			
Input speed sensor	Powertrain revolution			
Combineties and a	Vehicle speed*			
Combination meter	S-MODE switch operation*			

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

### SYSTEM DESCRIPTION

Refer to Owner's Manual for SynchroRev Match mode (S-MODE) operating instructions.

SynchroRev Match mode (S-MODE) controls engine speed at a suitable level from the present to the next gear position. This control is switched by S-MODE switch (Refer to <u>EC-531</u>, "<u>Description</u>"). When clutch pedal is depressed and shift lever is shifted while S-MODE is being operated, gear position signal is sent to ECM. ECM calculates target engine speed by gear position signal and vehicle speed signal, and then controls throt-tle opening angle and ignition timing. When downshift is performed, even if accelerator pedal is not depressed, ECM automatically controls throttle opening angle and increases engine speed. When upshift is performed, ECM controls engine speed so that it does not drop lower than the necessary level that is required after upshifting. Engine speed is controlled according to shifting operation above and driver can perform shifting operation quickly, smoothly, and without shifting shock. When S-MODE malfunction is detected, S-MODE warning on information display illuminates and S-MODE is automatically cancelled. At this time, S-MODE indicator turns OFF.

### < SYSTEM DESCRIPTION >

## **Component Parts Location**

[VQ37VHR]

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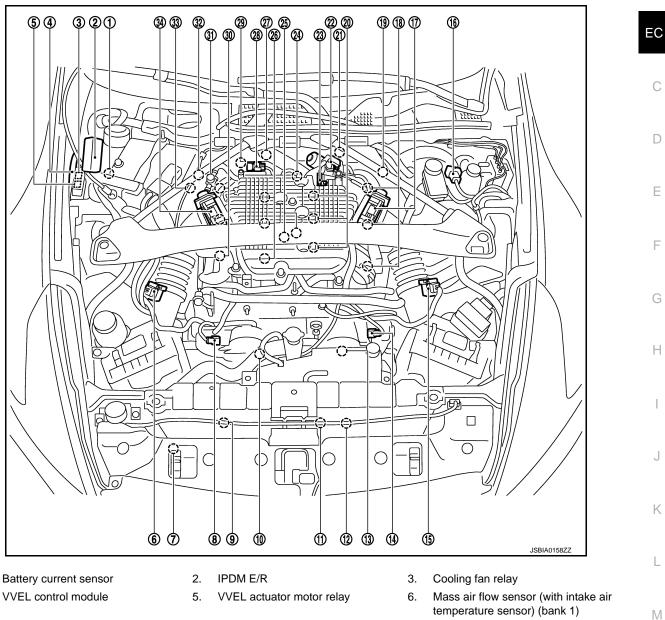
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7. Refrigerant pressure sensor

1.

4.

- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)
- 22. VVEL actuator motor (bank 2)
- 25. Knock sensor
- 28. EVAP canister purge volume control 29. VVEL control shaft position sensor solenoid valve

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

(bank 1)

- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- (bank 1)

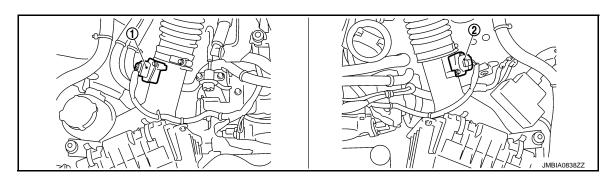
- temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. VVEL control shaft position sensor (bank 2)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

### < SYSTEM DESCRIPTION >

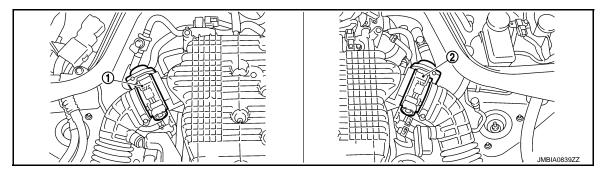
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- 31. EVAP service port
- 32. A/F sensor 1 (bank 1)
- 33. Crankshaft position sensor (POS)

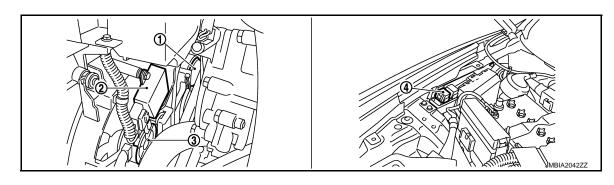
34. Electric throttle control actuator (bank 1)



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



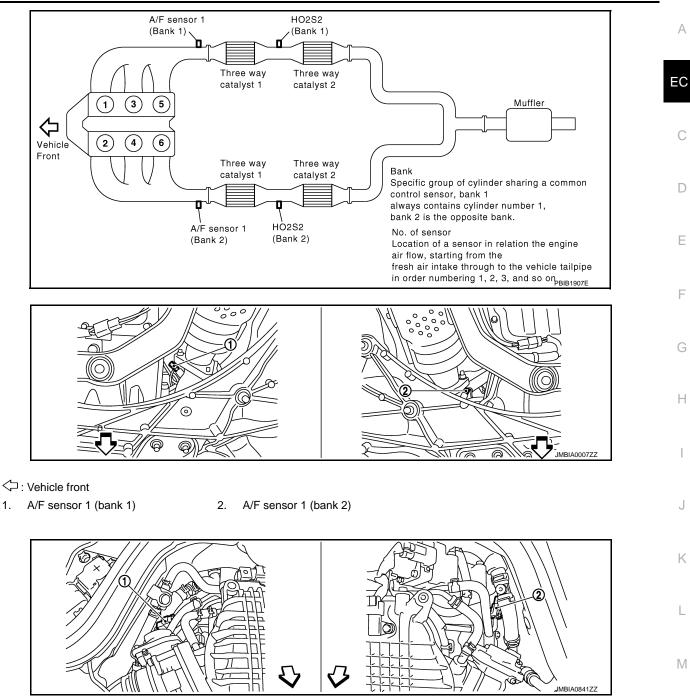
- 1. Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



C: Vehicle front

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

### < SYSTEM DESCRIPTION >



C: Vehicle front

1.

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

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#### Revision: 2014 September

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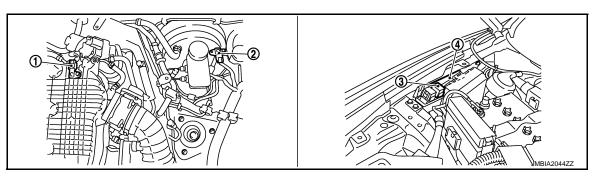
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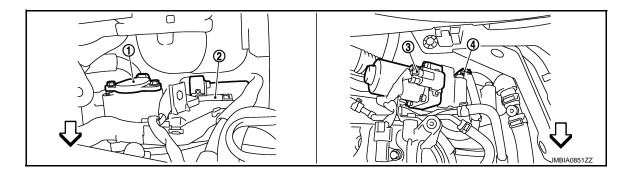
#### └─ : Vehicle front

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

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



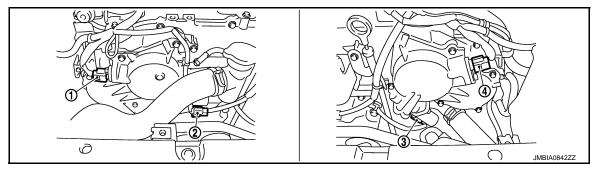
- Manifold absolute pressure (MAP) 1. 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



C: Vehicle front

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

4. VVEL control shaft position sensor (bank 2)

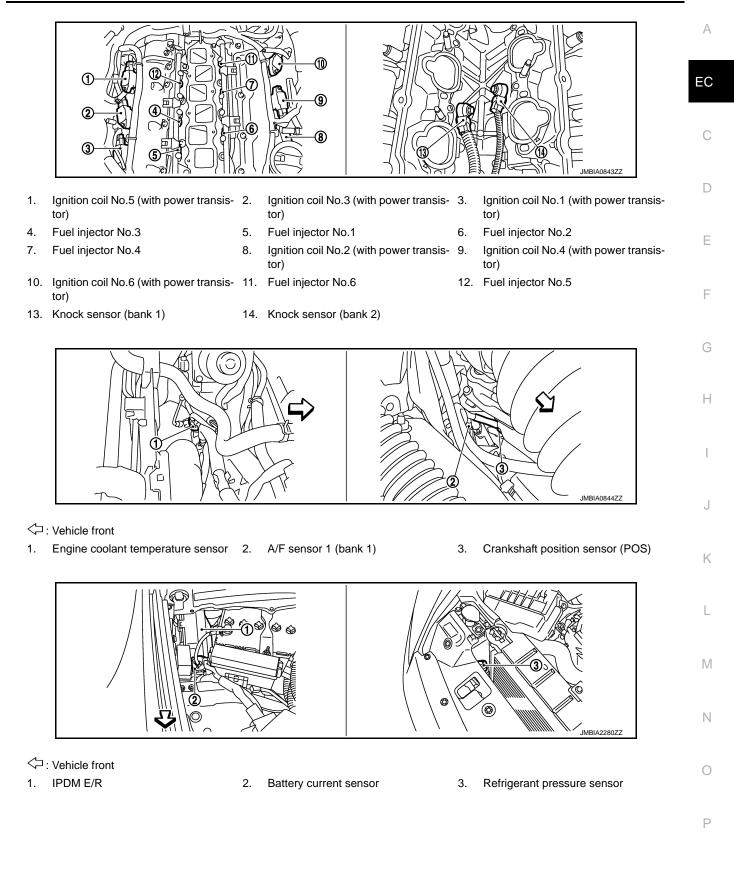


- 1. Camshaft position sensor (PHASE) 2. (bank 1)
- Camshaft position sensor (PHASE) 4. (bank 2)

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

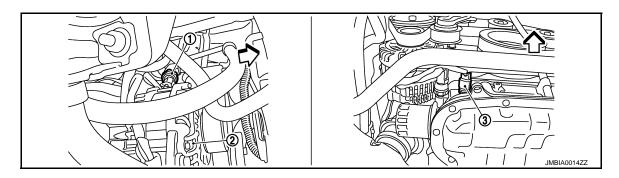
Intake valve timing control solenoid valve (bank 2) harness connector

### < SYSTEM DESCRIPTION >



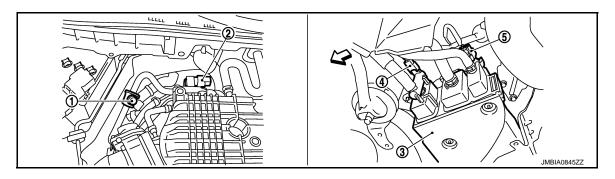
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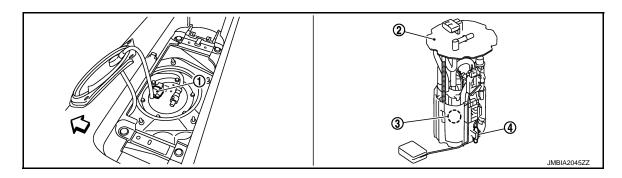


- C: Vehicle front
- 1. Power steering pressure sensor 2. Alternator

3. Engine oil temperature sensor



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

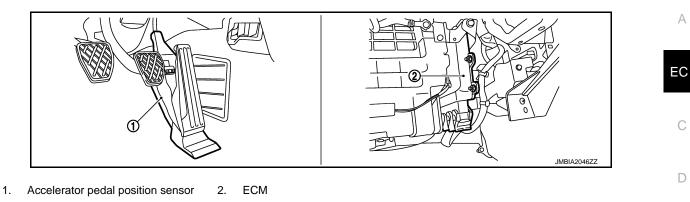


C: Vehicle front

- 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

### < SYSTEM DESCRIPTION >

## [VQ37VHR]



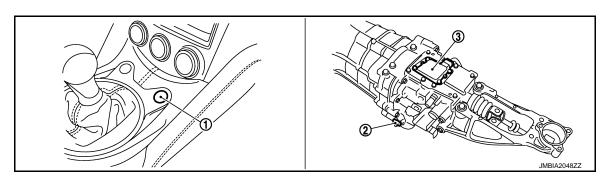
- 2 Ð 3 Ē 4 (5 JMBIA2047ZZ
- ASCD steering switch 1.

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- 2. SET/COAST switch
  - 5. MAIN switch

CANCEL switch

**RESUME/ACCELERATE** switch 3.



1. S-mode switch 2. Input speed sensor

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3. Gear lever position sensor

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Stop lamp switch 1.

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- Clutch pedal position switch 4.
- **Component Description**
- ASCD brake switch 2.
- 5. Clutch interlock switch

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- 3. Brake pedal 6.
  - Clutch pedal

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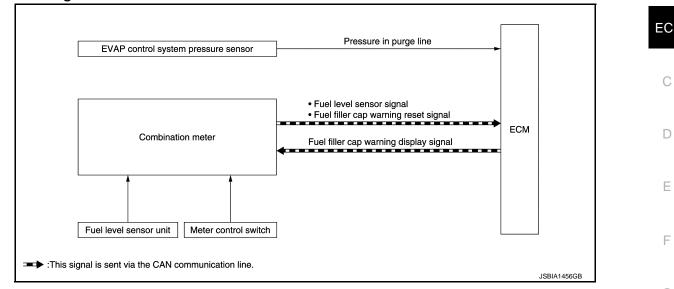
### < SYSTEM DESCRIPTION >

Component	Reference
Camshaft position sensor (PHASE)	EC-310, "Description"
Clutch interlock switch	EC-401, "Description"
Clutch pedal position switch	EC-406, "Description"
Crankshaft position sensor (POS)	EC-306, "Description"
Gear lever position sensor	EC-396, "Description"
Input speed sensor	EC-493, "Description"
Shift position indicator	EC-530, "Description"
S-MODE switch	EC-531, "Description"

### < SYSTEM DESCRIPTION >

## FUEL FILLER CAP WARNING SYSTEM

## System Diagram



## System Description

### 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 <sup>*</sup>	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 <sup>*</sup>	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 sensor signal transmitted from the combination meter via CAN communication.

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. Refer to <u>MWI-</u> <u>27, "INFORMATION DISPLAY : System Description"</u>.
- 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.

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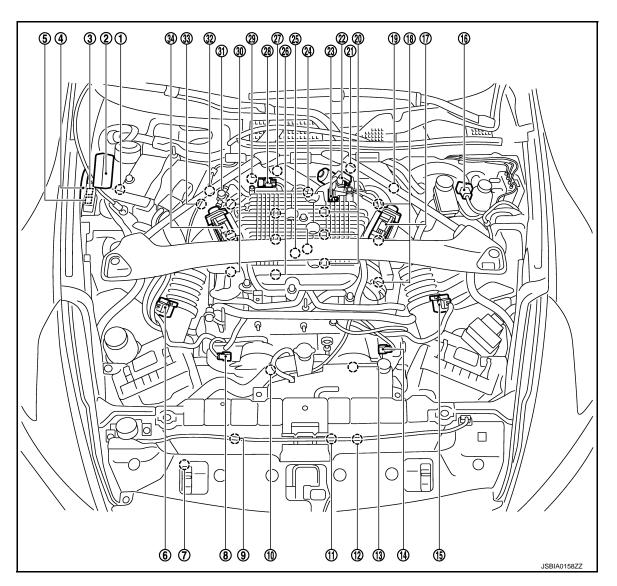
- EVAP leak diagnosis result is normal.
- Fuel refilled.
- DTC erased by using CONSULT.

#### NOTE:

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

## **Component Parts Location**

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- 1. Battery current sensor
- 4. VVEL control module
- 7. Refrigerant pressure sensor
- 10. Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. Brake booster pressure sensor
- 19. A/F sensor 1 (bank 2)

- 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. Electric throttle control actuator (bank 2)
- 20. Fuel injector (bank 2)

- 3. Cooling fan relay
- 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. VVEL control shaft position sensor (bank 2)

### < SYSTEM DESCRIPTION >

22. VVEL actuator motor (bank 2)

34. Electric throttle control actuator

25. Knock sensor

(bank 1)

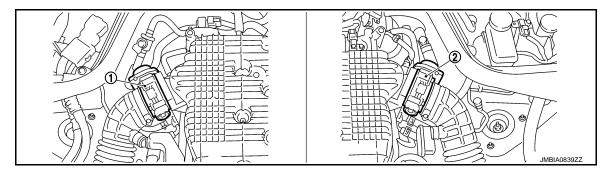
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- 28. EVAP canister purge volume control solenoid valve
- 31. EVAP service port

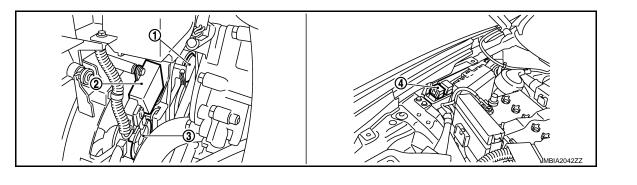
- 23. Manifold absolute pressure (MAP) sensor
- 26. Fuel injector (bank 1)
- 29. VVEL control shaft position sensor (bank 1)
- 32. A/F sensor 1 (bank 1)
- 24. Engine coolant temperature sensor
- 27. VVEL actuator motor (bank 1)
- 30. Ignition coil (with power transistor) and spark plug (bank 1)

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- 33. Crankshaft position sensor (POS)
- - Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)



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



C: Vehicle front

4.

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

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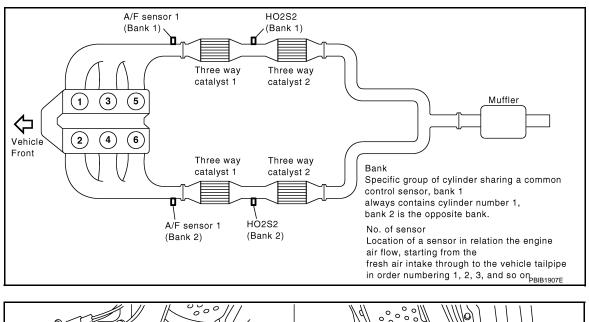
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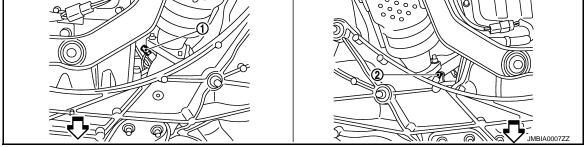
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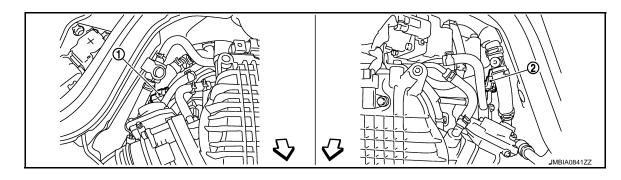
### < SYSTEM DESCRIPTION >





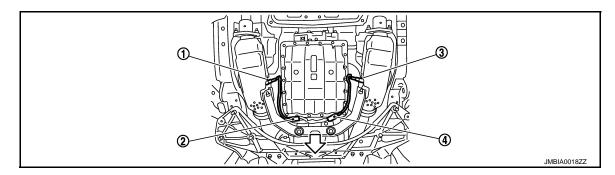
#### C: Vehicle front

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



C : Vehicle front

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



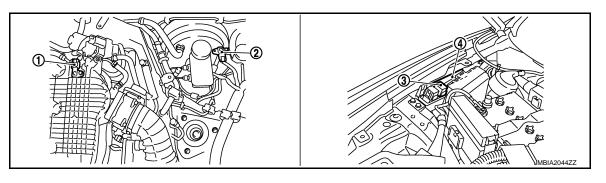
### < SYSTEM DESCRIPTION >

### [VQ37VHR]

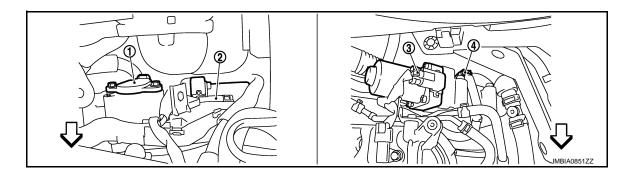
#### C: Vehicle front

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

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



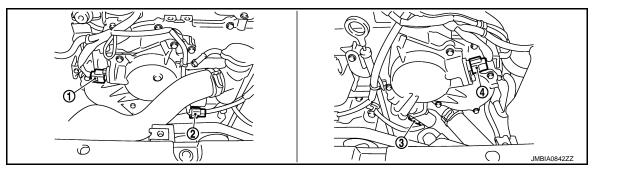
- 1. Manifold absolute pressure (MAP) 2. Brake booster pressure sensor 3. VVEL actuator motor relay sensor
- 4. VVEL control module



C: Vehicle front

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

 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

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#### Ignition coil No.5 (with power transis- 2. Ignition coil No.3 (with power transis- 3. tor) tor) Fuel injector No.1 Fuel injector No.3 5. 6. Fuel injector No.2 Ignition coil No.2 (with power transis- 9. Fuel injector No.4 8. tor) tor)

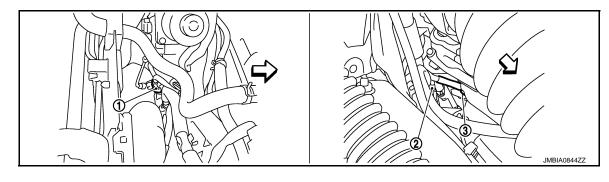
- tor)
- 14. Knock sensor (bank 2)

Ignition coil No.1 (with power transis-

JMBIA0843ZZ

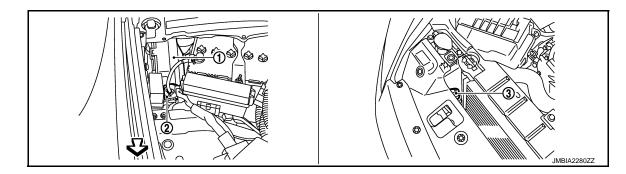
[VQ37VHR]

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



└□: Vehicle front

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



└─ : Vehicle front

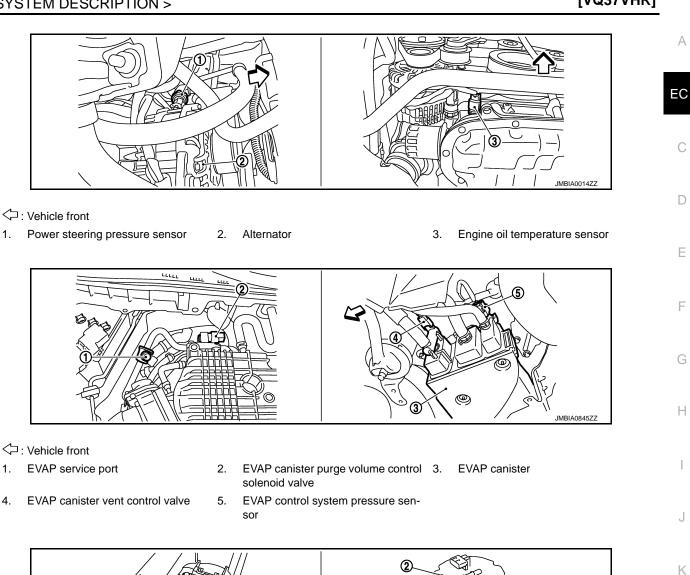
IPDM E/R 1.

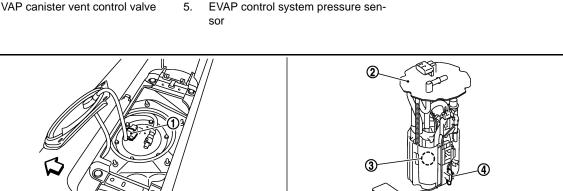
- 2. Battery current sensor
- Refrigerant pressure sensor 3.

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

### < SYSTEM DESCRIPTION >

### [VQ37VHR]





└□: 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.

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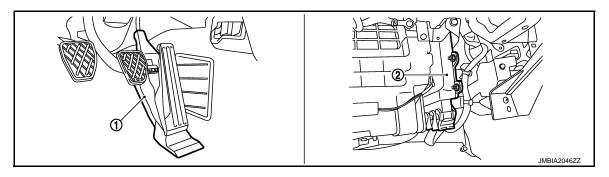
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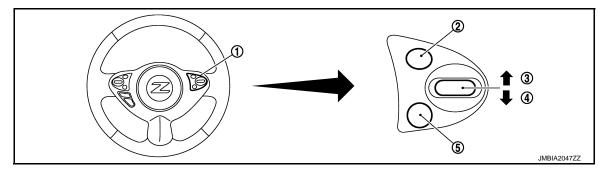
JMBIA2045ZZ

## < SYSTEM DESCRIPTION >

[VQ37VHR]

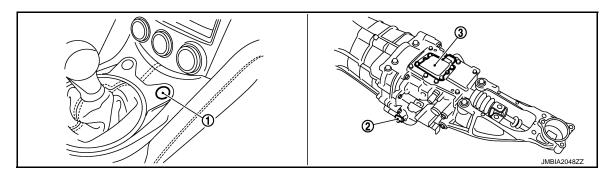


Accelerator pedal position sensor 2. ECM 1.



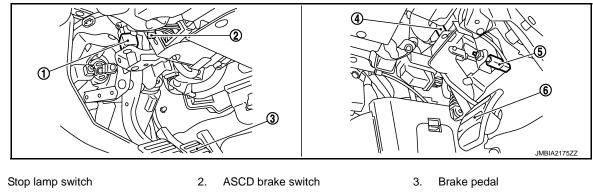
- ASCD steering switch 1.
- CANCEL switch 2.
- 4. SET/COAST switch
- 5. MAIN switch

3. RESUME/ACCELERATE switch



S-mode switch 1.

- 2. Input speed sensor
- 3. Gear lever position sensor



Clutch pedal position switch 4.

1.

**Component Description** 

- 5. Clutch interlock switch
- - 6. Clutch pedal

INFOID:000000010839458

### < SYSTEM DESCRIPTION >

## [VQ37VHR]

Component	Reference
EVAP control system pressure sensor	EC-340, "Description"
Fuel level sensor	EC-361, "Description"

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## **ON BOARD DIAGNOSTIC (OBD) SYSTEM**

### < SYSTEM DESCRIPTION >

## ON BOARD DIAGNOSTIC (OBD) SYSTEM

### Diagnosis Description

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

## GST (Generic Scan Tool)

INFOID:000000010839460

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to <u>EC-144</u>. "<u>Diagnosis Description</u>".

#### NOTE:

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

INFOID:000000010839459

< SYSTEM DESCRIPTION >

## DIAGNOSIS SYSTEM (ECM) DIAGNOSIS DESCRIPTION

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

INFOID:000000010839461 EC

×: Applicable —: Not applicable

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.

		Ν	IIL		D	ГС	1st tri	DTC	
Items	1st trip 2nd trip			nd 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 <u>EC-576, "DTC Index"</u> .)	_	×	_		×	_	_	_	
Except above	_	_		×	_	×	х	_	

## **DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data**

INFOID:000000010839462

### 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, "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>, "Work Flow". Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

## FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

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

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

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#### < 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				
3	1st trip freeze frame data					

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

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

### **DIAGNOSIS DESCRIPTION : Counter System**

INFOID:000000010839463

#### 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

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

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

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

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

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

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

### EC-146

#### < SYSTEM DESCRIPTION >

#### А This driving pattern satisfies with B and C patterns. This driving pattern EC satisfies with C but not B. NG This driving pattern NG OK NG Detection satisfies with B but not C. Detection Detection Detection <Driving Pattern> Vehicle 1st speed Trip Trip Trip Trip D NG OK NG NG IGN ON MIL MIL illuminates illuminates MIL turns off F MIL turns off ۲Ż в Нc 0 Ω 0 Counter DTC & DISPLAY NO DISPLAY Freeze NO DISPL Data> Н Frame Data \*4 °3 DISPLAY DISPLAY Frame 1st trip CLEAR CLEAR Freeze Frame Freeze 6 Data DISPLAY DISPLAY 1st trip CLEAR CLEAF trip) DTC (1st 1 6 \*8 ∞ DTC 80 С 79 5 Counter Κ trip) <(1st L JMBIA1417GB Μ \*1: When the same malfunction is de-\*2: MIL will turn OFF after vehicle is driv- \*3: When the same malfunction is deen 3 times (pattern B) without any tected in two consecutive trips, MIL tected in two consecutive trips, the will light up. malfunctions. DTC and the freeze frame data will be stored in ECM. Ν \*4: The DTC and the freeze frame data \*5: When a malfunction is detected for \*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at will not be displayed any longer after the first time, the 1st trip DTC and the 1st trip freeze frame data will be the moment OK is detected. vehicle is driven 80 times (pattern C) without the same malfunction. (The stored in ECM. DTC and the freeze frame data still remain in ECM.) \*7: When the same malfunction is de-\*8: 1st trip DTC will be cleared when ve-Ρ tected in the 2nd trip, the 1st trip hicle is driven once (pattern C) with-

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

is stored in ECM.

out the same malfunction after DTC

Driving Pattern B Refer to <u>EC-149, "DIAGNOSIS DESCRIPTION : Driving Pattern"</u>.

freeze frame data will be cleared.

## EC-147

< SYSTEM DESCRIPTION >

Driving Pattern C Refer to <u>EC-149</u>, "<u>DIAGNOSIS DESCRIPTION</u> : <u>Driving Pattern</u>". Example: If the stored freeze frame data is as per the following:

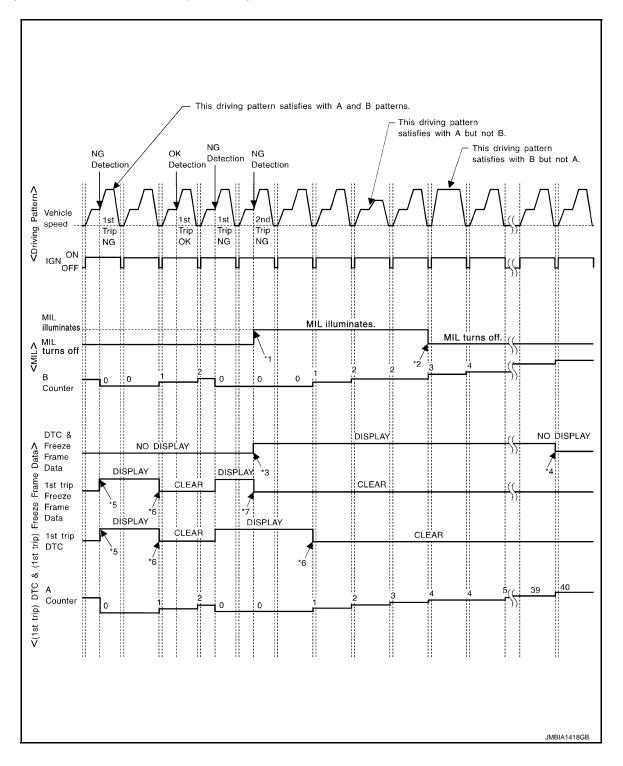
If the stored freeze frame data is as per the following:

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  $70^{\circ}C$  ( $158^{\circ}F$ )

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



#### < SYSTEM DESCRIPTION >

### [VQ37VHR]

*1: When the same malfunction is de- tected in two consecutive trips, MIL will light up. *2: MIL will turn OFF after vehicle is driv- en 3 times (pattern B) without any malfunctions. *3: When the same malfunction is de- tected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.	A
*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	EC C
still remain in ECM.) *7: When the same malfunction is de- tected in the 2nd trip, the 1st trip freeze frame data will be cleared.	D
Explanation for Driving Patterns Except for "Misfire < Exhaust Quality Deterioration>", "Fuel Injection System"	E
Driving Pattern A Refer to <u>EC-149, "DIAGNOSIS DESCRIPTION : Driving Pattern"</u> .	F
Driving Pattern B Refer to <u>EC-149, "DIAGNOSIS DESCRIPTION : Driving Pattern"</u> .	
DIAGNOSIS DESCRIPTION : Driving Pattern	G
CAUTION: Always drive at a safe speed.	Н
<ul> <li>DRIVING PATTERN A</li> <li>Driving pattern A means a trip satisfying the following conditions.</li> <li>Engine speed reaches 400 rpm or more.</li> <li>Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.</li> </ul>	I
<ul> <li>Engine coolant temperature reaches 70°C (158°F) or more.</li> <li>The ignition switch is turned from ON to OFF.</li> <li>NOTE:</li> </ul>	J
<ul> <li>When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern A.</li> <li>When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern A.</li> </ul>	17
DRIVING PATTERN B Driving pattern B means a trip satisfying the following conditions.	L
<ul> <li>Engine speed reaches 400 rpm or more.</li> <li>Engine coolant temperature reaches 70°C (158°F) or more.</li> <li>Vehicle speed of 70 – 120 km/h (44 – 75 MPH) is maintained for 60 seconds or more under the control of cleared land.</li> </ul>	M
<ul> <li>closed loop.</li> <li>Vehicle speed of 30 – 60 km/h (19 – 37 MPH) is maintained for 10 seconds or more under the control of</li> </ul>	
<ul> <li>closed loop.</li> <li>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.</li> </ul>	Ν
<ul> <li>The state of driving at 10 km/h (7 MPH) or more reaches 10 minutes or more in total.</li> <li>A lapse of 22 minutes or more after engine start.</li> </ul>	0
<ul> <li>NOTE:</li> <li>Drive the vehicle at a constant velocity.</li> <li>When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern B.</li> </ul>	1
<ul> <li>When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern B.</li> </ul>	
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)  $\pm 375$  rpm

#### < SYSTEM DESCRIPTION >

Calculated load value: (Calculated load value in the freeze frame data) x  $(1\pm0.1)$  [%] Engine coolant temperature condition:

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

#### NOTE:

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

#### DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.

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

#### NOTE:

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

## DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:000000010839465

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

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

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

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

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

#### NOTE:

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

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

#### NOTE:

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

#### SRT SET TIMING

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

#### < SYSTEM DESCRIPTION >

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				Example			A
Self-diagnosis result		Diagnosis	$\leftarrow ON \rightarrow$	$\begin{array}{rl} \text{Ignitio} \\ \text{OFF} & \leftarrow \text{ON} \rightarrow & \text{O} \end{array}$	$n  cycle \ FF \ \leftarrow ON  o \ OFF$	$\leftarrow ON \rightarrow$	
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)	EC
		P0402	OK (1)	— (1)	— (1)	OK (2)	-
		P1402	OK (1)	OK (2)	— (2)	— (2)	-
		SRT of EGR	"CMPLT"	"CMPLT"	"CMPLT"	"CMPLT"	C
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)	-
		P0402	— (0)	— (0)	OK (1)	— (1)	D
		P1402	OK (1)	OK (2)	— (2)	— (2)	-
		SRT of EGR	"INCMP"	"INCMP"	"CMPLT"	"CMPLT"	
NG exists	Case 3	P0400	OK	OK	—	—	E
		P0402	_	—	—	—	-
		P1402	NG	—	NG	NG (Consecutive NG)	F
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL ON)	G
		SRT of EGR	"INCMP"	"INCMP"	"INCMP"	"CMPLT"	G

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".

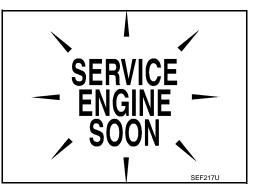
### DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

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-519, "Component Function Check"</u>.

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



INFOID:000000010839466

#### < 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

INFOID:000000010839467

[VQ37VHR]

### 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 <u>EC-20, "THROTTLE VALVE</u> <u>CLOSED POSITION LEARNING : Description"</u> .
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**

- 1. Turn ignition switch ON.
- The MIL on the instrument panel should stay ON. If it remains OFF, check MIL circuit. Refer to <u>EC-519, "Diagnosis Procedure"</u>.

#### SRT STATUS MODE

#### Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to <u>EC-150, "DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code"</u>.

**Operation Procedure** 

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

#### < SYSTEM DESCRIPTION >

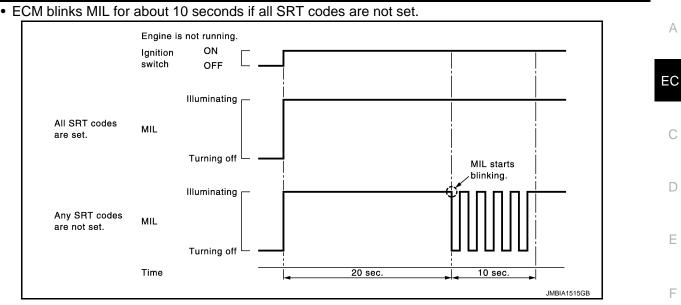
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### MALFUNCTION WARNING MODE

#### 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 <u>EC-519, "Diagnosis Procedure"</u> .

- 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 mal-function.
- After ignition switch is turned off, ECM is always released from the "self-diagnostic results" mode.
- 1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 2. Repeat the following procedure quickly five times within 5 seconds.
  - Fully depress the accelerator pedal.
  - Fully release the accelerator pedal.
- 3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.

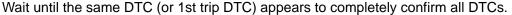
#### NOTE:

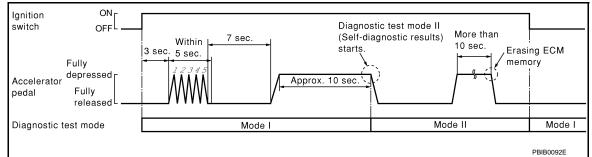
Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

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

#### < SYSTEM DESCRIPTION >

#### NOTE:

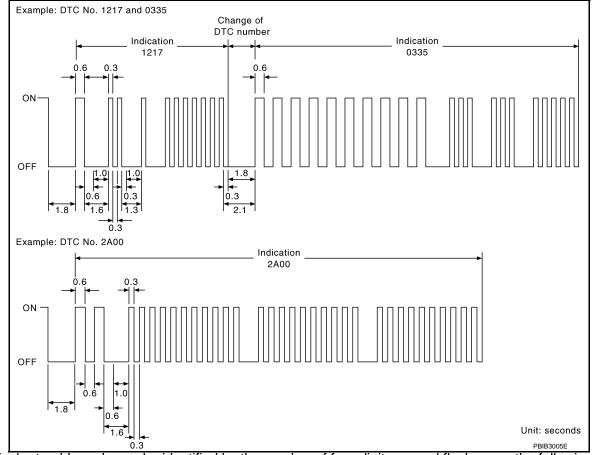




#### How to Read Self-diagnostic Results

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

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



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

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

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

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

### EC-154

#### < 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, "DTC Index"</u>.

How to Erase Self-diagnostic Results

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By performing this procedure, ECM memory is erased and the following diagnostic information is erased as	
well.	E
Discussed in translation of the second se	

- 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

### 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

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

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#### < SYSTEM DESCRIPTION >

#### NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see <u>EC-576. "DTC Index"</u>), skip step 1.
- 1. Erase DTC in TCM. Refer to TM-203, "Diagnosis Description".
- 2. Select "ENGINE" with CONSULT.
- 3. Select "SELF-DIAG RESULTS".
- 4. Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description			
DIAG TROUBLE CODE [PXXXX]	• The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to <u>EC-576</u> , "DTC Index".)			
CAL/LD VALUE [%]	The calculated load value at the moment a malfunction is detected is displayed.			
COOLANT TEMP [°C] or [°F]	The engine coolant temperature at the moment a malfunction is detected is displayed.			
L-FUEL TRM-B1 [%]	• "Long-term fuel trim" at the moment a malfunction is detected is displayed.			
L-FUEL TRM-B2 [%]	<ul> <li>The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.</li> </ul>			
S-FUEL TRM-B1 [%]	"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 schedule.			
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.			
FUEL SYS-B2	<ul> <li>One of the following mode is displayed.</li> <li>Mode2: Open loop due to detected system malfunction</li> <li>Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment)</li> <li>Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control</li> <li>Mode5: Open loop - has not yet satisfied condition to go to closed loop</li> </ul>			
INT MANI PRES [kPa]	Those items are displayed but are not applicable to this model			
COMBUST CONDITION	These items are displayed but are not applicable to this model.			

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

#### DATA MONITOR MODE

#### NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- For reference values of the following items, refer to EC-534, "Reference Value".

Monitored Item

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	<ul> <li>Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and cam- shaft position sensor (PHASE).</li> </ul>	<ul> <li>Accuracy becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul>
MAS A/F SE-B1			• When the engine is stopped, a
MAS A/F SE-B2	V	<ul> <li>The signal voltage of the mass air flow sensor is dis- played.</li> </ul>	<ul> <li>certain value is indicated.</li> <li>When engine is running, specification range is indicated in "SPEC".</li> </ul>

### < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
B/FUEL SCHDL	msec	• "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	<ul> <li>When engine is running, speci- fication range is indicated in "SPEC".</li> </ul>
A/F ALPHA-B1 A/F ALPHA-B2	%	<ul> <li>The mean value of the air-fuel ratio feedback correc- tion factor per cycle is indicated.</li> </ul>	<ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>This data also includes the data for the air-fuel ratio learning control.</li> <li>When engine is running, specification range is indicated in "SPEC".</li> </ul>
COOLAN TEMP/S	°C or °F	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant tem- perature sensor is open or short-circuited, ECM enters fail- safe mode. The engine coolant temperature determined by the ECM is displayed.
A/F SEN1 (B1)	V	• The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed.	
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is	
HO2S2 (B2)		displayed.	
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	RICH/LEAN	<ul> <li>Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small.</li> <li>LEAN: means the amount of oxygen after three way catalyst is relatively large.</li> </ul>	<ul> <li>When the engine is stopped, a certain value is indicated.</li> </ul>
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 voltage is displayed.	ACCEL SEN 2 signal is con- verted by ECM internally. Thus, they differs from ECM terminal voltage signal.
TP SEN 1-B1			• TP SEN 2-B1 signal is convert-
TP SEN 2-B1	V	<ul> <li>The throttle position sensor signal voltage is dis- played.</li> </ul>	ed by ECM internally. Thus, they differs from ECM terminal voltage signal.
FUEL T/TMP SE	°C or °F	• The fuel temperature (determined by the signal volt- age of the fuel tank temperature sensor) is displayed.	
EVAP SYS PRES	V	The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE	V	The signal voltage of the fuel level sensor is 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.	<ul> <li>After starting the engine, [OFF] is displayed regardless of the starter signal.</li> </ul>
CLSD THL POS	ON/OFF	<ul> <li>Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.</li> </ul>	
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
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.	

### < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
LOAD SIGNAL	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from the electrical load signal.</li> <li>ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position.</li> <li>OFF: Both rear window defogger switch and lighting switch are OFF.</li> </ul>	
IGNITION SW	ON/OFF	Indicates [ON/OFF] condition from ignition switch sig- nal.	
HEATER FAN SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from the heater fan switch signal.</li> </ul>	
BRAKE SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from the stop lamp switch signal.</li> </ul>	
INJ PULSE-B1		Indicates the actual fuel injection pulse width com-	• When the engine is stopped, a
INJ PULSE-B2	msec	pensated by ECM according to the input signals.	certain computed value is indi- cated.
IGN TIMING	BTDC	<ul> <li>Indicates the ignition timing computed by ECM ac- cording to the input signals.</li> </ul>	• 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 sen- sor.	
PURG VOL C/V	%	<ul> <li>Indicates the EVAP canister purge volume control so- lenoid valve control value computed by the ECM ac- cording to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
INT/V SOL (B1)	%	<ul> <li>The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated.</li> <li>The advance angle becomes larger as the value increases.</li> </ul>	
AIR COND RLY	ON/OFF	<ul> <li>The air conditioner relay control condition (deter- mined by ECM according to the input signals) is indi- cated.</li> </ul>	
FUEL PUMP RLY	ON/OFF	Indicates the fuel pump relay control condition deter- mined by ECM according to the input signals.	
VENT CONT/V	ON/OFF	The control condition of the EVAP canister vent con- trol 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 con- dition determined by the ECM according to the input signals.	
A/F S1 HTR (B2)	%	<ul> <li>Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals.</li> <li>The current flow to the heater becomes larger as the value increases.</li> </ul>	
HO2S2 HTR (B1)	_	• Indicates [ON/OFF] condition of heated oxygen sen-	
HO2S2 HTR (B2)	ON/OFF	sor 2 heater determined by ECM according to the in- put signals.	
I/P PULLY SPD	rpm	• Indicates the engine speed computed from the input speed sensor signal.	
VEHICLE SPEED	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	

### < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks	^
IDL A/V LEARN	YET/CMPLT	<ul> <li>Displays the condition of Idle Air Volume Learning YET: Idle air volume learning has not been performed yet.</li> <li>CMPLT: Idle air volume learning has already been performed successfully.</li> </ul>		EC
TRVL AFTER MIL	km or mile	Distance traveled while MIL is activated.		
ENG OIL TEMP	°C or °F	• The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed.		С
A/F S1 HTR (B1)	%	<ul> <li>Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals.</li> <li>The current flow to the heater becomes larger as the value increases.</li> </ul>		D
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.		E
SET VHCL SPD	km/h or mph	The preset vehicle speed is displayed.		_
MAIN SW	ON/OFF	Indicates [ON/OFF] condition from MAIN switch sig- nal.		F
CANCEL SW	ON/OFF	Indicates [ON/OFF] condition from CANCEL switch signal.		G
RESUME/ACC SW	ON/OFF	Indicates [ON/OFF] condition from RESUME/AC- CELERATE switch signal.		
SET SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from SET/COAST switch signal.</li> </ul>		Η
BRAKE SW1	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from ASCD brake switch signal.</li> </ul>		
BRAKE SW2	ON/OFF	Indicates [ON/OFF] condition of stop lamp switch sig- nal.		
VHCL SPD CUT	NON/CUT	<ul> <li>Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD op- eration is cut off.</li> </ul>		K
LO SPEED CUT	NON/CUT	<ul> <li>Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low, and ASCD operation is cut off.</li> </ul>		L
AT OD MONITOR	ON/OFF	<ul><li>Always OFF is displayed.</li><li>This item is not efficient for Z34 models.</li></ul>		IVI
AT OD CANCEL	ON/OFF	<ul><li>Always OFF is displayed.</li><li>This item is not efficient for Z34 models.</li></ul>		Ν
CRUISE LAMP	ON/OFF	• Indicates [ON/OFF] condition of CRUISE lamp deter- mined by the ECM according to the input signals.		(
SET LAMP	ON/OFF	<ul> <li>Indicates [ON/OFF] condition of SET lamp deter- mined by the ECM according to the input signals.</li> </ul>		0
FAN DUTY	%	• Indicates a command value for cooling fan. The value is calculated by ECM based on input signals.		Ρ
AC EVA TEMP	°C or °F	Indicates A/C evaporator temperature sent from combination meter.		
AC EVA TARGET	°C or °F	<ul> <li>Indicates target A/C evaporator temperature sent from "unified meter and A/C amp.".</li> </ul>		

### < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
A/F ADJ-B1 A/F ADJ-B2	_	• Indicates the correction of factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal.	
TP SEN 1-B2			• TP SEN 2-B2 signal is convert-
TP SEN 2-B2	V	<ul> <li>The throttle position sensor signal voltage is dis- played.</li> </ul>	ed by ECM internally. Thus, they differs from ECM terminal voltage signal.
P/N POSI SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.</li> </ul>	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
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.	
ATOM PRES SEN	mV	<ul><li> Always a certain value is displayed.</li><li> This item is not efficient for Z34 models.</li></ul>	
BRAKE BST PRES SE	mV	<ul><li>Always a certain value is displayed.</li><li>This item is not efficient for Z34 models.</li></ul>	
INT/V TIM (B1)	°CA a ladiantes [°CA] et intelle completit ad lange en		
INT/V TIM (B2)	°CA	<ul> <li>Indicates [°CA] of intake camshaft advance angle.</li> </ul>	
MAP SENSOR	V	<ul><li> Always a certain value is displayed.</li><li> This item is not efficient for Z34 models.</li></ul>	
EVAP LEAK DIAG	YET/CMPLT	<ul> <li>Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully.</li> </ul>	
EVAP DIAG READY	ON/OFF	<ul> <li>Indicates the ready condition of EVAP leak diagnosis.</li> <li>ON: Diagnosis has been ready condition.</li> <li>OFF: Diagnosis has not been ready condition.</li> </ul>	
VVEL LEARN	YET/DONE	<ul> <li>Display the condition of VVEL learning YET: VVEL learning has not been performed yet.</li> <li>DONE: VVEL learning has already been performed successfully.</li> </ul>	
VVEL SEN LEARN- B1	V	• Indicatoo the VA/EL location weight	
VVEL SEN LEARN- B2	v	<ul> <li>Indicates the VVEL learning value.</li> </ul>	
VVEL POSITION SEN-B1	V	The VVEL control shaft position sensor signal volt-	
VVEL POSITION SEN-B2	v	age is displayed.	
VVEL TIM-B1	dog	Indicators [dog] of \//EL control shoft angle	
VVEL TIM-B2	deg	<ul> <li>Indicates [deg] of VVEL control shaft angle.</li> </ul>	
ALTDUTY	%	<ul> <li>Indicates the duty ratio of the power generation com- mand value.</li> </ul>	

### < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks	0
ALT DUTY SIG	ON/OFF	<ul> <li>The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated.</li> <li>ON: Power generation voltage variable control is ac- tive.</li> <li>OFF: Power generation voltage variable control is in- active.</li> </ul>		EC
GEAR POSITION	1/2/3/4/5/6/N/R/ ##	<ul> <li>Indicates the shift position determined by the ECM according to the input signals.</li> </ul>	"##" is displayed when shift posi- tion cannot be judged.	С
M/T SYN REV STAT	INACT/ACTIVE	<ul> <li>Displays SynchroRev Match mode (S-MODE) is con- dition.</li> <li>INACT: S-MODE is not operated ACTIVE: S-MODE is operated</li> </ul>		D
M/T SYNCHRO SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from S-MODE switch signal.</li> </ul>		E
CPP SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from clutch pedal position switch signal.</li> </ul>		F
CLUTCH INTLCK SW	ON/OFF	<ul> <li>Indicates [ON/OFF] condition from clutch interlock switch signal.</li> </ul>		
M/T N POS LEARN	YET/DONE	<ul> <li>Displays the M/T Neutral Position Learning condition. YET: M/T neutral position learning is not complete yet.</li> <li>DONE: M/T neutral position learning is successfully complete.</li> </ul>		G
THRTL STK CNT B1 <sup>*</sup>	_	_		
HO2 S2 DIAG1 (B1)	INCMP/CMPLT	<ul> <li>Indicates DTC P0139 self-diagnosis (delayed response) condition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		
HO2 S2 DIAG1 (B2)	INCMP/CMPLT	<ul> <li>Indicates DTC P0159 self-diagnosis (delayed response) condition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		K
HO2 S2 DIAG2 (B1)	INCMP/CMPLT	<ul> <li>Indicates DTC P0139 self-diagnosis (slow response) condition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		L
HO2 S2 DIAG2 (B2)	INCMP/CMPLT	<ul> <li>Indicates DTC P0159 self-diagnosis (slow response) condition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		Μ
A/F SEN1 DIAG1 (B1)	INCMP/CMPLT	<ul> <li>Indicates DTC P015A or P015B self-diagnosis condition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		Ν
A/F SEN1 DIAG1 (B2)	INCMP/CMPLT	<ul> <li>Indicates DTC P015C or P015D self-diagnosis con- dition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		0
A/F SEN1 DIAG2 (B1)	INCMP/CMPLT	<ul> <li>Indicates DTC P014C or P014D self-diagnosis con- dition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		r
A/F SEN1 DIAG2 (B2)	INCMP/CMPLT	<ul> <li>Indicates DTC P014E or P014F self-diagnosis condition.</li> <li>INCMP: Self-diagnosis is incomplete.</li> <li>CMPLT: Self-diagnosis is complete.</li> </ul>		

### < SYSTEM DESCRIPTION >

### [VQ37VHR]

Monitored item	Unit	Description	Remarks
A/F SEN1 DIAG3 (B1)	ABSNT/PRSNT	<ul> <li>Indicates DTC P014C, P014D, P015A or P015B self- diagnosis condition.</li> <li>ABSNT: The vehicle condition is not within the diag- nosis range.</li> <li>PRSNT: The vehicle condition is within the diagnosis range.</li> </ul>	
A/F SEN1 DIAG3 (B2)	ABSNT/PRSNT	<ul> <li>Indicates DTC P014C, P014D, P015A or P015B self- diagnosis condition.</li> <li>ABSNT: The vehicle condition is not within the diag- nosis range.</li> <li>PRSNT: The vehicle condition is within the diagnosis range.</li> </ul>	

\*: The item is indicated, but not used.

#### NOTE:

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

### WORK SUPPORT MODE

#### Work Item

WORK ITEM	CONDITION	USAGE
IDLE AIR VOL LEARN	• The idle air volume that keeps the engine within the specified range is memorized in ECM.	When learning the idle air volume
EVAP SYSTEM CLOSE	<ul> <li>Close the EVAP canister vent control valve in order to make EVAP system close under the following conditions.</li> <li>Ignition switch ON</li> <li>Engine not running</li> <li>Ambient temperature is above 0°C (32°F).</li> <li>No vacuum and no high pressure in EVAP system</li> <li>Fuel tank temp. is more than 0°C (32°F).</li> <li>Within 10 minutes after starting "EVAP SYSTEM CLOSE"</li> <li>When trying to execute "EVAP SYSTEM CLOSE" under the condition except above, CONSULT will discontinue it and display appropriate instruction.</li> <li>NOTE:</li> <li>When starting engine, CONSULT may display "Battery voltage is low. Charge battery", even when using a charged battery.</li> </ul>	When detecting EVAP vapor leak in the EVAP system
FUEL PRESSURE RELEASE	<ul> <li>Fuel pump will stop by touching "START" during idling. Crank a few times after engine stalls.</li> </ul>	When releasing fuel pressure from fuel line
SELF-LEARNING CONT	• The coefficient of self-learning control mixture ratio returns to the original coefficient.	When clearing mixture ratio self- learning value
TARGET IDLE RPM ADJ*	Idle condition	When setting target idle speed
TARGET IGN TIM ADJ*	Idle condition	When adjusting target ignition timing
VIN REGISTRATION	In this mode, VIN is registered in ECM.	When registering VIN in ECM
VVEL POS SEN ADJ PREP	<ul><li>Use this item only when replacing VVEL actuator sub assembly.</li><li>Ignition on and engine stopped.</li></ul>	When adjusting VVEL control shaft position sensor
M/T NEUTRAL POS LEARN	<ul><li> Ignition on and engine stopped.</li><li>Shift position: neutral</li></ul>	When ECM is replaced When gear lever position sensor is replaced When shift position indicator "N" is blinking
CLSD THL POS LEARN	Ignition on and engine stopped.	When learning the throttle valve closed position

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

< SYSTEM DESCRIPTION >

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Ignition switch: ON (Engine stopped)

TEST ITEM

VENT CONTROL/V

ENG COOLANT TEMP

FUEL INJECTION

FUEL/T TEMP SEN

PURG VOL CONT/V

#### Test Item

			А
CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)	
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.	<ul><li>Harness and connectors</li><li>Solenoid valve</li></ul>	EC
<ul> <li>Engine: Return to the original trouble condition</li> <li>Change the engine coolant temperature using CONSULT.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	<ul> <li>Harness and connectors</li> <li>Engine coolant temperature sensor</li> <li>Fuel injector</li> </ul>	С
<ul> <li>Engine: Return to the original trouble condition</li> <li>Change the amount of fuel injection using CONSULT.</li> </ul>	If trouble symptom disap- pears, see CHECK ITEM.	<ul> <li>Harness and connectors</li> <li>Fuel injector</li> <li>Air fuel ratio (A/F) sensor 1</li> </ul>	D
Change the fuel tank temperature using CO	NSULT.	·	Е
<ul> <li>Engine: After warming up, run engine at 1,500 rpm.</li> <li>Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT.</li> </ul>	Engine speed changes ac- cording to the opening per- cent.	<ul><li>Harness and connectors</li><li>Solenoid valve</li></ul>	F

Fuel pump relay makes the | • Harness and connectors

FUEL PUMP RELAY	<ul> <li>Turn the fuel pump relay ON and OFF using CONSULT and listen to operating sound.</li> </ul>	Fuel pump relay makes the operating sound.	<ul><li>Harness and connectors</li><li>Fuel pump relay</li></ul>
IGNITION TIMING	<ul> <li>Engine: Return to the original trouble condition</li> <li>Timing light: Set</li> <li>Retard the ignition timing using CONSULT.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learning.
FAN DUTY CONTROL*	<ul><li> Ignition switch: ON</li><li> Change duty ratio using CONSULT.</li></ul>	Cooling fan speed changes.	<ul> <li>Harness and connectors</li> <li>Cooling fan motor</li> <li>Cooling fan relay</li> <li>Cooling fan control module</li> <li>IPDM E/R</li> </ul>
ALTERNATOR DUTY	<ul><li>Engine: Idle</li><li>Change duty ratio using CONSULT.</li></ul>	Battery voltage changes.	<ul><li>Harness and connectors</li><li>IPDM E/R</li><li>Alternator</li></ul>
POWER BALANCE	<ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch OFF</li> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Cut off each injector signal one at a time using CONSULT.</li> </ul>	Engine runs rough or dies.	<ul> <li>Harness and connectors</li> <li>Compression</li> <li>Fuel injector</li> <li>Power transistor</li> <li>Spark plug</li> <li>Ignition coil</li> </ul>

\*: 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*	—	_	0
EVAPORATIVE SYSTEM	EVP V/S LEAK P0456/P1456*	P0456	<u>EC-355</u>	
EVAPORATIVE STSTEM	PURG VOL CN/V P1444	P0443	<u>EC-324</u>	
	PURG FLOW P0441	P0441	<u>EC-319</u>	Р
	A/F SEN1 (B1) P1278/P1279	—	_	
A/F SEN1	A/F SEN1 (B1) P1276	P0130	EC-235	
ATSENT	A/F SEN1 (B2) P1288/P1289	—	_	
	A/F SEN1 (B2) P1286	P0150	EC-235	

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#### < SYSTEM DESCRIPTION >

Test mode	Test item	Corresponding DTC No.	Reference page
	HO2S2 (B1) P1146	P0138	<u>EC-251</u>
	HO2S2 (B1) P1147	P0137	<u>EC-245</u>
HO2S2	HO2S2 (B1) P0139	P0139	<u>EC-259</u>
H0252	HO2S2 (B2) P1166	P0158	<u>EC-251</u>
	HO2S2 (B2) P1167	P0157	<u>EC-245</u>
	HO2S2 (B2) P0159	P0159	<u>EC-259</u>

\*: DTC P0442, P1442 and P1456 does not apply to Z34 models but appears in DTC Work Support Mode screens.

#### SRT & P-DTC MODE

SRT STATUS Mode

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

#### PERMANENT DTC STATUS Mode

How to Display Permanent DTC Status

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

#### NOTE:

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

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

CAUTION: Turn ignition switch fro status screen.	m ON to OFF twice to update the inform	ation on the	
PERMANENT DTC	DRIVING PATTERN B	DRIVING PATTERN D	<u> </u>
XXXX	INCMP	INCMP	
xxxx	CMPLT	INCMP	
xxxx	INCMP	CMPLT	
xxxx	CMPLT	INCMP	
XXXX	INCMP	INCMP	
XXXX	INCMP	INCMP	ł
	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.

#### < DTC/CIRCUIT DIAGNOSIS >

# DTC/CIRCUIT DIAGNOSIS TROUBLE DIAGNOSIS - SPECIFICATION VALUE

## Description

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

1.preconditioning	G
Make sure that all of the following conditions are satisfied.	9
<ul> <li>TESTING CONDITION</li> <li>Vehicle driven distance: More than 5,000 km (3,107 miles)</li> </ul>	
• Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm <sup>2</sup> , 14.25 - 15.12 psi)	Н
<ul> <li>Atmospheric temperature: 20 - 30°C (68 - 86°F)</li> <li>Engine coolant temperature: 75 - 95°C (167 - 203°F)</li> </ul>	
• Transmission: Warmed-up	
- For A/T models: After the engine is warmed up to normal operating temperature, drive vehicle until "ATF	
TEMP 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F). - For M/T models: After the engine is warmed up to normal operating temperature, drive for 5 minutes.	.1
<ul> <li>Electrical load: Not applied</li> <li>Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight</li> </ul>	0
ahead.	
Engine speed: Idle	Κ
>> GO TO 2.	
2. PERFORM SPEC IN DATA MONITOR MODE	L
With CONSULT     NOTE:	Μ
Perform "SPEC" in "DATA MONITOR" mode in maximum scale display.	
<ol> <li>Perform <u>EC-14, "BASIC INSPECTION : Special Repair Requirement"</u>.</li> <li>Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2", "MAS A/F SE-B1" and "MAS A/F SE-B2" in</li> </ol>	Ν
"SPEC" of "DATA MONITOR" mode with CONSULT.	IN
<ol> <li>Make sure that monitor items are within the SP value.</li> <li><u>Is the measurement value within the SP value?</u></li> </ol>	
YES >> INSPECTION END	0
NO >> Go to EC-166, "Diagnosis Procedure".	
	Ρ

**EC-165** 

[VQ37VHR]

INFOID:0000000010839469

INFOID-000000010839470

А

EC

F

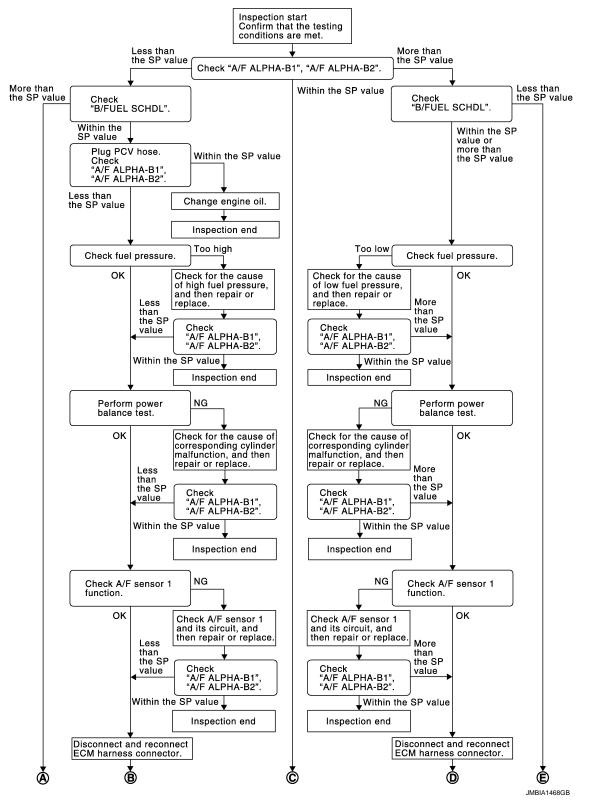
## < DTC/CIRCUIT DIAGNOSIS >

#### Diagnosis Procedure

INFOID:000000010839471

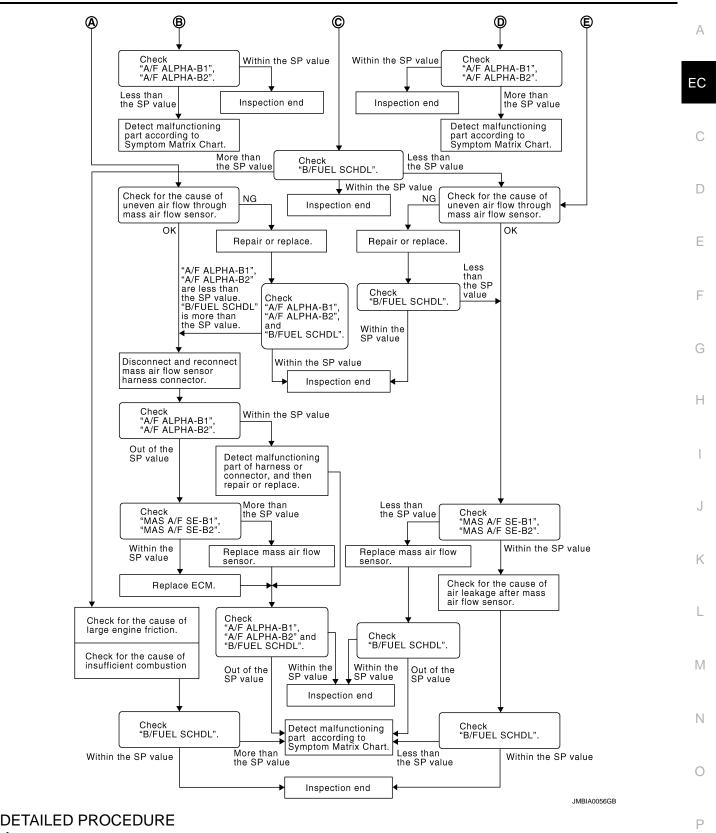
[VQ37VHR]

#### **OVERALL SEQUENCE**



#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



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

#### With CONSULT

- 1. Start engine.
- 2. Confirm that the testing conditions are met. Refer to EC-165, "Component Function Check".
- 3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

## EC-167

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

#### NOTE:

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

Is the measurement value within the SP value?

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

2.CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> GO TO 4.

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

**3.**CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> GO TO 6.

NO-1 >> More than the SP value: GO TO 6.

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

**4.**CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

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

Is the measurement value within the SP value?

YES >> GO TO 5.

NO >> GO TO 6.

**5.**CHANGE ENGINE OIL

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

#### NOTE:

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

>> INSPECTION END

#### **6.**CHECK FUEL PRESSURE

Check fuel pressure. (Refer to EC-631, "Inspection".)

Is the inspection result normal?

YES >> GO TO 9.

NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly" (Refer to <u>FL-5, "Exploded</u> <u>View"</u>.) and then GO TO 8.

NO-2 >> Fuel pressure is too low: GO TO 7.

**1**.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-5, "Exploded View"</u>.) and then GO TO 8. NO >> Repair or replace and then GO TO 8.

8. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"
<ol> <li>Start engine.</li> <li>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.</li> </ol>
Is the measurement value within the SP value?
YES >> INSPECTION END
NO $>>$ GO TO 9.
9. PERFORM POWER BALANCE TEST
<ol> <li>Perform "POWER BALANCE" in "ACTIVE TEST" mode.</li> <li>Make sure that the each cylinder produces a momentary engine speed drop.</li> </ol>
Is the inspection result normal?
YES >> GO TO 12. NO >> GO TO 10.
10. DETECT MALFUNCTIONING PART
<ul> <li>Check the following bellow.</li> <li>Ignition coil and its circuit (Refer to <u>EC-514, "Component Function Check"</u>.)</li> </ul>
<ul> <li>Fuel injector and its circuit (Refer to EC-508, "Component Function Check".)</li> </ul>
<ul> <li>Intake air leakage</li> <li>Low compression pressure (Refer to <u>EM-28, "Inspection"</u>.)</li> </ul>
Is the inspection result normal?
YES >> Replace fuel injector (Refer to EM-43, "Exploded View".) and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.
<b>11.</b> CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"
<ol> <li>Start engine.</li> <li>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.</li> </ol>
Is the measurement value within the SP value?
YES >> INSPECTION END NO >> GO TO 12.
<ul> <li>Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.</li> <li>For DTC P0130, P0150, refer to <u>EC-235, "DTC Logic"</u>.</li> </ul>
<ul> <li>For DTC P0131, P0151, refer to <u>EC-239, "DTC Logic"</u>.</li> </ul>
<ul> <li>For DTC P0132, P0152, refer to <u>EC-242, "DTC Logic"</u>.</li> <li>For DTC P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, refer to <u>EC-266, "DTC Logic"</u>.</li> </ul>
<ul> <li>For DTC P2096, P2097, P2098, P2099, refer to <u>EC-476, "DTC Logic"</u>.</li> </ul>
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.
<b>14</b> CHECK " $\Delta$ /F $\Delta$ I PHA-B1" " $\Delta$ /F $\Delta$ I PHA-B2"
1. Start engine.
<ol> <li>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.</li> </ol>
Is the measurement value within the SP value?
YES >> INSPECTION END
NO >> GO TO 15.

#### < DTC/CIRCUIT DIAGNOSIS >

## 15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

- 1. Stop the engine.
- 2. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.

>> GO TO 16.

**16.**CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

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

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> Detect malfunctioning part according to EC-614. "Symptom Table".
- 17.CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

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

**18.** DETECT MALFUNCTIONING PART

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

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

## **19.**CHECK INTAKE SYSTEM

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

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

Is the inspection result normal?

YES >> GO TO 21.

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

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

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

Is the measurement value within the SP value?

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

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

1. Stop the engine.

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
<ol> <li>Disconnect mass air flow sensor harness connector. Check pin terminal and connector then reconnect it again.</li> </ol>	for damage and
>> GO TO 22. <b>22.</b> CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"	E
<ol> <li>Start engine.</li> <li>Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and each indication is within the SP value.</li> </ol>	make sure that
<u>Is the measurement value within the SP value?</u> YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to <u>El</u> <u>sis Procedure</u> ". Then GO TO 29. NO >> GO TO 23.	<u>C-204. "Diagno-</u>
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 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 EN View".) and then GO TO 29.	
24.replace ecm	
<ol> <li>Replace ECM.</li> <li>Go to <u>EC-17</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : <u>Requirement</u>".</li> </ol>	Special Repair
>> GO TO 29. <b>25.</b> CHECK INTAKE SYSTEM	
<ul> <li>Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.</li> <li>Crushed air ducts</li> <li>Malfunctioning seal in air cleaner element</li> <li>Uneven dirt in air cleaner element</li> </ul>	
<ul> <li>Improper specification in intake air system</li> <li><u>Is the inspection result normal?</u></li> </ul>	
YES >> GO TO 27. NO >> Repair or replace malfunctioning part, and then GO TO 26. <b>26.</b> CHECK "B/FUEL SCHDL"	
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indica SP value.	tion is within the
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 indication is within the SP value.	e sure that each
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>EN</u> <u>View"</u> .) and then GO TO 30.	<u> 1-32, "Exploded</u>
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

#### < DTC/CIRCUIT DIAGNOSIS >

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

>> GO TO 30.

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to <u>EC-614, "Symptom Table"</u>.

**30.**CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> Detect malfunctioning part according to <u>EC-614, "Symptom Table"</u>.

< DTC/CIR(	CUIT DIAG		ER SUPF	PLY AN	ID GR	OUN	ND CI	RCUI	т	[V	Q37VHR]	
POWER	SUPPL	Y AND	GROUN	ND CIF	RCUIT	Γ						
Diagnosis	s Proced	ure								INFOI	D:0000000010839472	2 2
1.снеск	GROUND	CONNECTI	ON									EC
	nition switch	h OFF. nection M9	5 Refer to	Ground	nspectic	on in G	21_47 "	Circuit	Inspection	."		-
Is the inspec				Giouna i	nspeciic	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>, 1-47</u>	Circuit	mspection	<u>.</u> .		С
	GO TO 2. Repair or r	eplace grou	ind connec	tion								
2.снеск	-				) SHOR	RT-I						D
1. Disconr	nect ECM h	arness con ity between	nector.				und.					E
	ECM											
Connector	Termina	Gro	und Co	ontinuity	_							F
F101	8											
	123 124	Gro	und F	Existed								(
M107												
	128											I
	GO TO 4. GO TO 3. MALFUNO		PART									
<ul> <li>Harness c</li> </ul>	onnectors	F103, M116 short betwe		nd ground	ł							ŀ
4.снеск	ECM POW		Y CIRCUIT		arness o	r conr	nectors					-
2. Turn igr	nition switcl	arness coni h ON. between E(		s connec	tor and	groun	d.					N
		CM				•						Ν
+ Connector	Terminal	Connector	- Terminal	Volt	age							1
F102	53	M107	128	Battery	voltage	-						~
_NO >>	<u>ction result</u> GO TO 6. GO TO 5.	normal?										F
5.DETECT Check the for • Harness c	ollowing.		-AK I									_

- Harness connectors E3, F1IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between ECM and fuse

### < DTC/CIRCUIT DIAGNOSIS >

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

### 6.CHECK ECM POWER SUPPLY CIRCUIT-II

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

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

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 9.

### 7.CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch ON.

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

IPDN	/I E/R	Ground	Voltage	
Connector	Connector Terminal		voltage	
E7	53	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace IPDM E/R.

**8.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

## 9. CHECK ECM POWER SUPPLY CIRCUIT-IV

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

	E			
+		-	-	Voltage
Connector	Terminal	Connector Terminal		
F101	24	M107	128	Battery voltage

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 10.

10. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.

2. Disconnect IPDM E/R harness connector.

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

ECM		IPDI	Continuity	
Connector	Terminal	Connector Terminal		Continuity
F101	24	E7	69	Existed

## POWER SUPPLY AND GROUND CIRCUIT

<pre></pre>	[VQ37VHR]
4. Also check harness for short to ground and short to power.	
Is the inspection result normal?	A
YES >> GO TO 12.	
NO >> GO TO 11.	EC
11. DETECT MALFUNCTIONING PART	EC
Check the following.	
<ul> <li>Harness or connectors E3, F1</li> <li>Harness connectors F104, F105</li> </ul>	С
<ul> <li>Harness for open or short between ECM and IPDM E/R</li> </ul>	
	D
>> Repair open circuit or short to ground or short to power in harness or connector	rs.
12.CHECK 15 A FUSE	
<ol> <li>Disconnect 15 A fuse (No. 50) from IPDM E/R.</li> <li>Check 15 A fuse.</li> </ol>	E
Is the inspection result normal?	
YES $>>$ GO TO 15.	F
NO >> Replace 15A fuse.	
13. CHECK ECM POWER SUPPLY CIRCUIT-VI	0
1. Disconnect ECM harness connector.	G
<ol> <li>Disconnect IPDM E/R harness connector.</li> <li>Check the continuity between ECM harness connector and IPDM E/R harness connect</li> </ol>	tor
5. Check the continuity between ECM namess connector and FDM E/R namess connect	H
ECM IPDM E/R	
Connector Terminal Connector Terminal	
M107 125 E7 49 Existed	
4. Also check harness for short to ground and short to power.	
Is the inspection result normal?	J
YES >> GO TO 15. NO >> GO TO 14.	
14. DETECT MALFUNCTIONING PART	K
<ul><li>Check the following.</li><li>Harness or connectors E106, M6</li></ul>	1
<ul> <li>Harness for open or short between ECM and IPDM E/R</li> </ul>	L
>> Repair open circuit or short to ground or short to power in harness or connector	rs. M
15. CHECK INTERMITTENT INCIDENT	
Refer to GI-44, "Intermittent Incident".	N
Is the inspection result normal?	Ν
YES >> Replace IPDM E/R. NO >> Repair open circuit or short to ground or short to power in harness or connector	re
	0

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

### < DTC/CIRCUIT DIAGNOSIS >

## POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

## **Diagnosis** Procedure

INFOID:000000010839473

## 1. CHECK GROUND CONNECTION

Turn ignition switch OFF. 1.

Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.check vvel control module ground circuit for open and short

Disconnect VVEL control module harness connector. 1

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

VVEL con	trol module	Ground	Continuity	
Connector	Terminal	Ground		
E15	14	Ground	Existed	

Also check harness for short to power. 3.

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-I

1. Reconnect VVEL control module harness connector.

Turn ignition switch ON. 2.

Check the voltage between VVEL control module harness connector and ground. 3.

VVE	EL control mo	dule	
Connector	+	-	Voltage
Connector	Terminal	Terminal	
E15	8	14	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-II

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

Disconnect VVEL control module harness connector. 2.

Disconnect IPDM E/R harness connector. 3.

4. Check the continuity between VVEL control module harness connector and IPDM E/R harness connector.

VVEL con	trol module	IPDN	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E15	8	E7	49	Existed

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

Is the inspection result normal?

YES >> EC-173, "Diagnosis Procedure"

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

5.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

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

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal? YES >> Replace IPDM E/R. NO >> Repair open circuit, short to ground or short to power in harness or connectors. EC

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## U0101 CAN COMM CIRCUIT

## Description

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

## DTC Logic

INFOID:000000010839475

### DTC DETECTION LOGIC

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

### 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-178, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

Go to LAN-15, "Trouble Diagnosis Flow Chart".

Revision: 2014 September

INFOID:000000010839474

INFOID:000000010839476

#### < DTC/CIRCUIT DIAGNOSIS >

## **U1001 CAN COMM CIRCUIT**

## Description

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

## DTC Logic

INFOID:000000010839478

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis DTC detecting condition Possible cau		Possible cause		
U1001	CAN communication line	When ECM is not transmitting or receiving CAN com- munication signal other than OBD (emission related diagnosis) for 2 seconds or more.	Harness or connectors     (CAN communication line is open or     shorted)		
DTC CON	FIRMATION PRO	CEDURE			
1.PERFOR	RM DTC CONFIRM	ATION PROCEDURE			
<ol> <li>Turn ignition switch ON and wait at least 3 seconds.</li> <li>Check DTC.</li> </ol>					
<u>Is DTC detected?</u> YES >> <u>EC-179. "Diagnosis Procedure"</u> . NO >> INSPECTION END					
Diagnosi	s Procedure		INFOID:0000000108394		
Go to <u>LAN-</u>	15, "Trouble Diagno	<u>sis Flow Chart"</u> .			

INFOID:000000010839477

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## U1003 CAN COMM CIRCUIT

## Description

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

## DTC Logic

INFOID:000000010839481

## DTC DETECTION LOGIC

#### NOTE:

If DTC U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-392, "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.	<ul> <li>Harness or connectors (VVEL CAN communication line is open or shorted)</li> <li>ECM</li> <li>VVEL control module</li> </ul>

## DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

### **TESTING CONDITION:**

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

>> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check DTC.

#### Is DTC detected?

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

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:000000010839482

## 1. CHECK VVEL CAN COMMUNICATION CIRCUIT

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

ECM		VVEL control module		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F102	54	E15	24	Existed	
	55		EIS	11	LAISIEU

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

Is the inspection result normal?

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

**n**o *22* 00 10 2 **2** \_\_\_\_

2. DETECT MALFUNCTIONING PART

Check the following.

INFOID:000000010839480

## **U1003 CAN COMM CIRCUIT**

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR	]
<ul> <li>Harness connector E3, F1</li> <li>Harness for open or short between ECM and VVEL control module</li> </ul>	A
>> Repair open circuit, short to ground or short to power in harness or connectors.	
3. CHECK INTERMITTENT INCIDENT	EC
Refer to GI-44, "Intermittent Incident".	
Is the inspection result normal?	С
YES >> GO TO 4. NO >> Repair or replace.	
<b>4.</b> REPLACE VVEL CONTROL MODULE	D
<ol> <li>Replace VVEL control module.</li> <li>Go to <u>EC-18</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Special Repair Requirement".</li> </ol>	<u>)-</u> E
>> GO TO 5.	
5. PERFORM DTC CONFIRMATION PROCEDURE	F
1. Reconnect all harness connectors disconnected	_
2. Turn ignition switch ON.	G
<ol> <li>Erase DTC.</li> <li>Perform DTC Confirmation Procedure.</li> </ol>	
See <u>EC-180, "DTC Logic"</u> .	
5. Check DTC.	Н
<u>Is the DTC U1003 displayed again?</u> YES >> GO TO 6.	
YES >> GO TO 6. NO >> INSPECTION END	
6.REPLACE ECM	
1. Replace ECM.	J
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repa	<u>ir</u>
Requirement".	
>> INSPECTION END	K
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### U1024 CAN COMM CIRCUIT

### Description

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

### DTC Logic

INFOID:000000010839484

# DTC DETECTION LOGIC **NOTE**:

If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-392, "DTC Logic"</u>.

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

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

#### **TESTING CONDITION:**

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

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 3 seconds.
- 2. Check DTC.
- Is DTC detected?
- YES >> Go to EC-182, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000010839485

### 1. CHECK VVEL CAN COMMUNICATION CIRCUIT

#### 1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Disconnect VVEL control module harness connector.
- 4. Check the continuity between ECM harness connector and VVEL control module harness connector.

ECM		ECM VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F102	54	E15	24	Existed
1102	55		11	LAISIGU

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

Is the inspection result normal?

YES >> GO TO 2.

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

2. CHECK INTERMITTENT INCIDENT

### EC-182

### **U1024 CAN COMM CIRCUIT**

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
Refer to GI-44, "Intermittent Incident".	
Is the inspection result normal?	A
YES >> GO TO 3. NO >> Repair or replace.	
<b>3.</b> REPLACE VVEL CONTROL MODULE	EC
1. Replace VVEL control module.	
<ol> <li>Go to <u>EC-18. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEI ULE) : Special Repair Requirement"</u>.</li> </ol>	L CONTROL MOD- C
>> GO TO 4.	D
4. PERFORM DTC CONFIRMATION PROCEDURE	D
1. Recnnect all harness connectors disconnected.	
2. Turn ignition switch ON.	E
<ol> <li>Erase DTC.</li> <li>Perform DTC Confirmation Procedure.</li> </ol>	
See <u>EC-182, "DTC Logic"</u> .	F
<u>Is the DTC U1024 displayed again?</u> YES >> GO TO 5.	
NO >> INSPECTION END	G
5. REPLACE ECM	
1. Replace ECM.	Н
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECI	<u> V) : Special Repair</u>
Requirement".	1
>> INSPECTION END	I
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#### < DTC/CIRCUIT DIAGNOSIS >

### P0011, P0021 IVT CONTROL

### DTC Logic

[VQ37VHR]

INFOID:000000010839486

#### 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-194, "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-377, "DTC Logic"</u>.

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

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### TESTING CONDITION:

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

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE-I

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

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

#### CAUTION:

#### Always drive at a safe speed.

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

#### Is 1st trip DTC detected?

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

NO >> GO TO 3.

**3.**PERFORM DTC CONFIRMATION PROCEDURE-II

#### < DTC/CIRCUIT DIAGNOSIS >

ENG SPEED

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

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

COOLAN TEMP/S	More than 70°C (158°F)		EC
Selector lever	1st or 2nd position		
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)		С
CAUTION: Always drive at 3. Check 1st trip DT			D
Is 1st trip DTC detect	ed?		F
YES >> Go to <u>EC</u> NO >> INSPECT	- <u>185, "Diagnosis Procedure"</u> FION END		E
Diagnosis Proce	dure	INFOID:000000010839487	F
1.CHECK OIL PRES	SSURE WARNING LAMP		
<ol> <li>Start engine.</li> <li>Check oil pressunated.</li> </ol>	ure warning lamp and confirm it is not illumi-		G
	-7, "Inspection".		Н
NO >> GO TO 2			I
		PBIA8559J	J
2.CHECK INTAKE V	ALVE TIMING CONTROL SOLENOID VALVE		
Refer to EC-186, "Co	mponent Inspection".		K
Is the inspection resu			
YES >> GO TO 3 NO >> Replace	malfunctioning intake valve timing control soleno	id valve	L
<u>`</u>	HAFT POSITION SENSOR (POS)		
Refer to EC-309, "Co			M
Is the inspection resu			
YES >> GO TO 4			NI
	crankshaft position sensor (POS).		Ν
	FT POSITION SENSOR (PHASE)		
Refer to EC-313, "Co			0
Is the inspection resu YES >> GO TO 5			
	malfunctioning camshaft position sensor (PHASE	Ξ).	Р
5. CHECK CAMSHA	<b>3</b>	·	I
Check the following.			

Check the following.

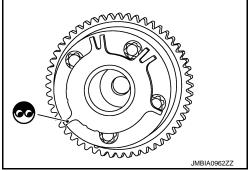
А

#### < DTC/CIRCUIT DIAGNOSIS >

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

#### Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to <u>EM-91,</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 <u>EM-57, "Removal and Installation"</u>.

NO >> GO TO 7.

**7.**CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to <u>EM-101, "Inspection"</u>. <u>Is the inspection result normal?</u>

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

**8.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### **Component Inspection**

INFOID:000000010839488

[VQ37VHR]

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

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

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

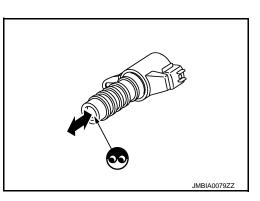
### 2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

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

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?



#### < DTC/CIRCUIT DIAGNOSIS >

### YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve.

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

### < DTC/CIRCUIT DIAGNOSIS >

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

### Description

INFOID:000000010839489

[VQ37VHR]

#### SYSTEM DESCRIPTION

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

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

### DTC Logic

INFOID:000000010839490

### 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.)	<ul> <li>Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)</li> <li>A/F sensor 1 heater</li> </ul>
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.)	<ul> <li>Harness or connectors (The A/F sensor 1 heater circuit is shorted.)</li> <li>A/F sensor 1 heater</li> </ul>
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.)	<ul> <li>Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)</li> <li>A/F sensor 1 heater</li> </ul>
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.)	<ul> <li>Harness or connectors (The A/F sensor 1 heater circuit is shorted.)</li> <li>A/F sensor 1 heater</li> </ul>

### 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-189, "Diagnosis Procedure".
- NG >> INSPECTION END

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

### [VQ37VHR]

the inspecti YES >> G NO >> R CHECK AI	ROUND on swite ound co on resu O TO 2 epair or R FUEL ct air fue on swite e voltage Bank 1	CONNEC ch OFF. nnection M <u>It normal?</u> replace gr . RATIO (A el ratio (A/F ch ON.	195. Refer round cont /F) SENS <sup>r</sup> F) sensor A/F senso	nection.	ER SUPP		INFOID:000000010839491
. Turn ignit . Check gro s the inspecti YES >> G NO >> R . CHECK AI . Disconne . Turn ignit . Check the DTC P0031, P0032 P0051, P0052	on swite ound co on resu O TO 2 epair or R FUEL ct air fue on swite e voltage Bank 1	ch OFF. nnection N It normal? replace gr . RATIO (A el ratio (A/f ch ON. e between A/F senso	195. Refer round cont /F) SENS <sup>r</sup> F) sensor A/F senso	nection. OR 1 POW 1 harness c	ER SUPP	LY CIRCUIT	<u>tion"</u> .
Check gro the inspecti YES >> G NO >> R CHECK AI Disconne Turn ignit Check the DTC P0031, P0032 P0051, P0052	ound co on resu O TO 2 epair or R FUEL ct air fue on swite voltage Bank 1	nnection M It normal? replace gr . RATIO (A el ratio (A/f ch ON. e between A/F senso	ound con /F) SENS <sup>-</sup> ) sensor A/F senso	nection. OR 1 POW 1 harness c	ER SUPP	LY CIRCUIT	: <u>tion"</u> .
. Turn ignit . Check the DTC - P0031, P0032 P0051, P0052	on swite voltage Bank 1	ch ON. e between A/F senso	A/F senso				
P0031, P0032 P0051, P0052	1	i	r 1			or and ground.	
P0031, P0032 P0051, P0052	1	Connector					
P0051, P0052			Terminal	- Ground	Voltag		
	2	F61	4	Ground	Battery vo	ltage	
the inspecti	2	F62	4			<u> </u>	
CHECK A/ Turn ignit	epair or F SENS on swite ct ECM	replace has OR 1 HEA ch OFF.	veen A/F s arness or o TER OUT	connectors. PUT SIGN	AL CIRCU		
Check the	Continu	uity betwee	en A/F ser	isor i name	ess conne	ctor and ECM harness co	onnector.
DTC		A/F sensor	1	EC	М	Continuity	
	Bank	Connector	Terminal	Connector	Terminal		
P0031, P0032	1	F61	3	F101	1	Existed	
P0051, P0052	2	F62	3	d and short	5		
	O TO 5 epair op	Den circuit, SOR 1 HEA	-		ort to pow	er in harness or connecto	ors.

CAUTION:

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

#### < DTC/CIRCUIT DIAGNOSIS >

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

#### >> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Perform GI-44, "Intermittent Incident".

>> Repair or replace.

Component Inspection

INFOID:000000010839492

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

1. Turn ignition switch OFF.

2. Disconnect A/F sensor 1 harness connector.

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

Terminal	Resistance ( $\Omega$ )
3 and 4	1.8 - 2.44 [at 25°C (77°F)]
3 and 1, 2	~
4 and 1, 2	(Continuity should not exist)

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

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

#### CAUTION:

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

>> INSPECTION END

### P0037, P0038, P0057, P0058 HO2S2 HEATER

Input signal to ECM

Engine coolant temperature

Amount of intake air

Engine speed

### < DTC/CIRCUIT DIAGNOSIS >

Sensor Camshaft position sensor (PHASE)

Crankshaft position sensor (POS)

Engine coolant temperature sensor

amount of intake air and engine coolant temperature.

Engine speed

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

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

minute and at idle for 1 minute under no load

Mass air flow sensor

OPERATION

Above 3.600 rpm

SYSTEM DESCRIPTION

## P0037, P0038, P0057, P0058 HO2S2 HEATER

### Description

Revision: 2014 September

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

### DTC Logic

### DTC DETECTION LOGIC

· Engine: After warming up

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0037	Heated oxygen sensor 2 heater (bank 1) control circuit lowThe 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.)		<ul> <li>Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>	J
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.)	<ul> <li>Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>	K
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.)	<ul> <li>Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>	L
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.)	<ul> <li>Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)</li> <li>Heated oxygen sensor 2 heater</li> </ul>	N

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

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

#### **TESTING CONDITION:**

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

>> GO TO 2.



ECM function

Heated oxygen sensor 2

heater control

### [VQ37VHR]

INFOID:000000010839493

Actuator

Heated oxygen sensor 2 heater

Heated oxygen sensor 2 heater

OFF

ON

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INFOID:000000010839494

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### P0037, P0038, P0057, P0058 HO2S2 HEATER

#### < DTC/CIRCUIT DIAGNOSIS >

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st tip DTC detected?

YES >> Go to EC-192, "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-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK HO2S2 POWER SUPPLY CIRCUIT

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

DTC		HO2S2		Ground	Voltage	
ыс	Bank	Connector	Terminal	Ground		
P0037, P0038	1	F60	2	Ground	Battery voltage	
P0057, P0058	2	F59	2	Ground	Dattery voltage	

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

#### Check the following.

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

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

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

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

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

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

DTC	HO2S2			E	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0037, P0038	1	F60	3	F101	17	Existed
P0057, P0058	2	F59	3	FIUI	33	EXISTED

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

P	0037, P0038, P0057, P0058 HO2S2 H	
< DTC/CIRCUIT DIAGN	)SIS >	[VQ37VHR]
s the inspection result not YES >> GO TO 5.	mal?	
	ircuit, short to ground or short to power in harness	or connectors.
<b>D</b> .CHECK HEATED OXY	GEN SENSOR 2 HEATER	
Refer to EC-193, "Compo	nent Inspection".	
s the inspection result no	mal?	_
YES >> GO TO 7.		
NO >> GO TO 6.		
<b>6.</b> REPLACE HEATED O		
Replace malfunctioning he	ated oxygen sensor 2.	
Before installing new	such as a concrete floor; use a new one. heated oxygen sensor, clean exhaust system ercial service tool (J-43897-18 or J-43897-12)] ce tool).	
>> INSPECTION	END	
7. CHECK INTERMITTEN	IT INCIDENT	
Refer to GI-44, "Intermitte	nt Incident".	
>> INSPECTION	END	
Component Inspection	วท	INFOID:000000010839496
<b>1.</b> CHECK HEATED OXY	GEN SENSOR 2 HEATER	
	FF. ygen sensor 2 harness connector. veen HO2S2 terminals as follows.	
Terminal	Resistance (Ω)	
2 and 3	3.4 - 4.4 [at 25°C (77°F)]	
1 and 2, 3, 4	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
4 and 1, 2, 3	(Continuity should not exist)	
Is the inspection result no	mal?	
YES >> INSPECTION NO >> GO TO 2.	END	
<b>2.</b> REPLACE HEATED O	(YGEN SENSOR 2	
Replace malfunctioning he	ated oxygen sensor 2.	
in) onto a hard surface	ygen sensor which has been dropped from a h such as a concrete floor; use a new one. oxygen sensor, clean exhaust system threads	-

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

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### P0075, P0081 IVT CONTROL SOLENOID VALVE

#### < DTC/CIRCUIT DIAGNOSIS >

### P0075, P0081 IVT CONTROL SOLENOID VALVE

### Description

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

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

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

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

### DTC Logic

### DTC DETECTION LOGIC

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

### 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?

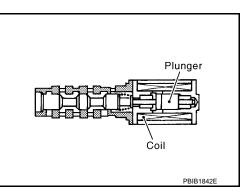
- YES >> Go to EC-194, "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis** Procedure

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

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

INFOID:000000010839499



[VQ37VHR]

INFOID:000000010839497

### P0075, P0081 IVT CONTROL SOLENOID VALVE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

	IVI	control solen	oid valve			-	
DTC	Bank	Bank     Connector     Terminal       1     F28     2       Ground     Battery voltage					
P0075	1	F28	2	Oneveral	Detterrivelter	_	
P0081	2	F29	2	Ground	Battery voltag	3	
•		esult norma	<u>ll?</u>				
	> GO T > GO T						
<b>~</b>		U 2. FUNCTION					
			ING PART				
Check the Harness		ig. tors E3, F1					
			etween inta	ke valve t	iming control	solenoid valve and IPDM E/R	
~		•		-	•	er in harness or connectors.	
		E VALVE T	IMING CON	ITROL SO	OLENOID VA	LVE OUTPUT SIGNAL CIRCUIT FOR OPEN	
AND SHO							
		witch OFF.	s connector.				
				valve timi	ing control so	lenoid valve harness connector and ECM har-	
ness	connect	or.					
		VT control so	enoid valve		ECM		
DTC		Bank Connector Terminal		Connecto	-	Continuity	
P0075		F28	1		18		
P0081	2	2 F29	1	– F101	29	Existed	
1. Also d	heck ha	rness for s	hort to grou	nd and sh	ort to power.		
<u>s the insp</u>	ection r	esult norma	<u>ll?</u>				
	> GO T		d also at ta				
		•		-	Short to pow DLENOID VA	er in harness or connectors.	
					JLENOID VA	_VE	
			t Inspection	<u>.</u>			
•	> GO T	esult norma	<u>u :</u>				
			tioning intak	e valve tii	ming control	solenoid valve.	
5.CHECH		MITTENT	NCIDENT		-		
		termittent I					
>	> INSP	ECTION EN	1D				
Compor	ent In	spection				INFOID:000000010839500	
		•					
I.CHEC	( INTAK	E VALVE T	IMING CON	TROL SC	DLENOID VA	_VE-I	
		witch OFF.					
						ss connector. oid valve terminals as follows.	

3. Check resistance between intake valve timing control solenoid valve terminals as follows.

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

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

 $2. {\sf CHECK} \text{ intake valve timing control solenoid valve-ii}$ 

1. Remove intake valve timing control solenoid valve.

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

CAUTION:

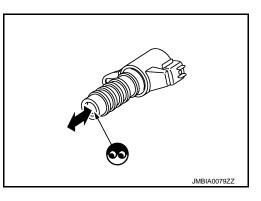
Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve. NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve.

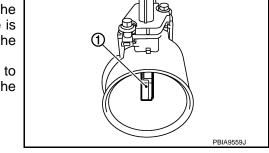


### P0101, P010B MAF SENSOR

### 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 DETECTION LOGIC

DTC Logic

NOTE:

INFOID:000000010839502

### 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)	<ul> <li>A high voltage from the sensor is sent to ECM under light load driving condition.</li> </ul>	<ul> <li>Harness or connectors (The sensor circuit is open or shorted.)</li> <li>Mass air flow sensor (bank 1)</li> <li>EVAP control system pressure sensor</li> <li>Intake air leaks</li> <li>Intake air temperature sensor</li> </ul>	ŀ
P010B	MAF SEN/CIRCUIT-B2 (Mass air flow sensor (bank 2) circuit range/performance)	<ul> <li>ECM under light load driving condition.</li> <li>A low voltage from the sensor is sent to ECM under heavy load driving condition.</li> </ul>	<ul> <li>Harness or connectors (The sensor circuit is open or shorted.)</li> <li>Mass air flow sensor (bank 2)</li> <li>EVAP control system pressure sensor</li> <li>Intake air leaks</li> <li>Intake air temperature sensor</li> </ul>	,

### 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  ${}^{\rm M}$  of running engine at idle speed.

#### >> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Drive the vehicle for at least 5 seconds under the following conditions:

#### CAUTION:

Always drive at a safe speed.

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

#### NOTE:

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

### EC-197

#### 2015 370Z

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### Is 1st trip DTC detected?

- YES >> Proceed to EC-198, "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis Procedure**

**1.**CHECK INTAKE SYSTEM

Check the following for connection.

Air duct

Vacuum hoses

• Intake air passage between air duct and intake manifold

Is the inspection result normal?

YES >> GO TO 2.

NO >> Reconnect the parts.

### 2. CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between mass air flow sensor harness connector and ground.

DTC	I	Mass air flow s	sensor	Ground	Voltage	
DIC	Bank	Connector	Terminal	Giouna		
P0101	1	F31	5	Ground	Battery voltage	
P010B	2	F42	5	Giounu	Ballery Vollage	

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# **3.** DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R

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

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

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

DTC	N	lass air flow s	ensor	EC	Continuity	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0101	1	F31	4	F102	68	Existed
P010B	2	F42	4	1102	94	LAISIEU

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.

 ${f 5.}$ CHECK MASS AIR FLOW SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

### EC-198

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

DTC	Ν	lass air flow s	ensor	EC	M	Continuity		
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity		
P0101	1	F31	3	F102	77	Existed		
P010B	2	F42	3	1102	79	Existed		
2. Also	check	harness for	short to	ground and	d short to	power.		
		n result nor	<u>mal?</u>					
		TO 6.	rouit oho	rt to group	d ar abart	to power in here	and or connectors	
<u> </u>		AKE AIR TE		-		to power in nam	ness or connectors.	
						<u> </u>		
		•		. Refer to	<u>=C-216, "</u>	Component Insp	<u>pection"</u> .	
	-	n result nori TO 7.	<u>mai?</u>					
-		-	air flow s	ensor (with	n intake ai	r temperature se	ensor).	
						•	,	
		3, "Compon						
		n result nor		<u>uun</u> .				
		20101 is det		GO TO 8				
YES-2 (	DTC F	010B is de	tected)>>	GO TO 9.				
~		place EVAP		· ·		sor.		
<b>Ö.</b> CHEC	CK MA	SS AIR FLC	W SENS	OR (BANK	( 1)			
Check m	ass air	flow senso	r (bank 1)	). Refer to	EC-199, "	Component Insp	pection".	
	-	n result nor						
						"Intermittent Inci	<u>dent"</u> .	
<b>^</b>		place mass		•	,			
		SS AIR FLC		-	-			
			. ,	). Refer to	<u>EC-199, "</u>	Component Insp	<u>pection"</u> .	
		<u>n result nor</u>						
		eck intermit place mass				"Intermittent Inci	<u>dent"</u> .	
Compo	nent	Inspectio	n					INFOID:000000010839504
<b>1.</b> CHEC	K MA	SS AIR FLC	W SENS	OR-I				
With C		шт						
		n switch OF	F.					
		all harness						
		e and warm ONSULT ar						
						d check the indic	ation.	
Monitor	item			Condition	ı		Indication (V)	
		Ignition switc	h ON (Engir	ne stopped.)			Approx. 0.4	
MAS A/F	SE-B1	Idlo (Engino i						
IVIAS A/F			s warmed-u	p to normal o	perating ter	mperature.)	0.7 - 1.2	

\*: 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.

Idle to about 4,000 rpm

0.7 - 1.2 to Approx. 2.4\*

#### < DTC/CIRCUIT DIAGNOSIS >

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

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

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

Is the inspection result normal?

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

**3.**CHECK MASS AIR FLOW SENSOR-II

#### (B) With CONSULT

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

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

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

#### **Without CONSULT**

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

#### < DTC/CIRCUIT DIAGNOSIS >

#### [VQ37VHR]

	ECM				
Connector	+	_	Condition		Voltage (V)
Connector	Terminal	Terminal			
			Ignition switch ON (Engine	stopped.)	Approx. 0.4
	77 [MAF sensor (bank 1)	68	Idle (Engine is warmed-up t ing temperature.)	o normal operat-	0.7 - 1.2
	signal]	00	2,500 rpm (Engine is warme operating temperature.)	ed-up to normal	1.3 - 1.7
F102			Idle to about 4,000 rpm		0.7 - 1.2 to Approx. 2.4*
F 102			Ignition switch ON (Engine stopped.)		Approx. 0.4
[MA	79 [MAF sensor (bank 2)	94	Idle (Engine is warmed-up t ing temperature.)	o normal operat-	0.7 - 1.2
	signal]	. ,	2,500 rpm (Engine is warme operating temperature.)	ed-up to normal	1.3 - 1.7
			Idle to about 4,000 rpm		0.7 - 1.2 to Approx. 2.4*
<b>With CO</b> <b>With CO</b> Turn ig Discor Start e Conne	gnition switch OFF. nnect mass air flow s engine and warm it u ect CONSULT and s	sensor harness o p to normal ope elect "DATA MO		C	
Monitor it	em	Condition	n	Indication	(V)
	Ignition switch ON	I (Engine stopped.)		Approx. 0	.4
MAS A/F SE-B1	E-B1 Idle (Engine is wa	irmed-up to normal o	operating temperature.)	0.7 - 1.2	2
MAS A/F S MAS A/F S	E-B2 2,500 rpm (Engin	e is warmed-up to no	ormal operating temperature.)	1.3 - 1.7	,

#### Without CONSULT

1. Turn ignition switch OFF.

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

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

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#### < DTC/CIRCUIT DIAGNOSIS >

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

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

Is the inspection result normal?

YES >> INSPECTION END

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

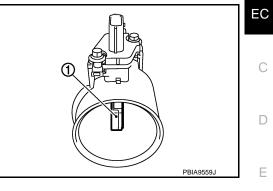
#### < DTC/CIRCUIT DIAGNOSIS >

### P0102, P0103, P010C, P010D MAF SENSOR

### Description

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

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



### DTC Logic

### DTC DETECTION LOGIC

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

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

Turn ignition switch ON. 2.

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 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-204, "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-203

#### 2015 370Z

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#### P0102, P0103, P010C, P010D MAF SENSOR < DTC/CIRCUIT DIAGNOSIS > Is DTC detected? YES >> Go to EC-204, "Diagnosis Procedure". NO >> GO TO 4. 4. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-II

Start engine and wait at least 5 seconds.

2. Check DTC.

Is DTC detected?

YES >> Go to EC-204, "Diagnosis Procedure".

>> INSPECTION END NO

### Diagnosis Procedure

**1.**INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

P0102, P010C>>GO TO 2.

P0103, P010D>>GO TO 3.

2.CHECK INTAKE SYSTEM

Check the following for connection.

Air duct

Vacuum hoses

Intake air passage between air duct to intake manifold

Is the inspection result normal?

YES >> GO TO 3.

NO >> Reconnect the parts.

 ${
m 3.}$  CHECK GROUND CONNECTION

Turn ignition switch OFF. 1.

Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace ground connection.

#### 4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.

Turn ignition switch ON. 2.

3. Check the voltage between MAF sensor harness connector and ground.

DTC		MAF sens	or	Ground Voltage	
ыс	Bank	Connector	Terminal	Ground	voltage
P0102, P0103	1	F31	5	Ground	Battery voltage
P010C, P010D	2	F42	5	Ground	Ballery vollage

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

### 5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E106, M6

Harness connectors M116, F103

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

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

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

### **EC-204**

#### 2015 370Z

### < DTC/CIRCUIT DIAGNOSIS >

### 6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

		MAF senso	)r	EC	`M			
DTC	Bank	Connector	Terminal	Connector	Terminal	Continuity		C
P0102, P0103	1	F31	4		68			C
P010C, P010D	2	F42	4	F102	94	Existed		
4. Also chec	k harne	ess for shoi	rt to grour	nd and sho	rt to powe	er.		D
Is the inspection			U		·			
	о то 7							Е
_	•	•		-	•		ness or connectors.	
7.CHECK MA								
1. Check the	contin	nuity betwee	en MAF s	ensor harn	ess conn	ector and E	CM harness connector.	F
		MAF senso	)r	EC	`M			
DTC	Bank	Connector	Terminal	Connector	Terminal	Continuity		G
P0102, P0103	1	F31	3		77			
P010C, P010D	2	F42	3	F102	79	Existed		Н
2. Also chec	k harne	ess for shoi	rt to grour	nd and sho	rt to powe	er.		
Is the inspection	on resu	ult normal?	-		-			
	0 T O 8							
•	•	•		ground or s	snort to po	wer in harn	ness or connectors.	
8.CHECK MA								J
Refer to <u>EC-2</u>			nspection	<u>.</u> .				
<u>Is the inspection</u> YES >> G	O TO 9							IZ.
		malfunction	ning mas	s air flow s	ensor.			K
9.CHECK IN	TERMI	TTENT INC	CIDENT					
Refer to GI-44	, "Inter	mittent Inci	dent".					L
>> IN	ISPEC	TION END						Μ
Componen	t Insp	ection					INF0/D:000000010839508	
<b>1.</b> CHECK MA								
		R FLOW 5	ENSOR-I					Ν
With CONS     Turn igniti		tch OFF						
2. Reconnec	t all ha	arness conr						0
		warm it up JLT and sel				ture.		
						ck the indic	ation.	Р
								Γ

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

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#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

\*: 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	68	Idle (Engine is warmed-up to normal operat- ing temperature.)	0.7 - 1.2	
	[MAF sensor (bank 1) signal]		2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.3 - 1.7	
F102			Idle to about 4,000 rpm	Approx. 0.4         0.7 - 1.2         1.3 - 1.7         0.7 - 1.2 to Approx. 2.4*         Approx. 0.4         0.7 - 1.2         1.3 - 1.7	
FIUZ			Ignition switch ON (Engine stopped.)	Approx. 0.4	
	79		Idle (Engine is warmed-up to normal operat- ing temperature.)	0.7 - 1.2	
	[MAF sensor (bank 2) signal]	94	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.3 - 1.7	
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*	

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

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

Is the inspection result normal?

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

**3.**CHECK MASS AIR FLOW SENSOR-II

#### With CONSULT

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

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

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

#### **Without CONSULT**

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

### EC-206

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

	ECM				
Connector	+	-	Condition		Voltage (V)
	Terminal	Terminal			
			Ignition switch ON (Engine st	opped.)	Approx. 0.4
	77 [MAF sensor (bank 1)	68	Idle (Engine is warmed-up to ing temperature.)	normal operat-	0.7 - 1.2
	signal]	00	2,500 rpm (Engine is warmed operating temperature.)	d-up to normal	1.3 - 1.7
F102			Idle to about 4,000 rpm		0.7 - 1.2 to Approx. 2.4
1102			Ignition switch ON (Engine st	opped.)	Approx. 0.4
[٨	79	94	Idle (Engine is warmed-up to ing temperature.)	normal operat-	0.7 - 1.2
	[MAF sensor (bank 2) signal]	94	2,500 rpm (Engine is warmed operating temperature.)	d-up to normal	1.3 - 1.7
			Idle to about 4,000 rpm		0.7 - 1.2 to Approx. 2.4
1. Turn iç	Inition Switch OFF.				
<ol> <li>Start e</li> <li>Conne</li> </ol>	engine and warm it ι ect CONSULT and s	ip to normal ope elect "DATA MO		C C	
<ol> <li>Start e</li> <li>Conne</li> </ol>	nnect mass air flow engine and warm it u ect CONSULT and s "MAS A/F SE-B1" a	ip to normal ope elect "DATA MO	rating temperature. NITOR" mode. E-B2", and check the indica	0	(V)
<ol> <li>Start e</li> <li>Conne</li> <li>Select</li> </ol>	nnect mass air flow engine and warm it u ect CONSULT and s "MAS A/F SE-B1" a	ip to normal ope elect "DATA MO and "MAS A/F S	rating temperature. NITOR" mode. E-B2", and check the indica	ation.	
<ol> <li>Start e</li> <li>Conne</li> <li>Select</li> </ol>	innect mass air flow engine and warm it used ct CONSULT and s "MAS A/F SE-B1" a em	ip to normal ope elect "DATA MO and "MAS A/F S Conditio	rating temperature. NITOR" mode. E-B2", and check the indica	ation.	).4
3. Start e 4. Conne 5. Select Monitor ite	ennect mass air flow engine and warm it used CONSULT and s "MAS A/F SE-B1" a em Ignition switch Of E-B1 Idle (Engine is wa	ip to normal ope elect "DATA MO and "MAS A/F S Conditio I (Engine stopped.) armed-up to normal	nating temperature. NITOR" mode. E-B2", and check the indica	ation. Indication Approx. (	).4 2
<ol> <li>Start e</li> <li>Conne</li> <li>Select</li> <li>Monitor it</li> <li>MAS A/F SI</li> </ol>	ennect mass air flow engine and warm it used CONSULT and s "MAS A/F SE-B1" a em Ignition switch Of E-B1 Idle (Engine is wa	ip to normal ope elect "DATA MO and "MAS A/F S Conditio V (Engine stopped.) armed-up to normal e is warmed-up to n	rating temperature. NITOR" mode. E-B2", and check the indica n operating temperature.)	ation. Indication Approx. ( 0.7 - 1.:	).4 2 7
<ul> <li>3. Start e</li> <li>4. Conne</li> <li>5. Select</li> <li>Monitor it</li> <li>MAS A/F SI</li> <li>MAS A/F SI</li> <li>*: Checl</li> <li>Without</li> <li>1. Turn ig</li> <li>2. Discor</li> <li>3. Start e</li> </ul>	innect mass air flow engine and warm it used CONSULT and s "MAS A/F SE-B1" a em Ignition switch Of E-B1 Idle (Engine is wa 2,500 rpm (Engin Idle to about 4,00 k for linear voltage rise in t <b>CONSULT</b> gnition switch OFF. Innect mass air flow engine and warm it u	Ip to normal ope elect "DATA MO and "MAS A/F S Conditio I (Engine stopped.) armed-up to normal e is warmed-up to n 0 rpm n response to engine sensor harness up to normal ope	rating temperature. NITOR" mode. E-B2", and check the indica n operating temperature.) ormal operating temperature.) e being increased to about 4,000 connector and reconnect it	ation. Indication Approx. ( 0.7 - 1.: 1.3 - 1.: 0.7 - 1.2 to App rpm. again.	).4 2 7 prox. 2.4*

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#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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

Is the inspection result normal?

YES >> INSPECTION END

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

#### < DTC/CIRCUIT DIAGNOSIS >

### P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

### Description

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

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

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DTC Logic

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### DTC DETECTION LOGIC

#### NOTE:

If DTC P010A is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-393, "DTC Logic".

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

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check DTC.

Is DTC detected?

>> Go to EC-209, "Diagnosis Procedure". YES

>> INSPECTION END NO

### **Diagnosis** Procedure

### 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF. 1.
- Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 2.

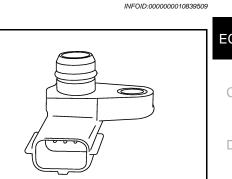
NO >> Repair or replace ground connection.

2.CHECK MAP SENSOR POWER SUPPLY CIRCUIT

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

### EC-209

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[VQ37VHR]

#### < DTC/CIRCUIT DIAGNOSIS >

#### 2. Turn ignition switch ON.

3. Check the voltage between MAP sensor harness connector and ground.

MAP sensor		Ground	Voltage (V)
Connector	Terminal	Ground	vollage (v)
F50	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 3.

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

### 3.CHECK MAP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

MAP	sensor	E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F50	3	F102	96	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

 ${f 4.}$  CHECK MAP SENSOR INTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

MAP	sensor	E	СМ	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F50	2	F101	38	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK MAP SENSOR

Refer to EC-210, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace MAP sensor.

**6.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

#### **Component Inspection**

### 1.CHECK MAP SENSOR-I

1. Turn ignition switch OFF.

- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

#### < DTC/CIRCUIT DIAGNOSIS >

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ECM			
	+	-	_
Connector	Terminal	Connector	Terminal
F101	38	F102	96

#### NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine (is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.
- 5. Measure the atmospheric pressure.

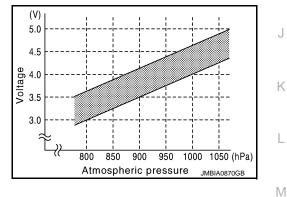
#### NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

Altitude (m)	Compensated pressure (hPa)
0	0
200	-24
400	-47
600	-70
800	-92
1000	-114
1500	-168
2000	-218

6. Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

Atmospheric pressure (hPa)	Voltage (V)
800	3.1 – 3.7
850	3.3 - 3.9
900	3.5 – 4.1
950	3.8 - 4.3
1000	4.0 - 4.6
1050	4.2 - 4.8



#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace MAP sensor.

### 2.CHECK MAP SENSOR-II

- 1. Start engine and let it idle.
- 2. Check intake manifold vacuum.

3. Check the voltage between ECM harness connector terminals as per the following.

	ECM			
	+	-	_	
Connector	Terminal	Connector	Terminal	
F101	38	F102	96	

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

Revision: 2014 September

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Intake manifold vacuum [kPA (mmHg)]	Voltage difference (V)
-40 (-300)	1.5 – 2.0
-53.3 (-400)	2.0 - 2.6
-66.7 (-500)	2.6 - 3.2
-80 (-600)	3.2 - 3.8

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace MAP sensor.

### P0111 IAT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

# P0111 IAT SENSOR

# DTC Logic

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#### INFOID:000000010839513

[VQ37VHR]

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0111	IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the IAT sensor is higher/ lower than that of other temperature sensors when the engine is started with its cold state.	<ul> <li>Harness or connectors (High or low resistance in the IAT sensor circuit)</li> <li>IAT sensor</li> </ul>
	ONFIRMATION PROCEDUR	E	
1.INSPI	ECTION START		
YES NO	essary to erase permanent DTC >> GO TO 3. >> GO TO 2. ORM COMPONENT FUNCTIO		
		er to EC-214, "Component Function Check	, II
NOTE: Use the of 1st trip D Is the ins YES NO	component function check to cl TC might not be confirmed. spection result normal? >> INSPECTION END >> Proceed to <u>EC-214. "Diagn</u>	neck the overall function of the IAT sensor	
	CONDITIONING		
dure befo 1. Turn 2. Turn	CONFIRMATION PROCEDURE ore conducting the next test. ignition switch OFF and wait a ignition switch ON.		erform the following proce-
TESTING	G CONDITION:		
• Before		ocedure, do not add fuel. ocedure, check that fuel level is betweer ocedure, confirm that battery voltage is a	
	>> GO TO 4.		
4.PERF	ORM DTC CONFIRMATION P	ROCEDURE	
	engine and let it idle for 60 mine the vehicle to a cool place. <b>E:</b>	nutes.	
Cool 3. Turn		of ambient air temperature between –10°C he vehicle for 12 hours.	(14°F) and 35°C (95°F).
	er turn ignition switch ON du	ring soaking.	
The 4. Start	c: vehicle must be cooled with the engine and let it idle for 5 minu TION:		
Nev	er turn ignition switch OFF d ck 1st trip DTC.	uring idling.	

5. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Proceed to EC-214, "Diagnosis Procedure".
- NO >> INSPECTION END

#### **Component Function Check**

**1.**CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

#### 1. Turn ignition switch OFF.

2. Disconnect mass air flow sensor (bank 1) harness connector.

3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

Terminals	Condition		Resistance (k $\Omega$ )
1 and 2	Temperature [°C (°F)]	25 (77)	1.800 – 2.200

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to <u>EC-214</u>, "Diagnosis Procedure".

#### 2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-44, "Intermittent Incident".

#### Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to EC-214, "Diagnosis Procedure".

### Diagnosis Procedure

**1.**CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

#### Check intake air temperature sensor. Refer to EC-214, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-32</u>, <u>"Exploded View"</u>.

### 2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

### **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 $\Omega$ )
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-32</u>, <u>"Exploded View"</u>.

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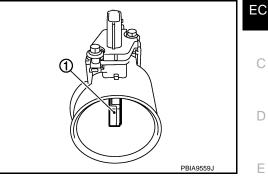
INFOID:000000010839515

### P0112, P0113 IAT SENSOR

### Description

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

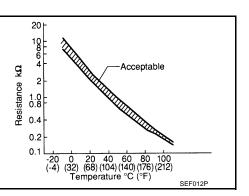
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



#### <Reference data>

Intake air temperature [°C (°F)]	Voltage* (V)	Resistance (k $\Omega$ )
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:0000000010839518

# DTC Logic

DTC DETECTION LOGIC

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

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

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

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

### >> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

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

### Is 1st trip DTC detected?

- YES >> Go to EC-216, "Diagnosis Procedure".
- NO >> INSPECTION END

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### P0112, P0113 IAT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

#### Diagnosis Procedure

INFOID:000000010839519

#### **1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "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 (bank 1) (intake air temperature sensor is built-into) harness connector.

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

MAF sens	or (bank 1)	Ground	Voltage (V)	
Connector	Terminal	Ciouna		
F31	2	Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 3.

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

 ${f 3.}$  CHECK 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 sense	or (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 or short to ground or short to power in harness or connectors.

**4.**CHECK INTAKE AIR TEMPERATURE SENSOR

#### Refer to EC-216, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

**Component Inspection** 

### 1. CHECK INTAKE AIR TEMPERATURE SENSOR

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

### EC-216

### P0112, P0113 IAT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

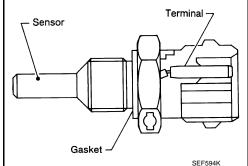
Termir	als	Condition		Resistance (k $\Omega$ )	_
1 and	2	Temperature °C (°F)	25 (77)	1.800 - 2.200	_
		ion result normal?			-
S	>>	NSPECTION END Replace mass air flo	weenee	r (with intoko oir	tomporo
0	>> r	replace mass all no	w senso	i (with intake all	.empera

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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.



#### 20 10 32 10 32 1.0 0.8 0.4 0.2 0.1 -20 0 20 40 60 80 100 (-4) (32) (68) (104) (140) (176) (212) Temperature °C (°F) SEE012P

INFOID:000000010839522

### <Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (k $\Omega$ )
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.10 - 2.90
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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

## DTC Logic

DTC DETECTION LOGIC

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.	<ul> <li>Harness or connectors (High or low resistance in the ECT sensor circuit)</li> <li>ECT sensor</li> </ul>

### DTC CONFIRMATION PROCEDURE

**1.**INSPECTION START

Is it necessary to erase permanent DTC?

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

 $\sim$  SO 10 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-219, "Component Function Check"</u>.

### NOTE:

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

Is the inspection result normal?

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

3. PRECONDITIONING

### P0116 ECT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

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	~~			

		P	J116 ECT SENSOR	
DTC/CIR	CUIT DIAGNOSIS >	>		[VQ37VHR]
		has been	previously conducted, always perform	m the following procedure
	ucting the next test. hition switch OFF and	d wait at lea	ast 10 seconds.	
	nition switch ON. Nition switch OFF and	d wait at lea	ast 10 seconds.	
EST CON	DITION:			
<ul> <li>Before pe</li> <li>Before pe</li> </ul>	erforming the follow	ing proce	dure, do not add fuel. dure, check that fuel level is between	1/4 and 4/4
			dure, confirm that battery voltage is 1	
	GO TO 4. RM DTC CONFIRMA			
	gine and let it idle fo le vehicle to a cool p		S.	
NOTE:	vehiele in on onvirg	nmont of a	mbient eir temperature between 10°C	$(14^{\circ}\text{E})$ and $25^{\circ}\text{C}$ (05°E)
3. Turn igr	nition switch OFF and		mbient air temperature between –10°C vehicle for 12 hours.	(14 F) and 55 C (95 F).
CAUTIC				
NOTE:			j svanily.	
The veh	nicle must be cooled			
<ol> <li>Start en CAUTIC</li> </ol>	gine and let it idle fo <mark>DN:</mark>	i o minutes		
Never t	urn ignition switch	OFF durin	g idling.	
	Ist trip DTC. <u>FC detected?</u>			
•	Proceed to <u>EC-219.</u>	"Diagnosis	Procedure".	
	INSPECTION END			
Compone	ent Function Che	eck		INFOID:000000010839523
1				
		TEMPERA	TURE (ECT) SENSOR	
	nition switch OFF. Nect ECT sensor har	ness conne	ctor	
3. Remove	e ECT sensor. Refer	to <u>CO-29.</u>	<u>'Exploded View"</u>	
	resistance between water as shown in t		or terminals by heating	G
		ne ngaror		
Terminals	Condition		Resistance (kΩ)	
		20 (68)	2.10 - 2.90	
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00	
	-	90 (194)	0.236 - 0.260	
	ction result normal?		г	
	GO TO 2. Proceed to <u>EC-219</u> ,	"Diagnosis	Procedure".	JMBIA0080ZZ
-	NTERMITTENT INC			
			"Intermittent Incident".	
	ction result normal?			
YES >>	INSPECTION END			
NO >>	Proceed to EC-219.	"Diagnosis	Procedure".	
Diagnosis	s Procedure			INFOID:000000010839524
1.снески	ENGINE COOLANT	TEMPERA	TURE (ECT) SENSOR	
Check ECT	sensor. Refer to EC-	-220, "Com	ponent Inspection".	
Revision: 201	14 September		EC-219	2015 370Z

Is the inspection result normal?

#### OK >> GO TO 2.

NG >> Replace ECT sensor. Refer to <u>CO-29</u>, "Exploded View".

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

#### Component Inspection

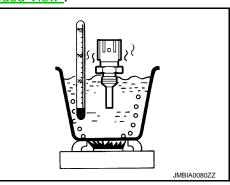
### 1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor. Refer to CO-29, "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 $\Omega$ )	
		20 (68)	2.10 - 2.90
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

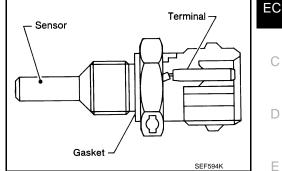
- YES >> INSPECTION END
- NO >> Replace engine coolant temperature sensor.



### P0117, P0118 ECT SENSOR

### Description

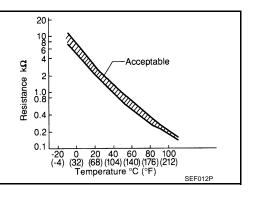
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.10 - 2.90
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



### DTC Logic

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### DTC DETECTION LOGIC

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause	
P0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted.)</li> </ul>	
P0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Engine coolant temperature sensor	

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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.

#### >> 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-222, "Diagnosis Procedure".
- NO >> INSPECTION END

## [VQ37VHR]

### Diagnosis Procedure

INFOID:000000010839528

#### **1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

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

ECT	sensor	Ground	Voltage (V)	
Connector	Terminal	Glound		
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 F106, F107

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

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

### **4.**CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

ECT :	sensor	E	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-223, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace engine coolant temperature sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### P0117, P0118 ECT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

### **Component Inspection**

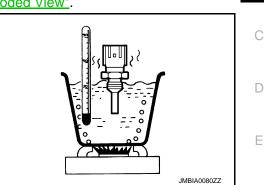
## $1. {\sf CHECK} \ {\sf ENGINE} \ {\sf COOLANT} \ {\sf TEMPERATURE} \ {\sf SENSOR}$

- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor. Refer to <u>CO-29</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 ( $k\Omega$ )	
		20 (68)	2.10 - 2.90
1 and 2	Temperature °C (°F)	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

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





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### P0122, P0123, P0227, P0228 TP SENSOR

#### < 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.

Throttle position sensor 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.

90

[VQ37VHR]

INFOID:000000010839530

### 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-393, "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.	<ul> <li>Harness or connectors (TP sensor 2 circuit is open or shorted.)</li> </ul>
P0227	Throttle position sensor 2 (bank 2) circuit low in- put	An excessively low voltage from the TP sensor 2 is sent to ECM.	<ul> <li>Electric throttle control actuator (TP sensor 2)</li> </ul>
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-225, "Diagnosis Procedure". YES
- NO >> INSPECTION END

Throttle position sensor 6.0 Sensor 1 4.0 output voltage Seńsor 2 0<sup>⊾</sup>0

45

Throttle valve opening angle (deg) PBIB0145E

INFOID:000000010839531

135

### P0122, P0123, P0227, P0228 TP SENSOR

### [V037VHR]

<ul> <li>Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>.</li> <li>the inspection result normal?</li> <li>YES &gt;&gt; GO TO 2.</li> <li>NO &gt;&gt; Repair or replace ground connection.</li> <li>CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT</li> <li>Disconnect electric throttle control actuator harness connector.</li> <li>Turn ignition switch ON.</li> <li>Check the voltage between electric throttle control actuator harness connector and ground.</li> </ul> DTC Electric throttle control actuator Terminal Ground Voltage (V) P0122, P0123 1 F6 6 Ground Approx. 5 ethe inspection result normal? YES >> GO TO 3. NO >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect ECM harness connector.	Г
<ul> <li>Turn ignition switch OFF.</li> <li>Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>.</li> <li>athe inspection result normal?</li> <li>YES &gt;&gt; GO TO 2.</li> <li>NO &gt;&gt; Repair or replace ground connection.</li> <li>CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT</li> <li>Disconnect electric throttle control actuator harness connector.</li> <li>Turn ignition switch ON.</li> <li>Check the voltage between electric throttle control actuator harness connector and ground.</li> </ul> PDTC Electric throttle control actuator For the inspection result normal? YES >> GO TO 3. NO >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect ECM harness connector.	Г
<ul> <li>Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>.</li> <li>a the inspection result normal?</li> <li>YES &gt;&gt; GO TO 2.</li> <li>NO &gt;&gt; Repair or replace ground connection.</li> <li>CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT</li> <li>Disconnect electric throttle control actuator harness connector.</li> <li>Turn ignition switch ON.</li> <li>Check the voltage between electric throttle control actuator harness connector and ground.</li> </ul> DTC Electric throttle control actuator for actuator harness connector and ground. DTC Electric throttle control actuator for actuator harness connector and ground. P0122, P0123 1 F6 6 G Ground Approx. 5 at he inspection result normal? YES >> GO TO 3. NO >> Repair open circuit, short to ground or short to power in harness or connectors. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT . Turn ignition switch OFF. Disconnect ECM harness connector. Check the continuity between electric throttle control actuator harness connector and ECM harness connect and ECM harnes connect and ECM harnes connect and ECM harnes connect	Г
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<ul> <li>Disconnect electric throttle control actuator harness connector.</li> <li>Turn ignition switch ON.</li> <li>Check the voltage between electric throttle control actuator harness connector and ground.</li> </ul> DTC           Electric throttle control actuator         Ground         Voltage (V)           P0122, P0123         1         F6         6         Ground         Approx. 5           P0227, P0228         2         F27         1         Ground         Approx. 5           Sthe inspection result normal?         YES         >> GO TO 3.         NO         >> Repair open circuit, short to ground or short to power in harness or connectors.           OCHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         Turn ignition switch OFF.         Disconnect ECM harness connector.           Objection terminic         Settion switch OFF.         Disconnect ECM harness connector.         Check the continuity between electric throttle control actuator harness connector and ECM harness connector.	Г
<ul> <li>2. Turn ignition switch ON.</li> <li>3. Check the voltage between electric throttle control actuator harness connector and ground.</li> <li>DTC Electric throttle control actuator Ground Voltage (V)</li> <li>P0122, P0123 1 F6 6 Ground Approx. 5</li> <li>P0227, P0228 2 F27 1 Ground Approx. 5</li> <li>s the inspection result normal?</li> <li>YES &gt;&gt; GO TO 3.</li> <li>NO &gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT</li> <li>Turn ignition switch OFF.</li> <li>Disconnect ECM harness connector.</li> <li>Check the continuity between electric throttle control actuator harness connector and ECM har</li> </ul>	Г
<ul> <li>Turn ignition switch ON.</li> <li>Check the voltage between electric throttle control actuator harness connector and ground.</li> <li>         DTC         Electric throttle control actuator         Ground         Voltage (V)         P0122, P0123         1         F6         6         Ground         Approx. 5         P0227, P0228         2         F27         1         Ground         Approx. 5         Sthe inspection result normal?         YES &gt;&gt; GO TO 3.         NO &gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.         CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         . Turn ignition switch OFF.         Disconnect ECM harness connector.         Check the continuity between electric throttle control actuator harness connector and ECM harness connector.         Check the continuity between electric throttle control actuator harness connector and ECM harness connector.         Check the continuity between electric throttle control actuator harness connector and ECM harness connector.         Check the continuity between electric throttle control actuator harness connector and ECM harness connector.     </li> </ul>	Г
DTC       Electric throttle control actuator       Ground       Voltage (V)         P0122, P0123       1       F6       6       Ground       Approx. 5         P0227, P0228       2       F27       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.         CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         . Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between electric throttle control actuator harness connector and ECM har	Г
DTC       Ground       Voltage (V)         Bank       Connector       Terminal       Ground       Voltage (V)         P0122, P0123       1       F6       6       Ground       Approx. 5         P0227, P0228       2       F27       1       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.         CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         . Turn ignition switch OFF.         . Disconnect ECM harness connector.         Check the continuity between electric throttle control actuator harness connector and ECM harness	
DTC       Ground       Voltage (V)         Bank       Connector       Terminal       Ground       Voltage (V)         P0122, P0123       1       F6       6       Ground       Approx. 5         P0227, P0228       2       F27       1       Ground       Approx. 5         ethe inspection result normal?       YES       >> GO TO 3.       Sector and connectors.         NO       >> Repair open circuit, short to ground or short to power in harness or connectors.         e.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         . Turn ignition switch OFF.         . Disconnect ECM harness connector.         . Check the continuity between electric throttle control actuator harness connector and ECM harness	
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<ul> <li>Turn ignition switch OFF.</li> <li>Disconnect ECM harness connector.</li> <li>Check the continuity between electric throttle control actuator harness connector and ECM har</li> </ul>	
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3. Check the continuity between electric throttle control actuator harness connector and ECM har	CM harness con∙
<b>y</b>	
DTC Electric throttle control actuator ECM Continuity	
Bank Connector Terminal Connector Terminal	
P0122, P0123 1 F6 3 F101 40 Existed	
P0227, P0228 2 F27 4 48	
<ol> <li>Also check harness for short to ground and short to power.</li> </ol>	
s the inspection result normal?	
YES >> GO TO 4.	
NO >> Repair open circuit, short to ground or short to power in harness or connectors.	
<b>1</b> . CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
	HORT
<ol> <li>Check the continuity between electric throttle control actuator harness connector and ECM har nector.</li> </ol>	
Electric throttle control actuator ECM	
DTC Electric throttle control actuator ECM Continuity	
DTC Bank Connector Terminal Connector Terminal	
DTC     Bank     Connector     Terminal     Connector     Terminal       P0122, P0123     1     F6     5     34     Existed	
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 $5. {\sf check \ throttle \ position \ sensor}$ 

Refer to EC-226, "Component Inspection".

### P0122, P0123, P0227, P0228 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.Replace electric throttle control actuator

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

#### >> INSPECTION END

### 7. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

#### Component Inspection

INFOID:000000010839533

### 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 : Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set selector lever to D (A/T) or 1st (M/T) position.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

	ECM				
Connector	+	-	Condition		Voltage (V)
Connector	Terminal	Terminal			
F101	30 [TP sensor 1 (bank 1)]	40		Fully released	More than 0.36
		40		Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36
			Accelerator pedal	Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40		Fully released	Less than 4.75
				Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)] 48	40		Fully released	Less than 4.75
			Fully depressed	More than 0.36	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

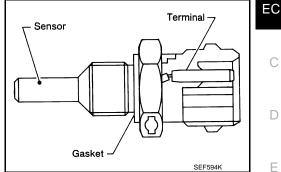
Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

#### >> INSPECTION END

### P0125 ECT SENSOR

### Description

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



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### <Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (k $\Omega$ )
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.10 - 2.90
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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

### DTC Logic

### DTC DETECTION LOGIC

#### NOTE:

## If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to <u>EC-221, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0125	Insufficient engine coolant temperature for closed loop fuel control	<ul> <li>Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.</li> <li>Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul>	<ul> <li>Harness or connectors (High resistance in the circuit)</li> <li>Engine coolant temperature sensor</li> <li>Thermostat</li> </ul>	L

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### >> GO TO 2.

### **2.**CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

- 1. Turn ignition switch ON.
- 2. Select "DATA MONITOR" mode with CONSULT.
- 3. Check that "COOLAN TEMP/S" is above 10°C (50°F).

Is the temperature above 10°C (50°F)?

### EC-227



[VQ37VHR]

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

**3.** PERFORM DTC CONFIRMATION PROCEDURE

#### Start engine and run it for 65 minutes at idle speed. If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK. CAUTION:

- Be careful not to overheat engine.
- 2. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> <u>EC-228</u>, "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-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-228, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine coolant temperature sensor.

**3.**CHECK THERMOSTAT OPERATION

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

**EC-228** 

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace thermostat. Refer to <u>CO-27, "Removal and Installation"</u>.

**4.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

**1.**CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.

- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor. Refer to <u>CO-29, "Exploded View"</u>.

INFOID:000000010839536

### **P0125 ECT SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

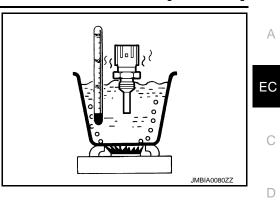
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition		Resistance (k $\Omega$ )
		20 (68)	2.10 - 2.90
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.



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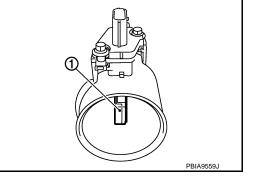
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### P0127 IAT SENSOR

### Description

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

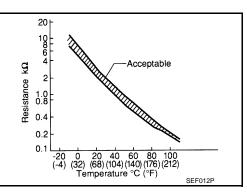
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



#### <Reference data>

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

\*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



### DTC Logic

INFOID:000000010839539

### 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.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Intake air temperature sensor</li> </ul>

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

**TESTING CONDITION:** 

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

### >> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Wait until engine coolant temperature is less than 90°C (194°F)
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch OFF and cool down engine.

### **P0127 IAT SENSOR**

	UIT DIAGNOSIS	>		[VQ37VHR]
		efore engi	ne coolant temperature is above 90°C (194°F).	
	tion switch ON. ATA MONITOR" n	node with	CONSULT	
Start eng	ine.			
CAUTIO	N:		m/h (43 MPH) for 100 consecutive seconds.	
	drive vehicle at a st trip DTC.	safe spee	ed.	
	<u>C detected?</u>			
	So to <u>EC-231, "Dia</u>		ocedure".	
	NSPECTION END			
lagnosis	Procedure			INFOID:0000000010839540
CHECK G	ROUND CONNEC	CTION		
	tion switch OFF.	105 Dofo	r to Ground Inspection in <u>GI-47, "Circuit Inspection"</u> .	
-	ion result normal?		The Ground Inspection in <u>GI-47, Circuit Inspection</u> .	
'ES >> (	GO TO 2.			
	Repair or replace g			
	231, "Component I ion result normal?		-	
′ES >> (	GO TO 3.			
10 >> F	Replace mass air fl	ow senso	r (bank 1) (with intake air temperature sensor).	
	ITERMITTENT IN			
efer to <u>GI-4</u>	ITERMITTENT IN	ident".		
efer to <u>GI-4</u> >> II	ITERMITTENT IN 4, "Intermittent Inc	ident".		INFOID:00000001083954
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efer to <u>GI-4</u> >> II omponer .CHECK IN Turn igni Disconne	ATERMITTENT ING 4. "Intermittent Inc NSPECTION END INTAKE AIR TEMPE tion switch OFF. ect mass air flow se	<u>ident"</u> . ERATURE ensor (bar	nk 1) harness connector.	INFOID:00000001083954
efer to <u>GI-4</u> >> II OMPONER CHECK IN CHECK IN Turn ignir Disconne Check re	ATERMITTENT IN 4. "Intermittent Inc NSPECTION END INTAKE AIR TEMPE tion switch OFF. ect mass air flow se sistance between	<u>ident"</u> . ERATURE ensor (bar	nk 1) harness connector. low sensor (bank 1) terminals as follows.	INFOID:00000001083954
efer to <u>GI-4</u> >> II omponer .CHECK IN Turn ignit Disconne Check re Terminals 1 and 2	ATERMITTENT ING 4, "Intermittent Inc NSPECTION END AT Inspection JTAKE AIR TEMPE tion switch OFF. ect mass air flow se sistance between Condition Temperature [°C	ident". ERATURE ensor (bar mass air f 25 (77)	nk 1) harness connector. flow sensor (bank 1) terminals as follows. Resistance (kΩ)	INFOID:00000001083954
efer to <u>GI-4</u> >> II OMPONER .CHECK IN Turn ignir Disconne Check re Terminals 1 and 2 the inspect (ES >> II	ATERMITTENT IN 4, "Intermittent Inc ASPECTION END AT Inspection ATAKE AIR TEMPE tion switch OFF. ect mass air flow se sistance between Condition Temperature [°C (°F)] tion result normal? NSPECTION END	ident". ERATURE ensor (bar mass air f 25 (77)	nk 1) harness connector. flow sensor (bank 1) terminals as follows. Resistance (kΩ)	INFOID:00000001083954

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### **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-297</u>.

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

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	<ul><li>Thermostat</li><li>Leakage from sealing portion of thermostat</li><li>Engine coolant temperature sensor</li></ul>

#### DTC CONFIRMATION PROCEDURE

#### NOTE:

Never refuel before and during the following procedure.

#### **1.**PRECONDITIONING-I

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

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

#### >> GO TO 2.

### 2. PRECONDITIONING-II

With CONSULT

- 1. Turn ignition switch ON.
- 2. Check the following conditions:

Ambient temperature	-10°C (14°F) or more
A/C switch	OFF
Blower fan switch	OFF

3. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.

4. Check the following conditions:

COOLAN TEMP/S	−10°C − 52°C (14 − 126°F)

#### Is the condition satisfied?

YES >> GO TO 3.

- NO >> 1. Satisfy the condition.
  - 2. GO TO 3.

### **3.** PERFORM DTC CONFIRMATION PROCEDURE-I

#### With CONSULT

- 1. Start engine.
- 2. Drive the vehicle until the following condition is satisfied. CAUTION:

### Always drive vehicle at safe speed.

STEP 1

Drive the vehicle under the conditions instructed below until the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" becomes at least 25°C (45°F).

### EC-232

### **P0128 THERMOSTAT FUNCTION**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

COOLAN TEMP/S     71°C (159°F) or less	А
FUEL T/TMP SE       Less than the value calculated by subtracting         25°C (45°F) from "COOLAN TEMP/S".*	
*: Example	EC
COOLAN TEMP/S FUEL T/TMP SE	
70°C (158°F)         45°C (113°F) or less	С
65°C (149°F) 40°C (104°F) or less	
60°C (140°F) 35°C (95°F) or less	D
<ul> <li>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:     </li> </ul>	D
Keep the accelerator pedal as steady as possible during cruising.	
<ul> <li>STEP 3 Drive the vehicle at 50 km/h (32 MPH) or more until "COOLAN TEMP/S" increases by 6°C (11°F).</li> </ul>	
NOTE:	F
Keep the accelerator pedal as steady as possible during cruising.	
Is the condition satisfied?	G
YES >> GO TO 4. NO >> GO TO 1.	0
4. PERFORM DTC CONFIRMATION PROCEDURE-II	
	Н
<ul> <li>With CONSULT</li> <li>Drive the vehicle until the following condition is satisfied.</li> </ul>	
COOLAN TEMP/S 71°C (159°F) or more	
CAUTION:	
Always drive vehicle at safe speed.	J
2. Check 1st trip DTC. Is 1st trip DTC detected?	
YES >> Proceed to EC-233, "Diagnosis Procedure".	Κ
NO >> INSPECTION END	
Diagnosis Procedure	1
	L
1.CHECK ENGINE COOLANT TEMPERATURE SENSOR	
Refer to EC-233, "Component Inspection".	M
Is the inspection result normal?	
YES >> GO TO 2. NO >> Replace engine coolant temperature sensor.	NI
NO >> Replace engine coolant temperature sensor. 2.CHECK THERMOSTAT	Ν
Check thermostat. Refer to <u>CO-28, "Inspection"</u> .	0
Is the inspection result normal?	
YES >> INSPECTION END	
NO >> Replace thermostat.	6
NO       >> Replace thermostat.         Component Inspection       INFOID:000000010839544	Ρ

1. Turn ignition switch OFF.

2. Disconnect engine coolant temperature sensor harness connector.

3. Remove engine coolant temperature sensor. Refer to CO-29, "Exploded View".

### **P0128 THERMOSTAT FUNCTION**

#### < DTC/CIRCUIT DIAGNOSIS >

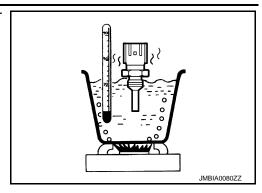
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (k $\Omega$ )	
		20 (68)	2.10 - 2.90
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.



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

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

### DTC Logic

### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible Cause	K
P0130	Air fuel ratio (A/F) sensor 1 (bank 1) circuit	<ul><li>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.</li></ul>			
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V.	<ul> <li>Harness or connectors (The A/F sensor 1 circuit is open</li> </ul>	
P0150	Air fuel ratio (A/F) sensor 1	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V.	or shorted.) • A/F sensor 1	M
	(bank 2) circuit		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:

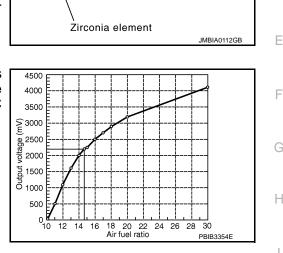
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.



EC

D

INFOID:000000010839546



Holder

Protector

Ρ

### P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

Is 1st trip DTC detected?

- YES >> Go to EC-237, "Diagnosis Procedure".
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 7.

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

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "Ă/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Does the indication fluctuate around 2.2 V?

YES >> GO TO 4.

NO >> Go to EC-237, "Diagnosis Procedure".

**4.**PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

- Select "A/F SEN1 (B1) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT.
- 2. Touch "START".
- 3. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen.

ENG SPEED	1,100 - 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 mph)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	D position (A/T) 5th position (M/T)

# If "TESTING" is not displayed after 20 seconds, retry from step 2. CAUTION:

Always drive vehicle at a safe speed.

Is "TESTING" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Check A/F sensor 1 function again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

Release accelerator pedal fully.

NOTE:

Never apply brake when releasing the accelerator pedal.

Which does "TESTING" change to?

COMPLETED>>GO TO 6.

OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-237, "Diagnosis Procedure".

7. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to EC-237, "Component Function Check".

NOTE:

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

Is the inspection result normal?

### P0130, P0150 A/F SENSOR 1

	PU	130, PU	1150 A/F SE	NSUR 1	
< DTC/CIRCUIT DIAGNO	)SIS >				[VQ37VHR]
YES >> INSPECTION NO >> Go to <u>EC-237</u>		Procedur	<u>e"</u> .		
<b>Component Function</b>	Check				INFOID:000000010839547
1.PERFORM COMPONE	NT FUNCTIO		СК		E
until the vehicle speed	speed of 80 k r to D positic	(m/h (50 n (A/T) (	MPH) for a few or 5th position (	minutes in the suit	e the accelerator pedal fully
CAUTION: Always drive vehicle NOTE:	at a safe sp	eed.			
<ul><li>Never apply brake wh</li><li>4. Repeat steps 2 and 3</li></ul>	for five times		-		
<ol> <li>Stop the vehicle and t</li> <li>Turn ignition switch O</li> <li>Turn ignition switch O</li> <li>Restart engine.</li> </ol>	N. FF and wait a	at least 1			
<ul><li>9. Repeat steps 2 and 3</li><li>10. Stop the vehicle and o</li><li>11. Check 1st trip DTC.</li><li><u>Is 1st trip DTC detected?</u></li></ul>			hicle.		
YES >> Go to EC-237 NO >> INSPECTION		Procedur	<u>e"</u> .		
Diagnosis Procedure	)				INFOID:000000010839548
1.CHECK GROUND CO					
,					
<ol> <li>Turn ignition switch O</li> <li>Check ground connect</li> </ol>		fer to Gro	ound Inspection	in GI-47, "Circuit I	nspection".
Is the inspection result no	<u>mal?</u>				
YES >> GO TO 2. NO >> Repair or repl	ace around a	onnectio	n		
2.CHECK AIR FUEL RA	0			Y CIRCUIT	
1. Disconnect A/F sense					
2. Turn ignition switch O	Ν.				
3. Check the voltage bet	Neen A/F ser	nsor 1 ha	irness connecto	r and ground.	
A/F ser	sor 1				
DTC Bank Connect	or Terminal	- Ground	Voltage		
P0130 1 F61	4	Ground	Pottony voltago	-	
P0150 2 F62	4	- Ground	Battery voltage		
Is the inspection result no	mal?				(
YES >> GO TO 4. NO >> GO TO 3.					
3.DETECT MALFUNCTION	NING PART	-			
Check the following.					
• Harness connectors E3,					
<ul> <li>IPDM E/R harness conn</li> <li>15 A fuse (No. 46)</li> </ul>	ector E7				
Harness for open or sho	rt between A/	F senso	r 1 and fuse		

>> Repair or replace harness or connectors.

### P0130, P0150 A/F SENSOR 1

#### < DTC/CIRCUIT DIAGNOSIS >

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

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

DTC	A/F sensor 1			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0130	1	F61	1	F102	57	Existed
F0130	I	101	2		61	
P0150	2	F62	1		65	
FU150	2	F02	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	Bank Connector Terminal		Gibunu	Continuity	
P0130	1	F61	1		Not existed	
F0130	I	101	2	Ground		
P0150	2	F62	1	Giouna		
P0150	7150 2 F62		2			

DTC	ECM			Ground	Continuity
DIC	Bank Connector Terminal		Giouna		
P0130	1	F100	57		Not existed
P0130	I		61	Ground	
P0150	2	F102	65	Giouna	
			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-44, "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. **CAUTION:** 

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

>> INSPECTION END

### P0131, P0151 A/F SENSOR 1

### Description

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

The sensor is capable of precise measurement  $\lambda = 1$ , but also in the lean and rich range. Together with its control electronics, the sensor

outputs a clear, continuous signal throughout a wide  $\lambda$  range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

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

### **DTC Logic**

### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause	Κ
P0131	Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage	• The A/F signal computed by ECM from the A/	Harness or connectors     (The A/F sensor 1 circuit is open or	
P0151	Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage	F sensor 1 signal is constantly approx. 0 V.	shorted.) • A/F sensor 1	L

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

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

#### **TESTING CONDITION:**

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

#### >> GO TO 2.

2. CHECK A/F SENSOR FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "Ă/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 0 V?

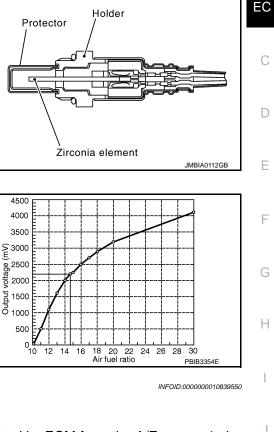
Μ

Ν

Ρ

INFOID:000000010839549

А



### P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

YES >> Go to <u>EC-240, "Diagnosis Procedure"</u>.

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-240, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000010839551

[VQ37VHR]

### 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

DTC		A/F senso	r 1	Ground	Voltage	
DIC	Bank	Connector	Terminal	Ciouna	voltage	
P0130	1	F61	4	Ground	Battery voltage	
P0150	2	F62	4	Ground	Ballery Vollage	

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

### 3.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E3, F1

• IPDM E/R harness connector E7

• 15 A fuse (No. 46)

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

### P0131, P0151 A/F SENSOR 1

#### < DTC/CIRCUIT DIAGNOSIS >

#### >> Repair or replace harness or connectors.

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

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

-	DTC	A/F sensor 1			EC	Continuity		
	DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity	
-	P0130	1	F61	1	F102	57	Existed	
	F0130	1	FUI	2		61		
-	P0150	2	F62	1	1102	65	LAISIEU	
	P0150	2	FOZ	2		66		

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

DTC		A/F sensor	Ground	Continuity		
DIC	Bank Connector Terminal		Giouna	Continuity		
P0130	1	F61	1		Not existed	
F0130	I	101	2	Ground		
D0150	2	EGO	1	Ground		
P0150	2	F62	2			

DTC	ECM			Ground	Continuity
DIC	Bank	Connector	Terminal	Giouna	Continuity
P0130	1		57		Not existed
F 0130	1	<b>E</b> 400	61	Ground	
P0150	0	F102	65	Giouna	
P0150	2		66		

5. Also check harness for short to power.

<u>Is the ir</u>	nspection result normal?								
YES	>> GO TO 5.								
NO	>> Repair open circuit, short to ground or short to power in harness or connectors.								
<b>5.</b> CHE	5. CHECK INTERMITTENT INCIDENT								
Perform	Perform GI-44, "Intermittent Incident".								

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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

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

EC

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### P0132, P0152 A/F SENSOR 1

### Description

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

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage	The A/F signal computed by ECM from the A/F	Harness or connectors     (The A/F sensor 1 circuit is open or
P0152	Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage	sensor 1 signal is constantly approx. 5 V.	shorted.) • A/F sensor 1

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

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

#### **TESTING CONDITION:**

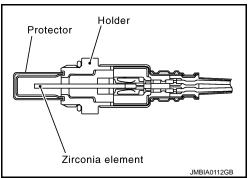
Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

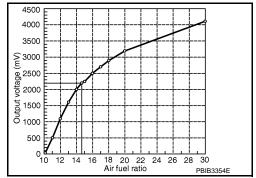
#### >> GO TO 2.

2. CHECK A/F SENSOR FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 5V?





< DTC/CI	RCUIT	DIAGNOS		32, P0	152 A/F SE	NSOR 1	[V0	Q37VHR]
YES >		EC-243, "I	-	Procedure	<u>e"</u> .			A
3.PERFC		C CONFIR	MATION P	ROCED	URE			
2. Turn i 3. Turn i	gnition gnition	switch OFF switch ON. switch OFF						EC
5. Drive CAUT	TON:	celerate vel			0 km/h (25 MPH	l) within 20 seco	nds after restarting	engine. C
		e vehicle at following co			0 consecutive s	econds.		D
ENG SPEE	D		1,000 - 3,200	rpm				
VHCL SPE	ED SE		More than 40	-	nph)			E
B/FUEL SC	CHDL		1.5 - 9.0 mse	с				
Selector le	ver		Suitable posi	tion				
	p the a				s possible duri			F
• If th 1.	is proc	edure is n	ot complet	ed withi	n 1 minute afte	er restarting eng	gine at step 4, retu	rn to step G
	< 1st trip	DTC.						0
<u>Is 1st trip</u>	DTC de	tected?						
		) <u>EC-243, "I</u> ECTION EI		Procedure	<u>e"</u> .			Н
Diagnos	sis Pro	cedure					INFOIL	D:000000010839554
1.снесн	( GROI	JND CONN	ECTION					I
	•	switch OFF d connectio		er to Gro	ound Inspection	in <u>GI-47, "Circui</u>	t Inspection".	J
Is the insp	ection I	result norma	<u>al?</u>					
	> GO T		a ground of	nnontion				K
•	•	ir or replace	-					
					POWER SUPPL			
		/F sensor 1 switch ON.	harness c	onnector	-			L
			en A/F ser	nsor 1 ha	rness connecto	r and ground.		
								M
DTC		A/F sensor	· 1	Ground	Voltage			
	Bank	Connector	Terminal		5	-		Ν
P0130	1	F61	4	Ground	Battery voltage			
P0150	2	F62	4					
YES >	> GO T > GO T > GO T		<u>al?</u>					0
-		FUNCTION	IING PART					Р
Check the								
<ul> <li>Harness</li> <li>IPDM E/</li> <li>15 A fus</li> </ul>	conne R harn e (No. 4	ctors E3, F1 ess connec 46)	tor E7	Foonoor	1 and fund			
			between A/	r 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 E		EC	CM	Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0130	1	F61	1		57	
F0130	•	1 101	2	F102	61	Existed
P0150	2	F62	1	- F102	65	Existed
P0150	2	F02	2		66	

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

DTC		A/F sensor	Ground	Continuity		
DIC	Bank Connector Terminal		Giouna	Continuity		
P0130	1	F61	1			
F0130	1	101	2	Ground	Not existed	
D0150	2	FGO	1	Giouna	NOL EXISTED	
F0150	P0150 2 F62		2			

DTC		ECM		Ground	Continuity	
DIC	Bank	Connector			Continuity	
P0130	1		57		Not existed	
F 0130	1	F102	61	Ground		
P0150	2	F102	65	Giouna		
P0150	Z		66	_		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK INTERMITTENT INCIDENT

Perform GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. **CAUTION:** 

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

>> INSPECTION END

### P0137, P0157 HO2S2

### Description

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

### **DTC** Logic



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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0137	Heated oxygen sensor 2 (bank 1) circuit low volt- age		<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> </ul>	-
P0157	Heated oxygen sensor 2 (bank 2) circuit low volt- age		<ul><li>Fuel pressure</li><li>Fuel injector</li><li>Intake air leaks</li></ul>	

#### DTC CONFIRMATION PROCEDURE

### **1.**INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

2. PRECONDITIONING

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

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

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

#### **TESTING CONDITION:**

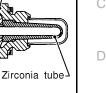
For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

## EC-245

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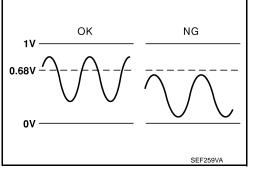
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### **3.** PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F). 9. Open engine hood.
- 10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 11. Start engine and follow the instruction of CONSULT display. **NOTE:**

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-247, "Diagnosis Procedure".

CAN NOT BE DIAGNOSED>>GO TO 4.

### **4.**PERFORM DTC CONFIRMATION PROCEDURE AGAIN

- 1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- 2. Perform DTC confirmation procedure again.

>> GO TO 3.

### **5.**PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-246, "Component Function Check".

#### NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-247, "Diagnosis Procedure".

### **Component Function Check**

INFOID:000000010839557

### **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 +		ector + – Cor		Voltage	
	Connector	Terminal	Terminal			
P0137	F102	76	84	Revving up to 4,000 rpm under no load at	The voltage should be above 0.68 V at least once during this procedure.	
P0157	1102	80	04	least 10 times		

#### Is the inspection result normal?

YES >> INSPECTION END

### P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

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### NO >> GO TO 2.

## 2. PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	Connector	+	_	Condition	N / 1/
				Condition	Voltage
		Terminal	Terminal		
P0137	- F102	76	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at
P0157		80			least once during this procedure.
	spection re				
YES NO	>> INSPE >> GO TC		ND		
~				TION CHECK-III	
					information
CHECK	ine vollage i	Jeiween		ness connector terminals under the f	onowing condition.
		ECM			
DTC		+	_	Condition	Voltage
	Connector	Terminal	Terminal		
P0137	E102	76	04	Coasting from 80 km/h (50 MPH) in D po-	The voltage should be above 0.68 V at
P0157	F102	80	84	sition (A/T), 4th gear position (M/T)	least once during this procedure.
<u>Is the ir</u>	spection re	sult norm	al?		
YES	>> INSPE				
NO			Diagnosis	<u>s Procedure"</u> .	
Diagn	osis Proc	edure			INFOID:0000000108395
<b>1.</b> CHE			ECTION		
	n ignition sv				
				Refer to Ground Inspection in GI-47.	"Circuit Inspection".
<u>Is the ir</u>	spection re		<u>al?</u>		
YES NO	>> GO TC		o around	connection.	
•	•	•	-	LF-LEARNING VALUE	
1. Cle CL	EAR : Speci	al Repair	Requirer	ng value. Refer to <u>EC-24, "MIXTUR</u> ment".	E RATIO SELF-LEARNING VALUE
				s at idle speed.	
<u>Is the 1</u>	st trip DTC	P0171 or	P0174 d	etected? Is it difficult to start engine?	-
YES			diagnosis	s for DTC P0171 or P0174. Refer to	<u>EC-272, "DTC Logic"</u> .
	>> GO TC				
				IT FOR OPEN AND SHORT	
1. Tur	n ignition su			r 2 harness connector.	
2 Die					
	connect EC	M harnes	s connec	ctor.	
3. Dis				20282 harness connector and ECM h	arness connector.

DTC		HO2S2		EC	Continuity	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0137	1	F60	1	F102	84	Existed
P0157	2	F59	1	F102	04	LAISteu

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2015 370Z

### P0137, P0157 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

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

Is the inspection result normal?

YES >> GO TO 4.

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

 ${f 4.}$ CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0137	1	F60	4	F102	76	Existed
P0157	2	F59	4	FIUZ	80	EXISTED

 Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC		HO2S2	Ground	Continuity		
DIC	Bank	Connector	Terminal	Giouna	Continuity	
P0137	1	F60	4	Ground	Not existed	
P0157	2	F59	4	Gibuliu	NUL EXISIEU	

DTC		ECM		Ground	Continuity	
	Bank	Connector	Terminal	Ciouna	Continuity	
P0137	1	F102	76	Ground	Not existed	
P0157	2	1102	80	Giouna	NOT EXISTED	

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK HEATED OXYGEN SENSOR 2

Refer to EC-249, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

**6.**REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new 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-44, "Intermittent Incident".

>> INSPECTION END

### **Component Inspection**

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### **1.**INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

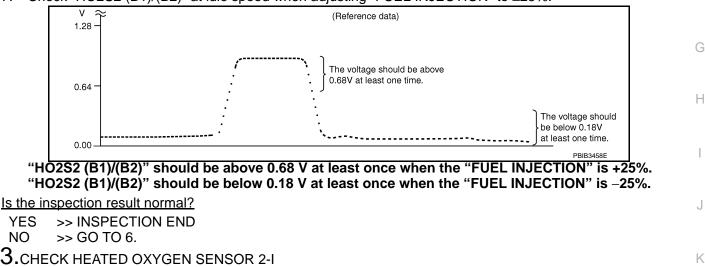
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

#### With CONSULT

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
- 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to  $\pm 25\%$ .



#### Without CONSULT

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

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

4. Let engine idle for 1 minute.

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

	ECM			
Connector +		-	Condition	Voltage
Connector	Terminal	Terminal		
E102	76 [HO2S2 (bank 1)]		Revving up to 4,000 rpm under no load at	The voltage should be above 0.68 V at least once during this procedure.
F102 80 [HO2S2 (bank 2)]		84	least 10 times	The voltage should be below 0.18 V at least once during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

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

### P0137, P0157 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

ECM					
Connector	+	_	Condition	Voltage	
	Terminal	Terminal			
F102	76 [HO2S2 (bank 1)]	- 84	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.	
	80 [HO2S2 (bank 2)]				

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

**5.**CHECK HEATED OXYGEN SENSOR 2-III

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

ECM				Voltage
Connector -	+ –		Condition	
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	- 84	Coasting from 80 km/h (50 MPH) in D po- sition (A/T), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

**6.**REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

#### CAUTION:

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

>> INSPECTION END

### P0138, P0158 HO2S2

### Description

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

## Holder Heater pad D Zirconia tube-Е SEF327R

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1.2V

1V

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### DTC Logic

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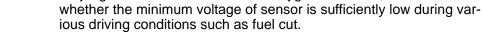
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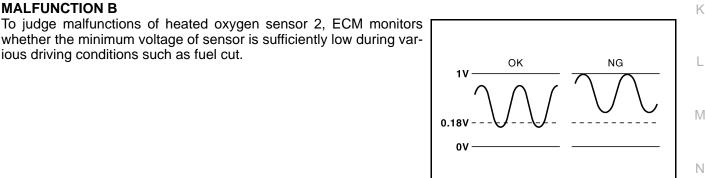
#### DTC DETECTION LOGIC

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



DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause	0
	Heated oxygen sensor 2 P0138 (bank 1) circuit high volt- age	A)	An excessively high voltage from the sen- sor is sent to ECM.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> </ul>	0
P0138		B)	The minimum voltage from the sensor is not reached to the specified voltage.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> </ul>	Ρ

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### P0138, P0158 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
	Heated oxygen sensor 2 P0158 (bank 2) circuit high volt- age	A)	An excessively high voltage from the sensor is sent to ECM.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> </ul>
P0158		B)	The minimum voltage from the sensor is not reached to the specified voltage.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> <li>Fuel pressure</li> <li>Fuel injector</li> </ul>

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### >> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

#### Is 1st trip DTC detected?

- YES >> Go to EC-254, "Diagnosis Procedure".
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 5.

### $\mathbf{3}.$ PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

#### NOTE:

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

- 1. Select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
- 9. Open engine hood.
- 10. Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 11. Start engine and follow the instruction of CONSULT display. **NOTE:**
- It will take at most 10 minutes until "COMPLETED" is displayed.
- 12. Touch "SELF-DIAG RESULTS".

#### Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-254, "Diagnosis Procedure".

CON NOT BE DIAGNOSED>>GO TO 4.

### **4.**PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

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

# P0138, P0158 HO2S2

## < DTC/CIRCUIT DIAGNOSIS >

< DTC/C					
2. Perf	orm DTC co	onfirmatio	n proced	ure again.	
	>> GO TO	3.			
<b>D.</b> PERF			FUNCTI	ON CHECK FOR MALFUNCTION	В
	component	function	check. Re	efer to EC-253, "Component Function	on Check".
check, a	1st trip DT	C might n	ot be con		oxygen sensor 2 circuit. During this
<u>s the ins</u> YES	spection res >> INSPE(				
NO				Procedure".	
Compo	onent Fur	nction C	heck		INFOID:000000010839562
			FUNCT	ON CHECK-I	
	out CONSU				
. Star	t engine an	d warm it		normal operating temperature.	
) T	n ianition sw	itch OFF	and wait	at least 10 seconds.	
				speed between 3,500 and 4,000 rpm	n for at least 1 minute under no load.
3. Start 1. Let e	t engine and engine idle	d keep the for 1 minu	e engine s ite.		n for at least 1 minute under no load.
8. Start I. Let e	t engine and engine idle	d keep the for 1 minu	e engine s ite.	speed between 3,500 and 4,000 rpm narness connector terminals under t	
3. Start 1. Let e	t engine and engine idle	d keep the for 1 minu	e engine s ite.		
3. Start 1. Let e	t engine and engine idle ck the volta	d keep the for 1 minu ge betwee	e engine s ite.		
3. Start 4. Let e 5. Che	t engine and engine idle	d keep the for 1 minu ge betwee ECM	e engine s ite.	narness connector terminals under t	the following condition.
3. Start 4. Let e 5. Che	t engine and engine idle ck the volta	d keep the for 1 minu ge betwee ECM +	engine s ite. en ECM ł	Condition Revving up to 4,000 rpm under no load at	the following condition. Voltage The voltage should be below 0.18 V at
<ul> <li>3. Stari</li> <li>4. Let e</li> <li>5. Che</li> <li>DTC</li> <li>P0138</li> <li>P0158</li> </ul>	t engine and engine idle ck the volta Connector F102	d keep the for 1 minu ge betwee ECM + Terminal 76 80	e engine s ite. en ECM f 	narness connector terminals under t Condition	the following condition. Voltage
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO	t engine and engine idle ck the volta Connector F102 >> INSPEC >> GO TO	d keep the for 1 minu ge betwee ECM + Terminal 76 80 sult norma CTION EN 2.	e engine s ite. en ECM f 	Condition Revving up to 4,000 rpm under no load at least 10 times	the following condition. Voltage The voltage should be below 0.18 V at
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO 2.PERF	t engine and engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM	d keep the for 1 minu ge betwee FCM + Terminal 76 80 Sult norma CTION EN 2. IPONENT	e engine s ite. en ECM f 	Condition Condition Revving up to 4,000 rpm under no load at least 10 times	the following condition. Voltage The voltage should be below 0.18 V at least once during this procedure.
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO 2.PERF	t engine and engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM	d keep the for 1 minu ge betwee FCM + Terminal 76 80 Sult norma CTION EN 2. IPONENT	e engine s ite. en ECM f 	Condition Revving up to 4,000 rpm under no load at least 10 times	the following condition. Voltage The voltage should be below 0.18 V at least once during this procedure.
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO 2.PERF	t engine and engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM	d keep the for 1 minu ge betwee FCM + Terminal 76 80 Sult norma CTION EN 2. IPONENT	e engine s ite. en ECM f 	Condition Condition Revving up to 4,000 rpm under no load at least 10 times	the following condition. Voltage The voltage should be below 0.18 V at least once during this procedure.
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO 2.PERF	t engine and engine idle ck the volta Connector F102 >> INSPEC >> GO TO FORM COM	d keep the for 1 minu ge betwee + Terminal 76 80 sult norma CTION EN 2. IPONENT etween E ECM +	e engine s ite. en ECM h - Terminal 84 ID FUNCTI CM harne	Condition Condition Revving up to 4,000 rpm under no load at least 10 times	the following condition. Voltage The voltage should be below 0.18 V at least once during this procedure.
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO 2.PERF Check th DTC	t engine and engine idle ck the volta Connector F102 >> INSPEC >> INSPEC >> GO TO FORM COM	d keep the for 1 minu ge betwee + Terminal 76 80 cult norma CTION EN 2. IPONENT etween E ECM + Terminal	e engine s ite. en ECM f 	Condition Condition Revving up to 4,000 rpm under no load at least 10 times ON CHECK-II ess connector terminals under the fo	the following condition.           Voltage           The voltage should be below 0.18 V at least once during this procedure.           ollowing condition.           Voltage
3. Stari 4. Let e 5. Che DTC P0138 P0158 S the ins YES NO 2.PERF Check th	t engine and engine idle ck the volta Connector F102 >> INSPEC >> INSPEC >> GO TO FORM COM	d keep the for 1 minu ge betwee + Terminal 76 80 sult norma CTION EN 2. IPONENT etween E ECM +	e engine s ite. en ECM h - Terminal 84 ID FUNCTI CM harne	Condition Condition Revving up to 4,000 rpm under no load at least 10 times ON CHECK-II ess connector terminals under the fo	the following condition. Voltage The voltage should be below 0.18 V at least once during this procedure. ollowing condition.

# Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

# 3.PERFORM COMPONENT FUNCTION CHECK-III

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

		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	1102	80	04	sition (A/T), 4th gear position (M/T)	least once during this procedure.	

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- <u>Is the inspection result normal?</u> YES >> INSPECTION END
- NO >> Go to <u>EC-254, "Diagnosis Procedure"</u>.

# Diagnosis Procedure

INFOID:000000010839563

**1.**INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-251, "DTC Logic".

Which malfunction is detected?

- A >> GO TO 2
- B >> GO TO 9.

2. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

# $\mathbf{3.}$ CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

2. Disconnect ECM harness connector.

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

DTC	HO2S2			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F60	1	F102	84	Existed
P0158	2	F59	1	1102	04	LAISteu

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F60	4	F102	76	Existed
P0158	2	F59	4	1102	80	LAISIEU

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

DTC		HO2S2		ECM		Ground	Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Giouna	Continuity
P0138	1	F60	4	F102	76	Ground	Not existed
P0158	2	F59	4	1102	80	Ground	NUL EXISTED

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Revision: 2014 September

Water should not exist.	
Is the inspection result normal?	
YES >> GO TO 6.	
NO >> Repair or replace harness or connectors.	
6.CHECK HEATED OXYGEN SENSOR 2	
Refer to EC-256, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 8. NO >> GO TO 7.	
7.REPLACE HEATED OXYGEN SENSOR 2	
Replace malfunctioning heated oxygen sensor 2. CAUTION:	
• Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (1	9.7
<ul><li>in) onto a hard surface such as a concrete floor; use a new one.</li><li>Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor.</li></ul>	sor
Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lul	
cant (commercial service tool).	
>> INSPECTION END	
8.CHECK INTERMITTENT INCIDENT	
Refer to <u>GI-44, "Intermittent Incident"</u> .	
>> INSPECTION END	
9. CHECK GROUND CONNECTION	
1. Turn ignition switch OFF.	
<ol> <li>Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>.</li> </ol>	
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, "MIXTURE RATIO SELF-LEARNING VAL</u>	<u>UE</u>
<u>CLEAR : Special Repair Requirement"</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-276. "DTC Logic".	
NO >> GO TO 11.	
11. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch OFF.	
<ol> <li>Disconnect heated oxygen sensor 2 harness connector.</li> <li>Disconnect ECM harness connector.</li> </ol>	
<ol> <li>Disconnect ECM namess connector.</li> <li>Check the continuity between HO2S2 harness connector and ECM harness connector.</li> </ol>	

DTC	HO2S2			EC	Continuity		
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity	
P0138	1	F60	1	F102	84	Existed	
P0158	2	F59	1	1102	5	LAISted	

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

Is the inspection result normal?

Ρ

# P0138, P0158 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 12.

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

12. CHECK H02S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F60	4	F102	76	Existed
P0158	2	F59	4	1102	80	LAISLEU

 Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC		HO2S2	Ground	Continuity		
DIC	Bank	Connector	Terminal	Giouna	Continuity	
P0138	1	F60	4	Ground	Not existed	
P0158	2	F59	4	Giouna	INUL EXISTED	

DTC		ECM		Ground	Continuity
DIC	Bank	Connector	Terminal		
P0138	1	F102	76	Ground	Not existed
P0158	2	1102	80		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 13.

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

**13.**CHECK HEATED OXYGEN SENSOR 2

Refer to EC-256, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 14.

**14.**REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. **CAUTION:** 

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

>> INSPECTION END

15. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

>> INSPECTION END

**Component Inspection** 

**1.**INSPECTION START

Do you have CONSULT?

Revision: 2014 September

INFOID:000000010839564

Do you have CONSULT? А YES >> GO TO 2. NO >> GO TO 3. 2. CHECK HEATED OXYGEN SENSOR 2 EC ()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 D with CONSULT. 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%. ٧ (Reference data) Е 1.28 The voltage should be above F 0.68V at least one time. 0.64 The voltage should be below 0.18V at least one time. 0.00 PBIB3458E "HO2S2 (B1)/(B2)" should be above 0.68 V at least once when the "FUEL INJECTION" is +25%. Н "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 Start engine and warm it up to the normal operating temperature. 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 3. Κ 4. Let engine idle for 1 minute. Check the voltage between ECM harness connector terminals under the following condition. 5. ECM

Connector	+	_	Condition	Voltage	
Connector	Terminal	Terminal			Μ
F102	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at	The voltage should be above 0.68 V at least once during this procedure.	Ν
1102	80 [HO2S2 (bank 2)]	04	least 10 times	The voltage should be below 0.18 V at least once during this procedure.	0

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.

[VQ37VHR]

# P0138, P0158 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

	ECM			
Connector	+	-	Condition	Voltage
Connector	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure.
1 102	80 [HO2S2 (bank 2)]	- 04	Neeping engine at lot 10 10 minutes	The voltage should be below 0.18 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

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

	ECM			
Connector	+	-	Condition	Voltage
Connector	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D posi-	The voltage should be above 0.68 V at least once during this procedure.
F 102	80 [HO2S2 (bank 2)]	04	tion (A/T), 4th gear position (A/T)	The voltage should be below 0.18 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

**6.**REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

#### **CAUTION:**

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

>> INSPECTION END

# P0139, P0159 HO2S2

### Description

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

# DTC Logic

#### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 (bank 1) circuit slow response	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Heated oxygen sensor 2</li> </ul>
P0159	Heated oxygen sensor 2 (bank 2) circuit slow response	time computed by ECM.	<ul> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> </ul>

### 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.

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

2. Turn ignition switch ON.

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

#### **TESTING CONDITION:**

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

>> GO TO 3.

## EC-259

Holder

Zirconia tube

SEF327R

INFOID:000000010839566

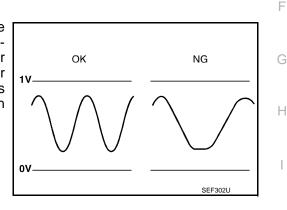
[VQ37VHR]

А

EC

D

Е



Heater pad



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# **3.** PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 7. Let engine idle for 1 minute.
- 8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- 9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed. CAUTION:

#### Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.

CAUTION:

- Enable the engine brake.
- Always drive carefully.
- Never apply brake when releasing the accelerator pedal.
- 11. Repeat step 9 and 10 at least 8 times.
- 12. Check the following item of "DATA MONITOR".

DTC	Data monitor item	Status
P0139	HO2 S2 DIAG1 (B1)	
F0139	HO2 S2 DIAG2 (B1)	CMPLT
P0159	HO2 S2 DIAG1 (B2)	GMFLI
F0159	HO2 S2 DIAG2 (B2)	

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

YES >> GO TO 6.

NO-1: "CMPLT" is not displayed on DIAG 1>>Perform DTC confirmation procedure again. NO-2: "CMPLT" is not displayed on DIAG 2>>GO TO 4.

## **4.**PERFORM DTC WORK SUPPORT

- 1. Open engine hood.
- Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 3. Start engine and follow the instruction of CONSULT display. **NOTE:**

It will take at most 10 minutes until "COMPLETED" is displayed.

#### Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 6.

NO >> GO TO 5.

# **5.**PERFORM DTC CONFIRMATION PROCEDURE AGAIN

- 1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- 2. Perform DTC confirmation procedure again.

>> GO TO 3.

**6.**PERFORM SELF-DIAGNOSIS

#### With CONSULT

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to EC-262, "Diagnosis Procedure".

NO >> INSPECTION END

**7.**PERFORM COMPONENT FUNCTION CHECK

#### < DTC/CIRCUIT DIAGNOSIS > Perform component function check. Refer to EC-261, "Component Function Check". NOTE: А Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed. Is the inspection result normal? EC YES >> INSPECTION END NO >> Proceed to EC-262, "Diagnosis Procedure". Component Function Check INFOID:0000000010839567 1.PERFORM COMPONENT FUNCTION CHECK-I D Without CONSULT Start engine and warm it up to the normal operating temperature. 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. Ε 3. Let engine idle for 1 minute. 4. Check the voltage between ECM harness connector terminals under the following condition. 5. F ECM DTC + Condition Voltage Connector Terminal Terminal P0139 76 Revving up to 4,000 rpm under no load at A change of voltage should be more than F102 84 least 10 times 0.24 V for 1 second during this procedure. P0159 80 Н Is the inspection result normal? 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 Condition + Voltage \_ Κ Connector Terminal Terminal P0139 76 A change of voltage should be more than F102 84 Keeping engine at idle for 10 minutes L 0.24 V for 1 second during this procedure. P0159 80 Is the inspection result normal? YES >> INSPECTION END Μ

NO >> GO TO 3.

# ${\it 3.}$ PERFORM COMPONENT FUNCTION CHECK-III

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

		ECM				$\circ$
DTC	Connector	+	-	Condition	Voltage	0
	Connector	Terminal	Terminal			
P0139	F102	76	84	Coasting from 80 km/h (50 MPH) in D po-	A change of voltage should be more than	Ρ
P0159	1 102	80	04	sition (A/T), 4th gear position (M/T)	0.24 V for 1 second during this procedure.	

Is the inspection result normal?

>> INSPECTION END YES

NO >> Go to EC-262, "Diagnosis Procedure".

Ν

### Diagnosis Procedure

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

 Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement</u>".

2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-272, "DTC Logic"</u> or <u>EC-276, "DTC Logic"</u>.

NO >> GO TO 3.

 ${f 3.}$  CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

#### 1. Turn ignition switch OFF.

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

DTC		HO2S2		EC	CM	Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0139	1	F60	1	F102	84	Existed
P0159	2	F59	1	1102	04	LAISIEU

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC		HO2S2		EC	CM	Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0139	1	F60	4	F102	76	Existed
P0159	2	F59	4	FIUZ	80	EXISTED

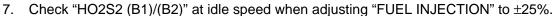
2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

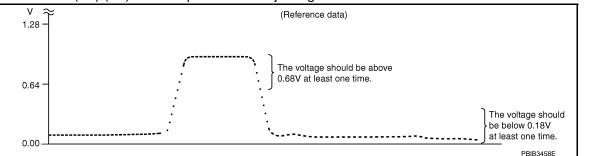
DTC		HO2S2		Ground	Continuity
DIC	Bank	Connector	Terminal	Giouna	Continuity
P0139	1	F60	4	Ground	Not existed
P0159	2	F59	4	Ground	INOL EXISTED

### < DTC/CIRCUIT DIAGNOSIS >

					1		Λ
DTC	Daula	ECM	Taurainal	Ground	Continuity		А
P0139	Bank 1	Connector	Terminal 76				
P0159	2	F102	80	Ground	Not existed		EC
3. Also c	heck h	arness for	short to p	ower.			
Is the insp			<u>nal?</u>				С
	> GO 1 > Repa		cuit short	to around	or short to	power in harness or connectors.	
5.CHECK		•		-			D
Refer to E							
Is the insp			-				Е
	> GO 1 > GO 1						
6.REPLA			YGEN SEI	NSOR 2			F
Replace m					)		Г
CAUTION		•					
					has been d floor; use a	ropped from a height of more than 0.5 m (19.7 a new one.	G
• Béfore i	nstalli	ng new h	eated oxy	/gen sens	or, clean e	xhaust system threads using Oxygen Sensor	
		cial servic			1-43697-16	or J-43897-12)] and approved Anti-seize Lubri-	Н
_	-	PECTION E					
1.CHECK							
Refer to <u>G</u>	<u> -44, " </u>	ntermittent	Incident".				J
>:	> INSF	PECTION E	ND				
Compon	ent Ir	nspectio	n			INFOID:000000010839569	К
1.INSPEC	TION	START					
Do you ha	ve COI	NSULT?					L
<u>Do you ha</u>							
	> GO 1 > GO 1						M
2.снеск			EN SENS	OR 2			
(P)With CC				-			Ν
1. Turn ig	gnition	switch ON				node with CONSULT.	IN
					perating ten 0 seconds.	nperature.	_
4. Start e	ngine a	and keep tl	he engine			and 4,000 rpm for at least 1 minute under no load.	0
		le for 1 mir		CTIVE TE	ST" mode. a	and select "HO2S2 (B1)/(B2)" as the monitor item	
with C						· · · · ·	Ρ

#### < DTC/CIRCUIT DIAGNOSIS >





"HO2S2 (B1)/(B2)" should be above 0.68 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

**3.**CHECK HEATED OXYGEN SENSOR 2-I

#### Without CONSULT

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

	ECM			
Connector	+	-	Condition	Voltage
CONNECTOR	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at	The voltage should be above 0.68 V at least once during this procedure.
F 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.

	ECM			
Connector	+	_	Condition	Voltage
Connector	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure.
F IUZ	80 [HO2S2 (bank 2)]	04		The voltage should be below 0.18 V at least once during this procedure.

#### is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

**5.**CHECK HEATED OXYGEN SENSOR 2-III

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

# < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

	ECM			
Connector	+	-	Condition	Voltage
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)]	84	Coasting from 80 km/h (50 MPH) in D posi- tion (A/T), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	ection result i			
	> INSPECTIC > GO TO 6.	ON END		
	CE HEATED	OXYGEN S	SENSOR 2	
			/gen sensor 2.	
AUTION		-	。 nsor which has been dropped from	a a height of more than 0.5 m (10.7
in) onto	a hard surfa	ce such as	a concrete floor; use a new one.	
Thread (	nstalling hea Cleaner [con mmercial se	nmercial se	oxygen sensor, clean exhaust syst ervice tool (J-43897-18 or J-43897-1	em threads using Oxygen Sensor 2)] and approved Anti-seize Lubri-
>:	> INSPECTIO	ON END		
>:	> INSPECTIC	ON END		
>:	> INSPECTIC	ON END		
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>:	> INSPECTIO	ON END		

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

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

# DTC Logic

INFOID:000000010839570

### 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)	<ul> <li>The response time of a A/F sen- sor 1 signal delays more than the specified time computed by ECM.</li> </ul>	<ul> <li>Harness or connectors (The A/F sensor 1 circuit is open or shorted.)</li> <li>A/F sensor 1</li> </ul>		
P015B	circuit delayed response				
P014E	Air fuel ratio (A/F) sensor 1 (bank 2)				
P014F	circuit slow response				
P015C	Air fuel ratio (A/F) sensor 1 (bank 2)				
P015D	circuit delayed response				

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### **TESTING CONDITION:**

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

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

#### With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 6. Let engine idle for 1 minute.
- 7. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
- 8. Fully release accelerator pedal and then let engine idle for about 1 minute.
- 9. Check the items status of "DATA MONITOR" as follows.
  - NOTE:

If "PRSNT" changed to "ABSNT", refer to EC-237, "Component Function Check".

# P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

	. <u></u> ,		<u>.</u>	0
DTC	Data monitor item	Status	_	А
<ul> <li>P014C</li> <li>P014D</li> <li>P015A</li> <li>P015B</li> </ul>	A/F SEN1 DIAG3 (B1)	PRSNT		EC
<ul> <li>P014E</li> <li>P014F</li> <li>P015C</li> <li>P015D</li> </ul>	A/F SEN1 DIAG3 (B2)	PRSNI		С
Is "PRSNT" displa	ved on CONSULT screen	<u> ?</u>	•	D
YES >> GO TO NO >> GO TO 3 PERFORM DT				
				Е
	Image of the second strength is a second strength in the second strength is a second strength in the second strength is a second str			F
YES >> GO T				
A	to EC-237, "Component I			G
<b>4.</b> PERFORM DT	C CONFIRMATION PRO	CEDURE-2		0
2. Check the iter	<b>T</b> t 20 seconds at idle. ms status of "DATA MONI	TOR" as follows.		Η
NOTE: If "CMPLT" c	hanged to "INCMP", ref	er to <u>EC-237, "C</u>	omponent Function Check".	I
DTC	Data monitor item	Status	-	
<ul><li>P014C</li><li>P014D</li></ul>	A/F SEN1 DIAG1 (B1)			J
<ul><li>P015A</li><li>P015B</li></ul>	A/F SEN1 DIAG2 (B1)	CMPLT		
• P014E	A/F SEN1 DIAG1 (B2)	CIVIT ET		Κ
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>	A/F SEN1 DIAG2 (B2)			I
Is "CMPLT" displa	ved on CONSULT screen	?	•	
YES >> GO TO				
_	to EC-237, "Component I	Function Check".		Μ
5.PERFORM SE				
With CONSULT Check the "SELF-				Ν
Is any DTC detect				
•	ed to <u>EC-268, "Diagnosis</u>	Procedure".		$\sim$
NO >> INSPE	ECTION END			0
<b>6.</b> CHECK AIR-FU	UEL RATIO SELF-LEARN	IING VALUE		
<ol> <li>Select Service</li> <li>Calculate the</li> </ol>	and warm it up to normal o e \$01 with GST. total value of "Short term tage within ±15%?		ture. ng term fuel trim" indications.	Ρ
YES >> GO TO NO >> GO TO				

7. DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust das leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

# 8. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch OFF and wait at least 10 seconds. 1.
- Turn ignition switch ON. 2.
- Turn ignition switch OFF and wait at least 10 seconds. 3.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
- 7. Fully release accelerator pedal and then let engine idle for about 1 minute.
- Check 1st trip DTC. 8.

#### Is 1st trip DTC detected?

>> Proceed to EC-268, "Diagnosis Procedure". YES

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:000000010839571

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF. 1.
- Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

#### 2.RETIGHTEN A/F SENSOR 1

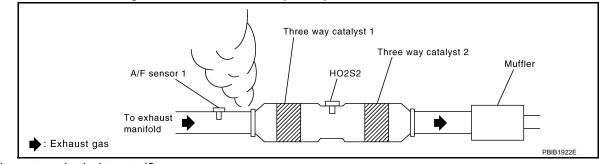
Loosen and retighten the A/F sensor 1. Refer to EM-39, "Exploded View".

>> GO TO 3.

# 3. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

Listen for an exhaust gas leak before three way catalyst 1. 2.



#### Is exhaust gas leak detected?

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

# P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

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[VQ37VHR]

4.CHECK	FOR IN	ITAKE AIR L	.EAK				Δ
Listen for a	an intake	e air leak afte	er the mass	air flow se	ensor.		~
<u>Is intake ai</u>							
	NO >> GO TO 5.						
5.CLEAR	THE MI	XTURE RAT	IO SELF-L	EARNING	VALUE		_
					r to <u>EC-24, "MIX</u>	TURE RATIO SELF-LEARNING VALUE	С
		<u>ial Repair Re</u> r at least 10					
Is the 1st t	rip DTC	P0171, P01	<u>72, P0174 c</u>	or P0175 c	letected? Is it dif	ficult to start engine?	D
YES >:		m trouble dia 276, "DTC L		DTC P017	1, P0174 or P01	72, P0175. Refer to <u>EC-272, "DTC Logic"</u>	
NO >:	> GO TC		<u></u> .				Е
<b>6.</b> CHECK	AIR FU	IEL RATIO (A	A/F) SENSC	DR 1 POW	/ER SUPPLY CI	RCUIT	
		F sensor 1 h witch ON.	arness conr	nector.			F
			n A/F senso	r 1 harnes	s connector and	ground.	
	1			1		_	G
DTC	Denk	A/F sensor		Ground	Voltage		
• P014C	Bank	Connector	Terminal			-	Н
<ul> <li>P014D</li> <li>P015A</li> <li>P015B</li> </ul>	1	F61	4	- Ground	Potton/ voltage		
<ul> <li>P014E</li> <li>P014F</li> <li>P015C</li> <li>P015D</li> </ul>	2	F62	4	Ground	Battery voltage		ı J
Is the inspe	ection re	sult normal?	>			-	0
	> GO TO						K
-	> GO TC T MALE	UNCTIONIN					N
Check the • Harness	following	g.					L
• 15 A fuse	e (No. 46	6)					M
• Harness	for oper	n or short be	ween A/F s	ensorial	na fuse		IVI
>:	> Repair	or replace h	arness or c	onnectors	i.		B. 7
8.CHECK	A/F SE	NSOR 1 INF	PUT SIGNA	L CIRCUI	T FOR OPEN A	ND SHORT	Ν
		witch OFF. CM harness o	connector				0
				sor 1 harn	ess connector a	nd ECM harness connector.	0
							Ρ

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

DTC	A/F sensor 1			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
• P014C			1		57	
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1	1 F61	2	F102	61	Existed
• P014E			1	1102	65	LAISIEU
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>		F62	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
• P014C			1	- Ground	Not existed
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1	F61	2		
• P014E			1	Ground	NUL EXISTED
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>	2 F62		2	_	

DTC	ECM			Ground	Continuity
DIC	Bank Connector		Terminal	Ground	Continuity
• P014C			57		
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1	– F102	61	Ground	Not existed
• P014E		1102	65	Ground	NUL EXISTED
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>	2		66		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

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

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

Refer to EC-190, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 13.

**10.**CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2). Refer to <u>EC-199</u>, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning mass air flow sensor. Refer to <u>EM-32</u>, "Exploded View".

11.CHECK PCV VALVE

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

# P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 12. NO >> Repair or replace PCV valve. Refer to <u>EM-53, "Exploded View"</u> .	А
12. CHECK INTERMITTENT INCIDENT	
Perform <u>GI-44, "Intermittent Incident"</u> .	EC
Is the inspection result normal?	EC
YES >> GO TO 13.	
NO >> Repair or replace.	С
13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1	
Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-39, "Exploded View".	
• Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a	D
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).	Е
>> INSPECTION END	F
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#### < DTC/CIRCUIT DIAGNOSIS >

# P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

## DTC Logic

INFOID:000000010839572

[VQ37VHR]

#### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator	
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector	

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171	Fuel injection system too lean (bank 1)		<ul> <li>Intake air leaks</li> <li>A/F sensor 1</li> </ul>
P0174	Fuel injection system too lean (bank 2)	<ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)</li> </ul>	<ul> <li>Fuel injector</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Lack of fuel</li> <li>Mass air flow sensor</li> <li>Incorrect PCV hose connection</li> </ul>

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

#### >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to <u>EC-24, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>.

2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

**3.**RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

#### NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-273, "Diagnosis Procedure".

NO >> Check exhaust and intake air leak visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.

2. Check 1st trip DTC.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION	
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
Is 1st trip DTC detected?	А
YES >> Go to <u>EC-273, "Diagnosis Procedure"</u> . NO >> GO TO 5.	A
5.PERFORM DTC CONFIRMATION PROCEDURE-III	
1. Turn ignition switch OFF and wait at least 10 seconds.	EC
<ol> <li>Start engine.</li> <li>Maintain the following conditions for at least 10 consecutive minutes.</li> </ol>	
<ol> <li>Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.</li> </ol>	С
· · · ·	
VHCL SPEED SE         50 - 120 km/h (31 - 75 MPH)	D
CAUTION: Always drive vehicle at a safe speed.	D
4. Check 1st trip DTC.	
Is 1st trip DTC detected?	E
YES >> Go to EC-273. "Diagnosis Procedure".	
NO >> INSPECTION END	F
Diagnosis Procedure	INFOID:000000010839573
<b>1.</b> CHECK EXHAUST GAS LEAK	
1. Start engine and run it at idle.	G
2. Listen for an exhaust gas leak before three way catalyst 1.	
A/F sensor 1 To exhaust manifold FEXhaust gas	H J 922E
Is exhaust gas leak detected?	K
YES >> Repair or replace.	1.
NO $>>$ GO TO 2.	
2.CHECK FOR INTAKE AIR LEAK	L
<ol> <li>Listen for an intake air leak after the mass air flow sensor.</li> <li>Check PCV hose connection.</li> </ol>	
Is intake air leak detected?	M
YES >> Repair or replace.	
NO $>>$ GO TO 3.	Ν
3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT	
<ol> <li>Turn ignition switch OFF.</li> <li>Disconnect corresponding A/F sensor 1 harness connector.</li> <li>Disconnect ECM harness connector.</li> <li>Check the centinuity between A/F sensor 1 harness connector and ECM harness connector.</li> </ol>	0

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

DTC	A/F sensor 1			EC	Continuity		
DTC	Bank	Connector	Terminal	Connector	Terminal	Continuity	
P0171	1	F61	1		57		
FUITI	1 101	101	2	F102	61	Existed	
P0174	2	F62	1	FIUZ	65	EXISIEU	
F0174	2	FUZ	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	Bank Connector Termin		Gibuliu	Continuity
P0171	1	F61	1	Ground	Not existed
FUITI	1	FUI	2		
P0174	0	Fco	1	Ground	
FU1/4	2	F62	2	1	

DTC		ECM		Ground	Continuity	
DIC	Bank	Connector	Terminal	Giouna	Continuity	
P0171	1		57			
FUITI	I	F102	61	Ground	Not existed	
P0174	2	FIUZ	65	Giouna	NOT EXISTED	
P0174	2		66			

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-631, "Inspection".

2. Install fuel pressure gauge and check fuel pressure. Refer to EC-631, "Inspection".

### At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 51 psi)

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

**5.** DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".

NO >> Repair or replace.

**6.**CHECK MASS AIR FLOW SENSOR

#### With CONSULT

- 1. Install all removed parts.
- 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT. For specification, refer to <u>EC-634, "Mass Air Flow Sensor"</u>.

#### With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to <u>EC-634</u>, "<u>Mass Air Flow Sensor</u>".

Is the measurement value within the specification?

- YES >> GO TO 7.
- NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to <u>EC-204, "Diagnosis Procedure"</u>.

### 7. CHECK FUNCTION OF FUEL INJECTOR

#### With CONSULT

1. Start engine.

[VQ37VHR]

#### < 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.

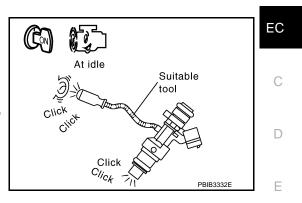
#### Without CONSULT

- 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-508</u>, "Diagnosis Procedure".



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# 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-43</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?

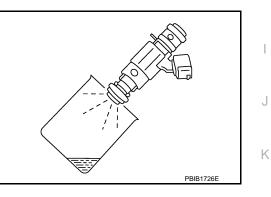
YES >> GO TO 9.

NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.

### 9. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

>> INSPECTION END





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#### < DTC/CIRCUIT DIAGNOSIS >

# P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

# DTC Logic

INFOID:000000010839574

[VQ37VHR]

#### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator	
A/F sensor 1 Density of oxygen in exhaust gas (Mixture ratio feedback signal)		Fuel injection control	Fuel injector	

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172	Fuel injection system too rich (bank 1)	Fuel injection system does not operate properly.	<ul><li> A/F sensor 1</li><li> Fuel injector</li></ul>
P0175	Fuel injection system too rich (bank 2)	The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	<ul> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul>

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

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

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Clear the mixture ratio self-learning value. Refer to <u>EC-24</u>, "<u>MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement</u>".
- 2. Start engine.

Is it difficult to start engine?

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

**3.**RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too. Crank engine while depressing accelerator pedal.

#### NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-277, "Diagnosis Procedure".

NO >> Remove spark plugs and check for fouling, etc.

**4.**PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 10 minutes.

2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-277, "Diagnosis Procedure".

NO >> GO TO 5.

#### [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > 5. PERFORM DTC CONFIRMATION PROCEDURE-III А Turn ignition switch OFF and wait at least 5 seconds. 1. 2. Turn ignition switch ON. 3. Start engine. EC Maintain the following conditions for at least 10 consecutive minutes. 4. 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. 5. Check 1st trip DTC. D Is 1st trip DTC detected? YES >> Go to EC-277, "Diagnosis Procedure". Е >> INSPECTION END NO Diagnosis Procedure INFOID:000000010839575 F **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. Three way catalyst 1 Н Three way catalyst 2 Muffler HO2S2 A/F sensor 1 To exhaust manifold : Exhaust gas PBIB1922E Is exhaust gas leak detected? YES >> Repair or replace. NO >> GO TO 2. Κ 2.CHECK FOR INTAKE AIR LEAK Listen for an intake air leak after the mass air flow sensor. L Is intake air leak detected? YES >> Repair or replace. NO >> GO TO 3. Μ **3.**CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT 1. Turn ignition switch OFF. Ν

- Disconnect corresponding A/F sensor 1 harness connector. 2.
- 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	F61	1		57	
FUITZ		101	2	F102	61	Existed
P0175	2	F62	1	FIUZ	65	EXISTED
F0175	2	FUZ	2		66	

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

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### < DTC/CIRCUIT DIAGNOSIS >

DTC		A/F sensor	1	Ground	Continuity	
DIC	Bank	Connector	Terminal	Giouna	Continuity	
P0172	1	F61	1			
FUITZ	1	101	2	Ground	Not existed	
P0175	2	F62	1	Giouna	NOT existed	
FU1/5	2	F02	2			

DTC		ECM		Ground	Continuity	
DIC	Bank	Connector	Terminal	Giouna	Continuity	
P0172	1		57			
FUITZ	I	F102	61	Ground	Not ovisted	
P0175	2	FIUZ	65	Giouna	Not existed	
P0175	2		66			

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-631, "Inspection".

2. Install fuel pressure gauge and check fuel pressure. Refer to EC-631, "Inspection".

#### At idling: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 51 psi)

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace "fuel filter and fuel pump assembly".

 ${f 5.}$ CHECK MASS AIR FLOW SENSOR

#### With CONSULT

- 1. Install all removed parts.
- 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT. For specification, refer to <u>EC-634, "Mass Air Flow Sensor"</u>.

#### With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in "Service \$01" with GST. For specification, refer to <u>EC-634, "Mass Air Flow Sensor"</u>.

Is the measurement value within the specification?

- YES >> GO TO 6.
- NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to <u>EC-204, "Diagnosis Procedure"</u>.

### **6.**CHECK FUNCTION OF FUEL INJECTOR

#### With CONSULT

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that each circuit produces a momentary engine speed drop.

#### Without CONSULT

1. Start engine and let it idle.

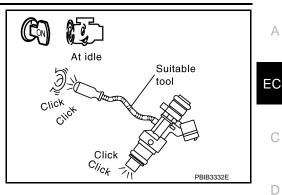
#### < DTC/CIRCUIT DIAGNOSIS >

#### 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-508</u>, "Diagnosis Procedure".



[VQ37VHR]

#### 7. CHECK FUELINJECTOR 1. Remove fuel injector assembly. Refer to EM-43, "Removal and Installation". Keep fuel hose and all fuel injectors connected to fuel tube. Ε 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle. Disconnect all fuel injector harness connectors. 3. 4. Disconnect all ignition coil harness connectors. 5. Prepare pans or saucers under each fuel injector. F 6. Crank engine for about 3 seconds. Make sure fuel that does not drip from fuel injector. Is the inspection result normal? YES >> GO TO 8. NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one. 8. CHECK INTERMITTENT INCIDENT Н Refer to GI-44, "Intermittent Incident". >> INSPECTION END Κ

Revision: 2014 September

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# P0181 FTT SENSOR

# Description

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases. <**Reference data**>

 Fluid temperature [°C (°F)]
 Voltage\* (V)
 Resistance (kΩ)

 20 (68)
 3.5
 2.3 - 2.7

 50 (122)
 2.2
 0.79 - 0.90

\*: These data are reference values and are measured between ECM terminals 106 (Fuel tank temperature sensor) and 128 (sensor ground).

# DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
	FTT SENSOR [Fuel tank temperature	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	(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 tempera- ture sensors when the engine is started with its cold state.	Harness or connectors (High or low resistance in the FTT sensor circuit) FTT sensor

#### DTC CONFIRMATION PROCEDURE

**1.**INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 7. NO >> GO TO 2.

2.PRECONDITIONING

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

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

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

>> GO TO 3.

# **3.**PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to EC-282, "Diagnosis Procedure".
- NO >> GO TO 4.

SEF012P

INFOID:000000010839577

# P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
4. CHECK ENGINE COOLANT TEMPERATURE	
<ol> <li>Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT.</li> <li>Check "COOLAN TEMP/S" value.</li> </ol>	
<u>"COOLAN TEMP/S" less than 60°C (140°F)?</u>	
YES >> INSPECTION END NO >> GO TO 5.	
5. PERFORM DTC CONFIRMATION PROCEDURE-II	
<ol> <li>Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).</li> <li>Wait at least 10 seconds.</li> <li>Check 1st trip DTC.</li> </ol>	
<u>Is 1st trip DTC detected?</u>	
YES >> Go to <u>EC-282, "Diagnosis Procedure"</u> . NO >> GO TO 6.	
<b>6.</b> PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)	
Perform component function check. Refer to EC-282, "Component Function Check".	
<b>NOTE:</b> Use the component function check to check the overall function of the FTT sensor circu 1st trip DTC might not be confirmed.	it. During this check, a
Is the inspection result normal?	
YES >> INSPECTION END NO >> Proceed to <u>EC-282, "Diagnosis Procedure"</u> .	
7. PRECONDITIONING	
If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform	m the following proce-
<ul><li>dure before conducting the next test.</li><li>1. Turn ignition switch OFF and wait at least 10 seconds.</li></ul>	
2. Turn ignition switch ON.	
3. Turn ignition switch OFF and wait at least 10 seconds.	
<ul><li>TEST CONDITION:</li><li>Before performing the following procedure, do not add fuel.</li></ul>	
<ul> <li>Before performing the following procedure, do not add idei.</li> <li>Before performing the following procedure, check that fuel level is between 1/4</li> <li>Before performing the following procedure, confirm that battery voltage is 11 V</li> </ul>	
>> GO TO 8.	
8. PERFORM DTC CONFIRMATION PROCEDURE B	
<ol> <li>Start engine and let it idle for 60 minutes.</li> <li>Move the vehicle to a cool place.</li> </ol>	
<ul> <li>NOTE: Cool the vehicle in an environment of ambient air temperature between -10°C (14°)</li> <li>3. Turn ignition switch OFF and soak the vehicle for 12 hours.</li> </ul>	F) and 35°C (95°F).
CAUTION: Never turn ignition switch ON during soaking. NOTE:	
<ul><li>The vehicle must be cooled with the food open.</li><li>4. Start engine and let it idle for 5 minutes or more.</li></ul>	
CAUTION: Nover turn ignition switch OEE during idling	
<ul><li>Never turn ignition switch OFF during idling.</li><li>5. Check 1st trip DTC.</li></ul>	
Is 1st trip DTC detected?	
YES >> Proceed to EC-282. "Diagnosis Procedure".	

NO >> INSPECTION END

# **Component Function Check**

# 1.CHECK FUEL TANK TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-5, "Exploded View".
- 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 $\Omega$ )	
4 and 5	Tomporaturo [°C (°E)]	20 (68)	2.3 - 2.7
4 anu 5	Temperature [°C (°F)]	50 (122)	0.79 - 0.90

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-282, "Diagnosis Procedure".

# 2.check intermittent incident

Check intermittent incident. Refer to GI-44. "Intermittent Incident".

## Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-282, "Diagnosis Procedure".

# Diagnosis Procedure

# **1.**INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-280, "DTC Logic".

Which malfunction is detected?

YES >> GO TO 2.

NO >> GO TO 7.

2.CHECK DTC WITH COMBINATION METER

Refer to MWI-34, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

>> GO TO 3. YES

>> Go to MWI-48, "Component Function Check". NO

3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

Disconnect "fuel level sensor unit and fuel pump (main)" harness connector. 2.

Turn ignition switch ON. 3.

Check the voltage between "fuel level sensor unit and fuel pump (main)" harness connector and ground. 4.

Fuel level sensor unit	Ground	Voltage (V)		
Connector	Connector Terminal		voltage (v)	
B22	4	Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 5.

>> GO TO 4. NO

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 (main)"

# EC-282

#### 2015 370Z

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# P0181 FTT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

#### >> Repair open circuit or short to ground or short to power in harness or connector. 5.check fuel tank temperature sensor ground circuit for open and short А 1. Turn ignition switch OFF. Disconnect combination meter harness connector. 2. EC Check the continuity between "fuel level sensor unit and fuel pump (main)" harness connector and combi-3. nation meter harness connector. Fuel level sensor unit and Combination meter fuel pump (main) Continuity Connector Connector Terminal Terminal D B22 5 M53 24 Existed Also check harness for short to ground and short to power. 4. Is the inspection result normal? E YES >> GO TO 7. NO >> GO TO 6. 6. DETECT MALFUNCTIONING PART F Check the following. Harness connectors M7, B1 • Harness for open or short between "fuel level sensor unit and fuel pump (main)" and "unified meter and combination meter Н >> Repair open circuit or short to ground or short to power in harness or connector. 7.CHECK FUEL TANK TEMPERATURE SENSOR Refer to EC-283, "Component Inspection". Is the inspection result normal? YES >> GO TO 8. NO >> Replace "fuel level sensor unit and fuel pump (main)". 8. CHECK INTERMITTENT INCIDENT Refer to GI-44, "Intermittent Incident". Κ >> INSPECTION END Component Inspection INFOID:000000010839580 1.CHECK FUEL TANK TEMPERATURE SENSOR M 1. Turn ignition switch OFF. Disconnect "fuel level sensor unit and fuel pump (main)" harness connector. 2. Remove fuel level sensor unit and fuel pump (main). Refer to FL-5, "Exploded View". 3. 4. Check resistance between "fuel level sensor unit and fuel pump Ν (main)" terminals by heating with hot water as shown in the figure. Terminals Condition Resistance ( $k\Omega$ ) 20 (68) 2.3 - 2.7 4 and 5 Temperature [°C (°F)] Ρ 50 (122) 0.79 - 0.90 Is the inspection result normal? YES >> INSPECTION END JMBIA0167ZZ NO >> Replace "fuel level sensor unit and fuel pump (main)".

201

10 8 6

2

1.0 0.8

0.4 0.2

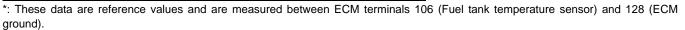
Resistance kΩ

# P0182, P0183 FTT SENSOR

# Description

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases. <**Reference data**>

Fluid temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90



# DTC Logic

INFOID:000000010839582

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## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)
P0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Fuel tank temperature sensor

## DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

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

### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-284, "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-47, "Circuit Inspection".
- Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK DTC WITH COMBINATION METER

# INFOID:000000010839581

Acceptable

0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F)

[VQ37VHR]

INFOID:000000010839583

# P0182, P0183 FTT SENSOR

			PUI	82, 201	83 FTT SENSUR	
< DTC/CIRC		AGNOSIS	>			[VQ37VHR]
Refer to <u>MW</u>	/I-34, "C	ONSULT F	unction (	METER/M	<u>&amp;A)"</u> .	
Is the inspec			2			
	GO TO 3		maaaat	Eurotion (		
-				Function (		
			ERATURI	= SENSOF	R POWER SUPPLY CIRCUIT	
		tch OFF.	or unit on	d fuel pum	p" harness connector.	
3. Turn ign			or unit an		ip namess connector.	
			n "fuel lev	el sensor u	init and fuel pump" harness connector and	ground.
Fuel level sens fuel pu			N / 1/	0.0		
Connector	Terminal	Ground	Voltage	(V)		
B22	4	Ground	Approx	. 5		
Is the inspec	-					
	GO TO :		<u> </u>			
	GO TO 4					
4.DETECT	MALFU	NCTIONIN	IG PART			
Check the fo						<u> </u>
<ul> <li>Harness co</li> </ul>		s M7, B1				
<ul> <li>Harness for</li> </ul>	or open o	or short be	tween EC	M and "fue	el level sensor unit and fuel pump"	
_	•	•		-	short to power in harness or connector.	
<b>5.</b> CHECK F	FUEL TA	NK TEMP	ERATURI	E SENSOF	R GROUND CIRCUIT FOR OPEN AND SH	IORT
1. Turn ign						
				ess connec	ctor. or unit and fuel pump" harness connector a	and combination
		onnector.		6761 361130	of unit and fuel pump mariess connector	
Fuel level ser		Combinat	ion meter		-	
and fuel p	-			Continuity		
Connector	Terminal	Connector	Terminal		-	
B22	5	M53	24	Existed	-	
			•	nd and she	ort to power.	
Is the inspec			2			
	GO TO 7 GO TO (					
6.DETECT		-				
			IG PART			
Check the fo						
<ul> <li>Harness co</li> <li>Harness for</li> </ul>			tween "fue	el level ser	nsor unit and fuel pump" and combination r	neter
>>	Repair o	pen circuit	t, short to	around or	short to power in harness or connector.	
7.снеск ғ	•	•		-	•	
					·	
Refer to EC-				<u>l</u> .		
Is the inspec			<u></u>			
YES >>	GO TO 8	). "fuallassa!		nit on al f	Lourop"	

NO >> Replace "fuel level sensor unit and fuel pump".

 $8. {\sf CHECK} {\sf INTERMITTENT} {\sf INCIDENT}$ 

Refer to GI-44, "Intermittent Incident".

>> INSPECTION END

### Component Inspection

INFOID:000000010839584

# 1.CHECK FUEL TANK TEMPERATURE SENSOR

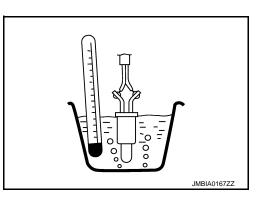
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-5. "Exploded View".
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (k $\Omega$ )	
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
4 anu 5		50 (122)	0.79 - 0.90

Is the inspection result normal?

YES >> INSPECTION END

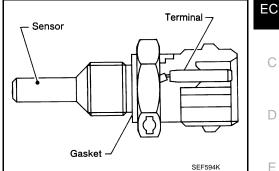
NO >> Replace "fuel level sensor unit and fuel pump".



# P0196 EOT SENSOR

# Description

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



Acceptable

0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F)

20

10 6 4

0.1

-20

Resistance kΩ 2 1.0 0.8 0.4 0.2

#### <Reference data>

Engine oil temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.10 - 2.90
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
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

#### NOTE:

If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198. Refer to EC-291, "DTC Logic".

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DTC No.	Trouble diagnosis (Trouble diagnosis content)			Possible cause	
	EOT SENSOR [Engine oil temperature (EOT) sensor range/performance	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	<ul> <li>Harness or connectors (The EOT sensor circuit is open or shorted)</li> <li>EOT sensor</li> </ul>	
P0196		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.	<ul> <li>Harness or connectors (High or low resistance in the EOT sensor circuit)</li> <li>EOT sensor</li> </ul>	

#### DTC CONFIRMATION PROCEDURE

**1.**INSPECTION START

#### Is it necessary to erase permanent DTC?

YES	>> GO TO 6.
NO	>> GO TO 2.
<b>2.</b> pre	CONDITIONING

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INFOID:000000010839586

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INFOID:000000010839585

# P0196 EOT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

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

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

#### **TESTING CONDITION:**

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

>> GO TO 3.

# **3.**PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and let it idle for 5 minutes and 10 seconds.
- 6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-290, "Diagnosis Procedure".

NO >> GO TO 4.

**4.**PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Select "DATA MONITOR" mode with CONSULT.
- Check that "COOLAN TEMP/S" indicates above 80°C (176°F). If it is above 80°C (176°F), go to the following steps. If it is below 80°C (176°F), warm engine up until "COOLAN TEMP/S" indicates more than 80°C (176°F). Then perform the following steps.
- 3. Turn ignition switch OFF and soak the vehicle in a cool place.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Turn ignition switch ON. **NOTE:**

# Do not turn ignition switch OFF until step 10.

- 7. Select "DATA MONITOR" mode with CONSULT.
- 8. Check the following.

COOLAN TEMP/S	Below 40°C (104°F)
INT/A TEMP SE	Below 40°C (104°F)
Difference between "COOLAN TEMP/S" and "INT/A TEMP SE"	Within 6°C (11°F)

If they are within the specified range, perform the following steps.

If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.

NOTĚ:

• Do not turn ignition switch OFF.

- If it is supposed to need a long period of time, do not deplete the battery.
- 9. Start engine and let it idle for 5 minutes.
- 10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-290, "Diagnosis Procedure".

NO >> GO TO 5.

**5.**PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to <u>EC-289, "Component Function Check"</u>.

#### NOTE:

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

#### Is the inspection result normal?

YES >> INSPECTION END

## **P0196 EOT SENSOR**

< DTC/CIF	RCUIT DIAGNOSIS >	>		[VQ37VHR]	
NO >:	> Proceed to <u>EC-290.</u>	"Diagnos	is Procedure".		
6.PRECC	NDITIONING				А
dure before 1. Turn ig 2. Turn ig 3. Turn ig <b>TEST CON</b> • Before p • Before p	e conducting the next gnition switch OFF and gnition switch ON. gnition switch OFF and NDITION: performing the follow performing the follow	test. d wait at l d wait at l <b>/ing proc</b> <b>/ing proc</b>	east 10 seconds. east 10 seconds. edure, do not add fr edure, check that fu		C
>:	> GO TO 7.				
7.PERFO	RM DTC CONFIRMA		OCEDURE B		Е
2. Move to NOTE Cool the Cool	ne vehicle in an enviro	lace. onment of	ambient air tempera	rure between –10°C (14°F) and 35°C (95°F).	F
CAUT Never NOTE	turn ignition switch	ON durin	ng soaking.		G
4. Start e CAUT		r 5 minute	es or more.		Η
	turn ignition switch 1st trip DTC.	OFF dur	ing idling.		1
<u>Is 1st trip E</u>	DTC detected?				
	Proceed to <u>EC-290.</u> INSPECTION END	"Diagnos	is Procedure".		
-					J
	ent Function Che			INFOID:000000010839587	
1.СНЕСК	ENGINE OIL TEMPE	ERATURE	(EOT) SENSOR		K
<ol> <li>Discor</li> <li>Removing</li> <li>Check</li> </ol>	nition switch OFF. nect EOT sensor har ve EOT sensor. Refer resistance between ot water as shown in t	to <u>EM-83</u> EOT se	, "Exploded View".	eating	L
Terminals	Condition		Resistance (kΩ)		
		20 (68)	2.10 - 2.90		N
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00		IN
In the 1		90 (194)	0.236 - 0.260		_
YES >: NO >:	<u>ection result normal?</u> > GO TO 2. > Proceed to <u>EC-290.</u> ( INTERMITTENT INC	-	is Procedure".	JMBIA0080ZZ	O
Check inte	rmittent incident. Refe	er to <u>GI-44</u>	1, "Intermittent Incide	<u>nt"</u> .	
	ection result normal?				
	> INSPECTION END > Proceed to <u>EC-290,</u>	"Diagnos	is Procedure".		

## P0196 EOT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

### Diagnosis Procedure

## **1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-290, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace engine oil temperature sensor.

## **3.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

## 1.CHECK ENGINE OIL TEMPERATURE SENSOR

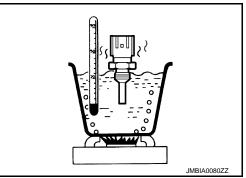
- 1. Turn ignition switch OFF.
- 2. Disconnect engine oil temperature sensor harness connector.
- 3. Remove engine oil temperature sensor. Refer to EM-50, "Exploded View".
- 4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (k $\Omega$ )	
		20 (68)	2.10 - 2.90
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



INFOID:000000010839588

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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.

# Terminal Sensor Gasket SEF594K

#### <Reference data>

Engine oil temperature [°C (°F)]	Voltage* (V)	Resistance (k $\Omega$ )
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.10 - 2.90
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153

\*: These data are reference values and are measured between ECM terminals 78 (Engine oil temperature sensor) and 84 (Sensor ground).

## DTC Logic



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DTC DETECTION LOGIC	

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause	V
P0197	Engine oil temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)	K
P0198	Engine oil temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.		L

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### >> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

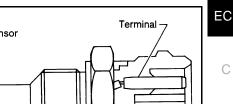
- >> Go to EC-292, "Diagnosis Procedure". YES
- >> INSPECTION END NO

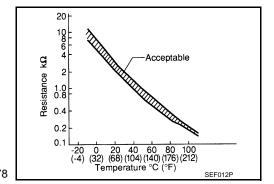
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### < DTC/CIRCUIT DIAGNOSIS >

### Diagnosis Procedure

### **1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2. CHECK EOT SENSOR POWER SUPPLY CIRCUIT

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

EOT	sensor	Ground	Voltage (V)
Connector	Terminal	Glound	voltage (v)
F38	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 3.

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

## $\mathbf{3}$ . Check eot sensor ground circuit for open and short

1. Turn ignition switch OFF.

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

EOT	sensor	EC	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F38	2	F102	84	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-292, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace engine oil temperature sensor.

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### **Component Inspection**

## 1.CHECK ENGINE OIL TEMPERATURE SENSOR

1. Turn ignition switch OFF.

2. Disconnect engine oil temperature sensor harness connector.

3. Remove engine oil temperature sensor. Refer to EM-50, "Exploded View".

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## P0197, P0198 EOT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

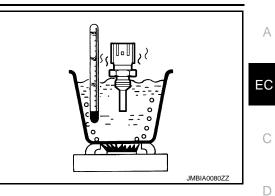
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition		Resistance (k $\Omega$ )
		20 (68)	2.10 - 2.90
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



[VQ37VHR]

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#### < DTC/CIRCUIT DIAGNOSIS >

## P0222, P0223, P2132, P2133 TP SENSOR

### Description

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

the throttle 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.



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### 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-393, "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.	<ul> <li>Harness or connectors (TP sensor 1 circuit is open or shorted.)</li> </ul>
P2132	Throttle position sensor 1 (bank 2) circuit low in- put	An excessively low voltage from the TP sensor 1 is sent to ECM.	<ul> <li>Electric throttle control actuator (TP sensor 1)</li> </ul>
P2133	Throttle position sensor 1 (bank 2) circuit high in- put	An excessively high voltage from the TP sensor 1 is sent to ECM.	

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to EC-295. "Diagnosis Procedure".
- NO >> INSPECTION END

INFOID:000000010839594

Throttle position sensor

Sensor 1

Seńsor 2

45

Throttle valve opening angle (deg) PBIB0145E

6.0

4.0

output voltage

0<sup>⊾</sup>0

## P0222, P0223, P2132, P2133 TP SENSOR

### [V037VHR]

Diagnosis F	Proce	dure						INFOID:000000010839596
.CHECK GF								
. Turn igniti			/195. Refe	r to Ground	l Inspecti	on in GI-47	7, "Circuit Inspe	ection".
s the inspection					-			
	о то 2							
	•	r replace g						
2.CHECK TH	IROTT	LE POSITI	ON SENS	SOR 1 POV	VER SUF	PLY CIRC	CUIT	
2. Turn igniti	on swit	tch ON.		tuator harn			s connector and	d ground.
	Elect	ric throttle cor	ntrol actuato	or				
DTC	Bank	Connector	Termina	Ground	Voltag	e (V)		
P0222, P0223	1	F6	6		_			
P2132, P2133	2	F27	1	Ground	Appro	ox. 5		
s the inspection	on resu	It normal?						
NO >> R	enair o	nen circuit	Short to (	around or s	hort to ho	ower in har	mess or conner	TORS
3.CHECK T⊢ 1. Turn igniti	IROTT on swit	LE POSITI	ON SENS	-			rness or connee R OPEN AND	
<b>3.</b> CHECK TH 1. Turn igniti 2. Disconnec	IROTT on swit ct ECM contir	LE POSITI tch OFF. I harness co nuity betwe	ON SENS	SOR 1 GRC	DUND CII	RCUIT FO	R OPEN AND	
<b>B.</b> CHECK TH 1. Turn igniti 2. Disconnec 3. Check the	IROTT on swit ct ECM contin	LE POSITI tch OFF. I harness c nuity between c throttle contri	ON SENS onnector. en electri	SOR 1 GRC	DUND CII	RCUIT FO	R OPEN AND	SHORT
<ul> <li>CHECK TH</li> <li>Turn igniti</li> <li>Disconned</li> <li>Check the nector.</li> </ul>	IROTT on swit ct ECM contin Electric Bank	LE POSITI tch OFF. I harness c nuity between c throttle contri Connector	ON SENS onnector. en electri rol actuator Terminal	SOR 1 GRC	DUND CII ontrol act	RCUIT FO	R OPEN AND	SHORT
<ul> <li>CHECK TH</li> <li>Turn igniti</li> <li>Disconned</li> <li>Check the nector.</li> </ul>	IROTT on swit ct ECM contin	LE POSITI tch OFF. I harness c nuity between c throttle contri	ON SENS onnector. en electri	SOR 1 GRC	DUND CII	RCUIT FO	R OPEN AND	SHORT
<ul> <li>3.CHECK TH</li> <li>1. Turn igniti</li> <li>2. Disconned</li> <li>3. Check the nector.</li> <li>DTC</li> <li>P0222, P0223</li> <li>P2132, P2133</li> <li>4. Also chections</li> <li>s the inspection</li> <li>YES &gt;&gt; Git</li> <li>NO &gt;&gt; Rest</li> </ul>	IROTT on switt ot ECM c Electric Bank 1 2 k harne on resu o TO 4 epair o	LE POSITI tch OFF. I harness c nuity between c throttle contri Connector F6 F27 ess for shou ult normal? I. pen circuit,	ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g	SOR 1 GRC c throttle co Connector F101 nd and shor ground or s	DUND CII Dontrol act M Terminal 40 48 rt to powe hort to po	RCUIT FO uator harn Continuity Existed er.	R OPEN AND	SHORT and ECM harness con-
<ul> <li>CHECK TH</li> <li>Turn igniti</li> <li>Disconned</li> <li>Check the nector.</li> <li>DTC</li> <li>P0222, P0223</li> <li>P2132, P2133</li> <li>Also check</li> <li>s the inspection</li> <li>YES &gt;&gt; G</li> <li>NO &gt;&gt; Refu</li> <li>CHECK TH</li> </ul>	IROTT on switt ot ECM ct ECM contin Bank 1 2 k harne on resu on resu on TO 4 epair o IROTT	LE POSITI tch OFF. I harness c nuity between c throttle contri Connector F6 F27 ess for shou It normal? I. pen circuit, LE POSITI	ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS	SOR 1 GRC c throttle cc Connector F101 nd and shor ground or s SOR 1 INPL	DUND CII Dontrol act M Terminal 40 48 rt to powe hort to po UT SIGN	RCUIT FO uator harn Continuity Existed er.	R OPEN AND ess connector - - - - - Thess or connector IT FOR OPEN	SHORT and ECM harness con-
<ul> <li>CHECK TH</li> <li>Turn igniti</li> <li>Disconner</li> <li>Check the nector.</li> <li>DTC</li> <li>P0222, P0223</li> <li>P2132, P2133</li> <li>Also chections</li> <li>YES &gt;&gt; G</li> <li>NO &gt;&gt; Ref</li> <li>CHECK TH</li> <li>Check the nector.</li> </ul>	IROTT on switt on switt t ECM contir Electric Bank 1 2 k harne on resu on resu on TO 4 epair o IROTT contir	LE POSITI tch OFF. I harness c nuity between c throttle contri Connector F6 F27 ess for shou It normal? I. pen circuit, LE POSITI	ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric	SOR 1 GRC c throttle cc Connector F101 nd and shor ground or s SOR 1 INPL	DUND CII Dontrol act M Terminal 40 48 rt to powe hort to po UT SIGN, Dontrol act	RCUIT FO uator harn Continuity Existed er. Ower in har AL CIRCU uator harn	R OPEN AND ess connector - - - - IT FOR OPEN ess connector -	SHORT and ECM harness con- ctors. AND SHORT
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<ul> <li>CHECK TH</li> <li>Turn igniti</li> <li>Disconner</li> <li>Check the nector.</li> <li>DTC</li> <li>P0222, P0223</li> <li>P2132, P2133</li> <li>Also chections</li> <li>Sthe inspection</li> <li>YES &gt;&gt; G</li> <li>NO &gt;&gt; Ref</li> <li>CHECK TH</li> <li>Check the nector.</li> </ul>	IROTT on switch ct ECM e contin Electrice Bank 1 2 k harne on resu O TO 4 epair o IROTT e contin	LE POSITI tch OFF. I harness control to throttle control Connector F6 F27 ess for shore alt normal? LE POSITI nuity between throttle control	ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric	SOR 1 GRC SOR 1 GRC Connector F101 And and show Ground or s SOR 1 INPL c throttle co EC Connector	DUND CII ontrol act M Terminal 40 48 rt to powe hort to powe UT SIGN, ontrol act	RCUIT FO uator harn Continuity Existed er. Dwer in har AL CIRCU uator harn Continuity	R OPEN AND ess connector - - - - IT FOR OPEN ess connector -	SHORT and ECM harness con- ctors. AND SHORT
<ul> <li>3.CHECK TH</li> <li>1. Turn igniti</li> <li>2. Disconned</li> <li>3. Check the nector.</li> <li>DTC</li> <li>P0222, P0223</li> <li>P2132, P2133</li> <li>4. Also chections</li> <li>Sthe inspections</li> <li>YES &gt;&gt; G</li> <li>NO &gt;&gt; Ref</li> <li>4. CHECK TH</li> <li>1. Check the nector.</li> </ul>	IROTT on switt ct ECM e contir Electric Bank 1 2 k harne on resu on resu O TO 4 epair o IROTT e contir Electric Bank	LE POSITI tch OFF. I harness c nuity between c throttle contri Connector F6 F27 ess for shou alt normal? I. pen circuit, LE POSITI nuity between c throttle contri Connector	ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric rol actuator Terminal	SOR 1 GRC c throttle co Connector F101 nd and shor ground or s SOR 1 INPL c throttle co EC	DUND CII Dontrol act M Terminal 40 48 rt to powe hort to powe UT SIGN/ Dontrol act M Terminal	RCUIT FO uator harn Continuity Existed er. Ower in har AL CIRCU uator harn	R OPEN AND ess connector - - - - IT FOR OPEN ess connector -	SHORT and ECM harness con- ctors. AND SHORT
<ul> <li>3.CHECK TH</li> <li>1. Turn igniti</li> <li>2. Disconned</li> <li>3. Check the nector.</li> <li>DTC</li> <li>P0222, P0223</li> <li>P2132, P2133</li> <li>4. Also chection</li> <li>YES &gt;&gt; Ginone</li> <li>XES &gt;&gt; Ginone</li> <li>YES &gt;&gt; Ginone</li></ul>	IROTT on switt ct ECM e contir Electric Bank 1 2 k harne on resu on resu on resu on resu on ro 4 epair o IROTT e contir Electric Bank 1 2 contir	LE POSITION toch OFF. I harness consulty between to throttle control F6 F27 ess for shou alt normal? A. pen circuit, LE POSITION to throttle control Connector F6 F27	ON SENS onnector. en electric rol actuator Terminal 3 4 rt to grour short to g ON SENS en electric rol actuator Terminal 4 2	SOR 1 GRC SOR 1 GRC Connector F101 And and show Ground or s SOR 1 INPL c throttle co EC Connector	DUND CII Dontrol act M Terminal 40 48 rt to powe hort to powe hort to powe UT SIGN/ Dontrol act M Terminal 30 31	RCUIT FO uator harn Continuity Existed er. Dwer in har AL CIRCU uator harn Continuity Existed	R OPEN AND ess connector - - - - IT FOR OPEN ess connector -	SHORT and ECM harness con- ctors. AND SHORT

 $5. {\sf CHECK \ THROTTLE \ POSITION \ SENSOR}$ 

Refer to EC-296, "Component Inspection".

## P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.Replace electric throttle control actuator

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

#### >> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

INFOID:000000010839597

## 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 : Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set selector lever to D (A/T) or 1st (M/T) position.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

	ECM				
Connector	+	_	Condition		Voltage (V)
Connector	Terminal				
	30 [TP sensor 1 (bank 1)]	40		Fully released	More than 0.36
		40		Fully depressed	Less than 4.75
	24 (TD concord (here); 2)]	40		Fully released	More than 0.36
<b>E</b> 404	31 [TP sensor 1 (bank 2)]	48	A coole reter nodel	Fully depressed	Less than 4.75
F101	24 (TD concer 2 (here); 4)]	40	Accelerator pedal	Fully released	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40		Fully depressed	More than 0.36
		40	1	Fully released	Less than 4.75
	35 [TP sensor 2 (bank 2)]	48		Fully depressed	More than 0.36

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-34, "Exploded View".

#### >> INSPECTION END

### < DTC/CIRCUIT DIAGNOSIS >

## P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

## **DTC** Logic

INFOID:000000010839598

[VQ37VHR]

#### DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)

On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.

When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.

When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off. If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink. When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain 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.	<ul> <li>Insufficient compression</li> <li>Incorrect fuel pressure</li> </ul>	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.	<ul> <li>Fuel injector</li> <li>Intake air leak</li> </ul>	k
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	The ignition signal circuit is open or short-	
P0305	No. 5 cylinder misfire detected	No. 5 cylinder misfires.	ed • Lack of fuel	
P0306	No. 6 cylinder misfire detected	No. 6 cylinder misfires.	<ul> <li>Signal plate</li> <li>A/F sensor 1</li> <li>Incorrect PCV hose connection</li> </ul>	L

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### >> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart engine and let it idle for about 15 minutes.
- 6. Check 1st trip DTC.

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< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

YES >> Go to EC-298, "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 $\pm$ 400 rpm	
Vehicle speed	Vehicle speed in the freeze frame data $\pm$ 10 km/h (6MPH)	
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-298, "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

#### (B) With CONSULT

1. Start engine.

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### < DTC/CIRCUIT DIAGNOSIS >

- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 4.

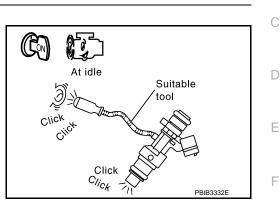
**4.**CHECK FUNCTION OF FUEL INJECTOR-I

- 1. Start engine and let it idle.
- 2. Listen to each fuel injector operation sound.

#### Clicking sound should be heard.

#### Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>EC-508, "Diagnosis Procedure"</u>.



## 5. CHECK FUNCTION OF IGNITION COIL-I

#### **CAUTION:**

#### Perform the following procedure in a place where with no combustible objects and good ventilation.

- 1. Turn ignition switch OFF.
- Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

#### NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

#### Spark should be generated.

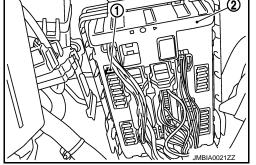
#### CAUTION:

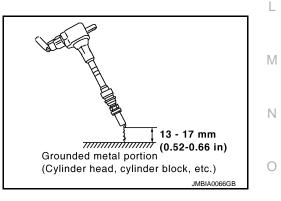
- During the operation, always stay 50 cm (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 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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### < DTC/CIRCUIT DIAGNOSIS >

[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.

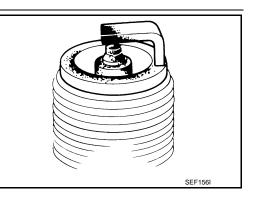
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-514. "Diagnosis Procedure".

7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-22, "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). For spark plug type, refer to <u>EM-21, "Removal</u> <u>and Installation"</u>.

9.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-28, "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-631, "Inspection".
- 3. Install fuel pressure gauge and check fuel pressure. Refer to EC-631, "Inspection".

### At idle: Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 51 psi)

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".

NO >> Repair or replace.

< DTC/CIRCUIT DIAGNOSIS >

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12.CHECK IDLE SPEED AND IGNITION TIMING
For procedure, refer to EC-14, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to EC-634, "Idle Speed" and EC-634, "Ignition Timing".
Is the inspection result normal?
YES >> GO TO 13.
NO >> Follow the EC-14, "BASIC INSPECTION : Special Repair Requirement".
13.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT
1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.

3. Disconnect ECM harness connector.

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

	A/F sensor	1	EC	CM	Continuity
Bank	Connector	Terminal	Connector	Terminal	Continuity
1	F61	1		57	
1	101	2	F102	61	Existed
2	F62	1	FIUZ	65	Existed
2	F02	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	F61	1			
1	101	2	Ground	Not existed	
2	E60	1	Ground		
2	F62	2			

ECM			Ground	Continuity	
Bank	Connector	Terminal	Ciouna	Continuity	
1		57			
I	F102	61	Ground	Not existed	
2	FIUZ	65	Ground		
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-190, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace (malfunctioning) A/F sensor 1.

**15.**CHECK MASS AIR FLOW SENSOR

#### With CONSULT

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT. For specification, refer to EC-634, "Mass Air Flow Sensor".

#### With GST

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to <u>EC-634</u>, "<u>Mass Air Flow Sensor</u>".

Is the measurement value within the specification?

YES >> GO TO 16.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to <u>EC-204, "Diagnosis Procedure"</u>.

16.CHECK SYMPTOM TABLE

Check items on the rough idle symptom in <u>EC-614, "Symptom Table"</u>.

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 <u>EC-155</u>, <u>"CONSULT Func-tion"</u>.

>> GO TO 18.

**18.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "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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[VQ37VHR]

INFOID:000000010839600

### 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.		Е			
P0328	Knock sensor (bank 1) circuit high input	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (The connect or second of the connect of the conne	F			
P0332	Knock sensor (bank 2) circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul><li>(The sensor circuit is open or shorted.)</li><li>Knock sensor</li></ul>				
P0333	Knock sensor (bank 2) circuit high input	An excessively high voltage from the sensor is sent to ECM.		G			
DTC CON	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? YES >> Go to EC-303, "Diagnosis Procedure". M NO >> INSPECTION END Diagnosis Procedure INFOID:0000000010839602 Ν **1.**CHECK GROUND CONNECTION Turn ignition switch OFF. 1 Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2 Is the inspection result normal? >> GO TO 2. YES 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

### < DTC/CIRCUIT DIAGNOSIS >

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	LAISteu

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-304, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning knock sensor.

**1**.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "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:**

Revision: 2014 September

## EC-304

2015 370Z

INFOID:000000010839603

## P0327, P0328, P0332, P0333 KS

#### < DTC/CIRCUIT DIAGNOSIS >

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It is	necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .	A
It is necessary to use an ohmmeter which can measure more than 10 MΩ.       A         Terminals       Resistance (kΩ)         1 and 2       Approx. 532 - 588 [at 20°C (68°F)]         CAUTION:         Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.         Is the inspection result normal?       C         YES       >> INSPECTION END         NO       >> Replace malfunctioning knock sensor.		
1 and	2 Approx. 532 - 588 [at 20°C (68°F)]	FC
Do not u	se any knock sensors that have been dropped or physically damaged. Use only new ones.	C
. = •		0
		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.

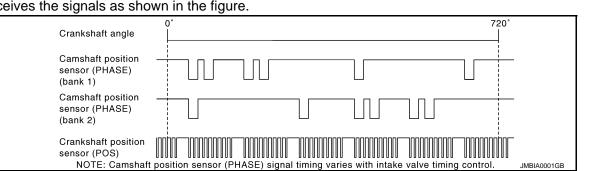
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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:000000010839605

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sen- sor (POS) circuit	<ul> <li>The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.</li> <li>The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.</li> <li>The crankshaft position sensor (POS) signal is not in the normal pattern during engine run- ning.</li> </ul>	<ul> <li>Harness or connectors [CKP sensor (POS) circuit is open or shorted.]</li> <li>(APP sensor 2 circuit is shorted.)</li> <li>(EVAP control system pressure sensor circuit is shorted.)</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>(Brake booster pressure sensor circuit is shorted)</li> <li>(Gear lever position sensor circuit is shorted)</li> <li>Crankshaft position sensor (POS)</li> <li>Accelerator pedal position sensor</li> <li>EVAP control system pressure sensor</li> <li>Refrigerant pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Gear lever position sensor</li> <li>Signal plate</li> </ul>

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

2015 370Z

INFOID:000000010839604

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#### Before performing the following procedure, confirm that battery voltage is more than 10.5 V with igni-А tion switch ON. >> GO TO 2. EC 2. PERFORM DTC CONFIRMATION PROCEDURE 1 Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds. 2. Check 1st trip DTC. Is 1st trip DTC detected? D YES >> Go to EC-307, "Diagnosis Procedure". >> INSPECTION END NO Diagnosis Procedure E INFOID:000000010839606 1.CHECK GROUND CONNECTION 1. Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I Н 1. Disconnect crankshaft position (CKP) sensor (POS) harness connector. Turn ignition switch ON. 2. Check the voltage between CKP sensor (POS) harness connector and ground. 3. CKP sensor (POS) Ground Voltage (V) Connector Terminal F2 1 Ground Approx. 5 Is the inspection result normal? Κ YES >> GO TO 8. NO >> GO TO 3. ${f 3.}$ CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector. 3. M CKP sensor (POS) ECM Continuity Connector Terminal Terminal Connector Ν F2 F101 46 1 Existed Is the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit. **4.**CHECK SENSOR POWER SUPPLY CIRCUIT P Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector Terminal Name		Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
1 101	46	CKP sensor (POS)	F2	1

< DTC/CIRCUIT DIAGNOSIS >

**TESTING CONDITION:** 

### < DTC/CIRCUIT DIAGNOSIS >

EC	CM	Sensor		
Connector	Terminal	Name	Connector	Terminal
F102	74	Gear lever position sensor	F57	3
	103	APP sensor	E112	6
M107	107	EVAP control system pressure sensor	B30	3
	107	Refrigerant pressure sensor	E172	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.

- Brake booster pressure sensor (Refer to EC-386. "Component Inspection".)
- Gear lever position sensor (Refer to EC-399, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-343. "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-527. "Diagnosis Procedure".)
- Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

**6.**CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

**I**.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-4. "Exploded View".

#### >> INSPECTION END

## $\mathbf{8}$ .CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	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.

 ${f 9.}$ CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F2	3	F101	37	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

	P0335 C	KP SENSOR (POS)
< DTC/CIRCUIT I	DIAGNOSIS >	[VQ37VHR]
		or short to power in harness or connectors.
<b>10.</b> CHECK CRA	NKSHAFT POSITION SENS	OR (POS)
Refer to EC-309, "	Component Inspection".	
Is the inspection re	esult normal?	
YES >> GO TO		
NO >> Repla 11.CHECK GEA	ce crankshaft position sensor	(POS).
Visually check for ls the inspection re	chipping signal plate gear too	th.
YES >> GO T		
	ce the signal plate.	
12. CHECK INTE	ERMITTENT INCIDENT	
	termittent Incident".	
	ECTION END	
Component In	spection	INFOID:000000010839607
<b>1.</b> CHECK CRAN	KSHAFT POSITION SENSO	R (POS)-I
1. Turn ignition s		
	ting bolt of the sensor. ankshaft position sensor (PO	S) harness connector.
4. Remove the s	ensor. Refer to <u>EM-118, "Exp</u>	
•	the sensor for chipping.	
Is the inspection re YES >> GO TO		
	ce crankshaft position sensor	(POS).
·	·	
		JMBIA0063ZZ
2.CHECK CRAN	KSHAFT POSITION SENSO	R (POS)-II
Check resistance	between crankshaft position s	ensor (POS) terminals as follows.
		-
Terminals (Polarity)	Resistance (Ω)	-
1 (+) - 2 (-)	Event $0 \text{ or } [at 0500 (7705)]$	
1 (+) - 3 (-) 2 (+) - 3 (-)	Except 0 or ∞ [at 25°C (77°F)]	
	esult normal?	-
Is the inspection re YES >> INSPE	ECTION END	
	a crankshaft position concor	(DOS)

NO >> Replace crankshaft position sensor (POS).

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### < 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.

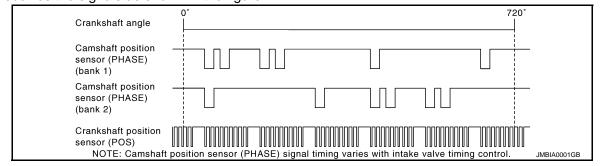
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

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:000000010839609

### 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-393, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sensor (PHASE) (bank 1) circuit	<ul> <li>The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.</li> <li>The cylinder No. signal is not</li> </ul>	<ul> <li>Harness or connectors [CMP sensor (PHASE) (bank 1) circuit is open or shorted.]</li> <li>Camshaft position sensor (PHASE) (bank 1)</li> <li>Camshaft (INT)</li> <li>Starter motor</li> <li>Starting system circuit</li> <li>Dead (Weak) battery</li> </ul>
P0345	Camshaft position sensor (PHASE) (bank 2) circuit	<ul> <li>The cylinder No. signal is not sent to ECM during engine running.</li> <li>The cylinder No. signal is not in the normal pattern during engine running.</li> </ul>	<ul> <li>Harness or connectors [CMP sensor (PHASE) (bank 2) circuit is open or shorted.]</li> <li>Camshaft position sensor (PHASE) (bank 2)</li> <li>Camshaft (INT)</li> <li>Starter motor</li> <li>Starting system circuit</li> <li>Dead (Weak) battery</li> </ul>

### 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:



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## P0340, P0345 CMP SENSOR (PHASE)

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON. А >> GO TO 2. EC 2.PERFORM DTC CONFIRMATION PROCEDURE-I 1. Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds. 2. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-311, "Diagnosis Procedure". D NO >> GO TO 3. 3 .perform dtc confirmation procedure-II 1. Е Maintaining engine speed at more than 800 rpm for at least 5 seconds. Check 1st trip DTC. 2. Is 1st trip DTC detected? YES >> Go to EC-311, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure INFOID:000000010839610 CHECK STARTING SYSTEM Turn ignition switch to START position. Н Does the engine turn over? Does the starter motor operate? YES >> GO TO 2. NO >> Check starting system. (Refer to EC-9, "Work Flow".) 2. CHECK GROUND CONNECTION 1. Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 3. Κ NO >> Repair or replace ground connection.  ${
m 3.}$  CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT 1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector. L 2. Turn ignition switch ON. Check the voltage between CMP sensor (PHASE) harness connector and ground. 3. M CMP sensor (PHASE) DTC Ground Voltage (V) Bank Connector Terminal Ν P0340 1 F5 1 Ground Approx. 5 P0345 2 F18 1 Is the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors.  ${f 4.}$ CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT Ρ 1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

## P0340, P0345 CMP SENSOR (PHASE)

### < DTC/CIRCUIT DIAGNOSIS >

DTC	CMP sensor (PHASE)			ECM		Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0340	1	F5	2	F102	96	Existed
P0345	2	F18	2	1102	92	LAISIEU

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 F107, F106 (bank 2)

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.

### 6.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

DTC	CMP sensor (PHASE)			EC	CM	Continuity
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0340	1	F5	3	F102	59	Existed
P0345	2	F18	3	F IUZ	63	EXISTED

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

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F107, F106 (bank 2)
- 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.

### **8.**CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-313. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace malfunctioning camshaft position sensor (PHASE).

**9.**CHECK CAMSHAFT (INTAKE)

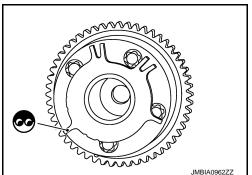
#### Check the following.

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

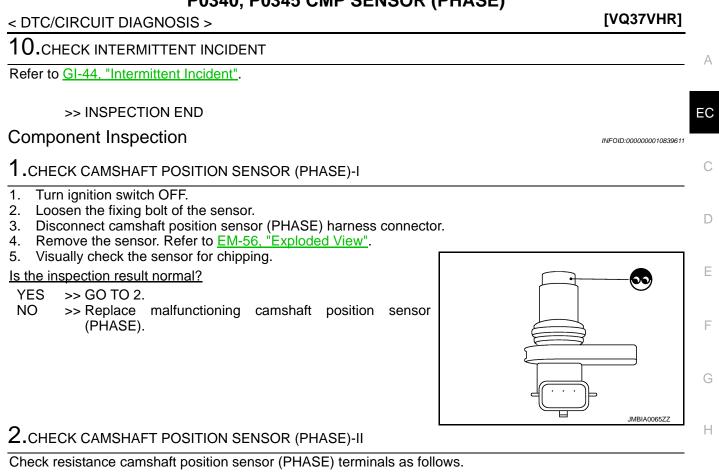
Is the inspection result normal?

YES >> GO TO 10.

NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft.



## P0340, P0345 CMP SENSOR (PHASE)



Terminals (Polarity)	Resistance ( $\Omega$ )
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or $\infty$ [at 25°C (77°F)]
2 (+) - 3 (-)	
Is the inspection res	sult normal?
	CTION END

NO >> Replace malfunctioning camshaft position sensor (PHASE).

Revision: 2014 September

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< DTC/CIRCUIT DIAGNOSIS >

## P0420, P0430 THREE WAY CATALYST FUNCTION

## **DTC Logic**

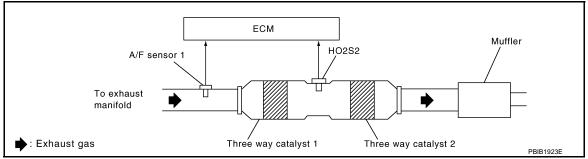
INFOID:000000010839612

[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-	<ul><li>Three way catalyst (manifold)</li><li>Exhaust tube</li></ul>
P0430	Catalyst system efficiency below threshold (bank 2)	<ul><li>erate properly.</li><li>Three way catalyst (manifold) does not have enough oxygen storage capacity.</li></ul>	<ul> <li>Intake air leaks</li> <li>Fuel injector</li> <li>Fuel injector leaks</li> <li>Spark plug</li> <li>Improper ignition timing</li> </ul>

### 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.

P0420, P0430 THREE WAY CATALYST FUNCTION	
	VQ37VHR]
<ol> <li>Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F). If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C</li> <li>Open engine hood.</li> </ol>	<b>С (158°F).</b> А
<ol> <li>Select "DTC &amp; SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT.</li> <li>Rev engine up to about 2,000 rpm and hold it for 3 consecutive minutes then release the pedal completely.</li> </ol>	accelerator
12. Check the indication of "CATALYST".	
Which is displayed on CONSULT screen?	С
CMPLT>> GO TO 6. INCMP >> GO TO 4.	
4.PERFORM DTC CONFIRMATION PROCEDURE-II	D
<ol> <li>Wait 5 seconds at idle.</li> <li>Rev engine up to about 2,000 rpm and maintain it until "INCMP" of "CATALYST" changes to will take approximately 5 minutes).</li> </ol>	"CMPLT" (It ⊟
Does the indication change to "CMPLT"?	
YES >> GO TO 6. NO >> GO TO 5.	F
5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN	
<ol> <li>Stop engine and cool it down to less than 70°C (158°F).</li> <li>Perform DTC CONFIRMATION PROCEDURE again.</li> </ol>	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-316, "Diagnosis Procedure"</u> . NO >> INSPECTION END	
7.PERFORM COMPONENT FUNCTION CHECK	J
Perform component function check. Refer to <u>EC-315, "Component Function Check"</u> . NOTE:	
Use component function check to check the overall function of the three way catalyst (manifold) check, a 1st trip DTC might not be confirmed.	. During this K
Is the inspection result normal?	I
YES >> INSPECTION END NO >> Go to <u>EC-316, "Diagnosis Procedure"</u> .	
Component Function Check	FOID:000000010839613
1.PERFORM COMPONENT FUNCTION CHECK	
Without CONSULT	Ν
<ol> <li>Start engine and warm it up to the normal operating temperature.</li> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> </ol>	
<ol> <li>Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute ur</li> <li>Let engine idle for 1 minute.</li> </ol>	nder no load. $_{\bigcirc}$
<ol> <li>Open engine hood.</li> <li>Check the voltage between ECM harness connector terminals under the following condition.</li> </ol>	Р

### < 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-316, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010839614

### **1.**CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dents.

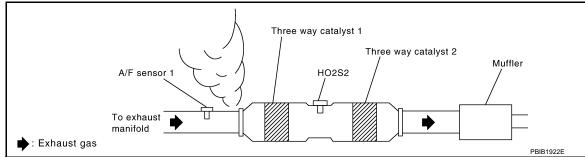
Is the inspection result normal?

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-634, "Idle Speed"</u> and <u>EC-634, "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 >

	E	CM		
	+	-	-	Voltage
Connector	Terminal	Connector	Terminal	
	81			
	82			
F102	85	M107	128	Pottory voltage
F102	86	IVITO7	120	Battery voltage
	89			
	90			

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform <u>EC-508</u>, "Diagnosis Procedure".

**6.**CHECK FUNCTION OF IGNITION COIL-I

### CAUTION:

#### Perform the following procedure in a place where with no combustible objects and good ventilation.

- 1. Turn ignition switch OFF.
- 2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

#### NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

#### Spark should be generated.

#### CAUTION:

 During the operation, always stay 50 cm (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.

• It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

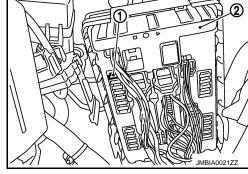
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

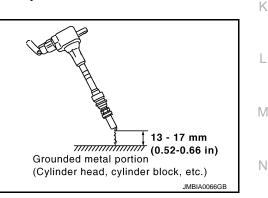
Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.





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### < 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?

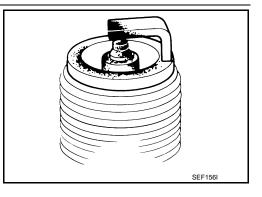
- YES >> GO TO 8.
- NO >> Check ignition coil, power transistor and their circuits. Refer to EC-514, "Diagnosis Procedure".

#### 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-22, "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-21, "Removal</u> and Installation".
- 10. CHECK FUEL INJECTOR
- 1. Turn ignition switch OFF.
- Remove fuel injector assembly. Refer to <u>EM-43, "Removal and Installation"</u>. Keep fuel hose and all fuel injectors connected to fuel
- 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.
- NO >> GO TO 11.

## 11.CHECK INTERMITTENT INCIDENT

#### Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace three way catalyst assembly.
- NO >> Repair or replace harness or connector.

#### < DTC/CIRCUIT DIAGNOSIS >

## P0441 EVAP CONTROL SYSTEM

### **DTC Logic**

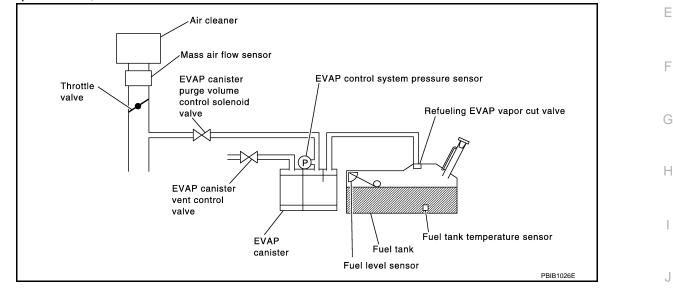
#### DTC DETECTION LOGIC

#### 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.	<ul> <li>EVAP canister purge volume control solenoid valve stuck closed</li> <li>EVAP control system pressure sensor and the circuit</li> <li>Loose, disconnected or improper connection of rubber tube</li> <li>Blocked rubber tube</li> <li>Cracked EVAP canister</li> <li>EVAP canister purge volume control solenoid valve circuit</li> <li>Accelerator pedal position sensor</li> <li>Blocked purge port</li> <li>EVAP canister vent control valve</li> </ul>

### 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.

# [VQ37VHR]

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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 <u>EC-321</u>, "Diagnosis Procedure".

#### **6.**PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-320, "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-321, "Diagnosis Procedure".

Component Function Check

**1.**PERFORM COMPONENT FUNCTION CHECK

#### Without CONSULT

1. Lift up drive wheels.

INFOID:000000010839616

< DTC/CIR		PU441 EVAP ( DSIS >	JUNIKUL SI		7VHR]
<ol> <li>Start e</li> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> </ol>	ngine (VDC sw Inition switch O Inition switch O Inition switch O	itch OFF) and warm it up FF and wait at least 10 se N. FF and wait at least 10 se	econds.	-	A
		at least 70 seconds. to ECM harness connecto	or terminals as pe	er the following.	EC
		ECM			
		+			С
Connector		Terminal	Terminal		
M107	(EVAP control s	102 /stem pressure sensor signal)	112		D
	EVAP control s	system pressure sensor v n the following conditions			Е
Air condition	ner switch	ON		-	_
Headlamp s		ON		_	F
	w defogger switch	ON		_	
Engine spee		Approx. 3,000 rpm	ar D	_	G
	hat EVAP cont	Any position other than P, N rol system pressure sense least 1 second.		V less than the value at idle spee	d (mea- H
YES >>	ection result no > INSPECTION > Go to <u>EC-321</u>				I
Diagnosi	s Procedure	Э		INFOID:000	0000010839617
<b>1.</b> снеск	EVAP CANIST	ER			J
	nition switch O				
	EVAP canister action result no				K
YES-1 >>	> With CONSU	LT: GO TO 2.			
	> Without CON > Replace EVA	SULT: GO TO 3. P canister.			L
2.снеск	PURGE FLOV	V			
With CO 1. Disconvice po	nect vacuum h	ose connected to EVAP	canister purge vo	blume control solenoid valve at EV	M AP ser-
<ol> <li>Start e</li> <li>Select</li> </ol>	ngine and let it "PURG VOL C	ONT/V" in "ACTIVE TES		NSULT. DL C/V" opening and check vacuu	N m exist-
					0
PURG V	OL C/V	Vacuum			
100	)%	Existed			Р
0%	%	Not existed			
-	ection result no	rmal?			
	> GO TO 7. > GO TO 4.				

 $3. {\sf CHECK PURGE FLOW}$ 

## **Without CONSULT**

#### < 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-98</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-98. "System Diagram"</u>.

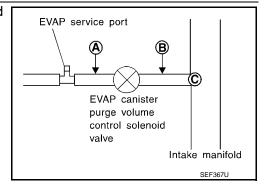
Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair it.

5.CHECK EVAP PURGE HOSE AND PURGE PORT

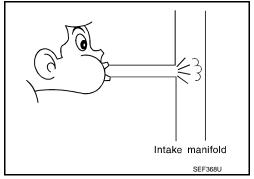
- 1. Disconnect purge hoses connected to EVAP service port **A** and EVAP service purge volume control selencid value **P**
- EVAP canister purge volume control solenoid valve **B**.
- 2. Blow air into each hose and EVAP purge port **C**.



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.

<pre>P0441 EVAP CONTROL SYSTEM &lt; DTC/CIRCUIT DIAGNOSIS &gt;</pre>	[VQ37VHR]
NO >> GO TO 7.	
<b>7.</b> CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to EC-328, "Component Inspection".	
Is the inspection result normal?	ł
YES >> GO TO 8. NO >> Replace EVAP canister purge volume control solenoid valve.	
<b>8.</b> CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR	
<ol> <li>Disconnect EVAP control system pressure sensor harness connector.</li> <li>Check connectors for water.</li> </ol>	
Water should not exist.	
Is the inspection result normal?	
YES >> GO TO 9. NO >> Replace EVAP control system pressure sensor.	
9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION	
Refer to EC-344, "DTC Logic" for DTC P0452, EC-349, "DTC Logic" for DTC P0453.	
Is the inspection result normal?	
YES >> GO TO 10.	
NO >> Replace EVAP control system pressure sensor.	
10.CHECK RUBBER TUBE FOR CLOGGING	
<ol> <li>Disconnect rubber tube connected to EVAP canister vent control valve.</li> <li>Check the rubber tube for clogging.</li> </ol>	
Is the inspection result normal?	
YES >> GO TO 11.	
NO >> Clean the rubber tube using an air blower. 11.CHECK EVAP CANISTER VENT CONTROL VALVE	
Refer to EC-334, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 12.	
NO >> Replace EVAP canister vent control valve.	
12.CHECK EVAP PURGE LINE	
Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to <u>EC-98, "System Diagram"</u> .	
Is the inspection result normal?	
YES >> GO TO 13.	
NO >> Replace it. 13.CLEAN EVAP PURGE LINE	
Clean EVAP purge line (pipe and rubber tube) using air blower.	
>> GO TO 14.	
14.CHECK INTERMITTENT INCIDENT	
Refer to <u>GI-44, "Intermittent Incident"</u> .	

>> INSPECTION END

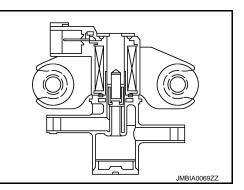
## P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

## 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.

#### INFOID:000000010839618



## DTC Logic

### DTC DETECTION LOGIC

DTC No. Possible cause Trouble diagnosis name DTC detecting condition The canister purge flow is detected during the vehicle is stopped while the engine is running, EVAP control system pressure sensor А even when EVAP canister purge volume control EVAP canister purge volume control solenoid valve is completely closed. solenoid valve EVAP canister purge (The valve is stuck open.) P0443 volume control solenoid EVAP canister vent control valve The canister purge flow is detected during the valve • EVAP canister specified driving conditions, even when EVAP В Hoses canister purge volume control solenoid valve is (Hoses are connected incorrectly or completely closed. 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:**

- Perform "DTC CONFIRMATION PROCEDURE" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 60°C (41 to 140°F).
- Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.

Do you have CONSULT

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

2.PERFORM DTC CONFIRMATION PROCEDURE A

#### (B) With CONSULT

- 1. Turn ignition switch ON.
- Check that the following condition are met. FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
- 3. Start engine and wait at least 60 seconds.
- 4. Check 1st trip DTC.

#### IS 1st trip DTC detected?

- OK >> Go to <u>EC-325. "Diagnosis Procedure"</u>.
- NG >> GO TO 3.

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### P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

3.PERFO	RM DTC CONFIRMATION PROC	EDURE B			А
<ol> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Select</li> <li>CONS</li> <li>Start e mately</li> <li>If "TE</li> </ol>	ngine and warm it up to normal op gnition switch OFF and wait at leas gnition switch ON. gnition switch OFF and wait at leas gnition switch ON. "PURG VOL CN/V P1444" of "EV ULT. "START".	st 10 seconds. st 10 seconds. VAPORATIVE G" on CONSUL	SYSTEM" in "E T changes to "(	TC WORK SUPPORT" mode with	EC C D
<u>Which is d</u>	isplayed on CONSULT screen?				Ε
NG >	Rol ECTION END Solution Contraction Processing RM DTC CONFIRMATION PROCESING RM DTC CONFIRMATION PROCESSING RM DTC CONFIRMATION PROCESSINT PROFESSION PR				F
With GS 1. Turn ig			als.		G
	ECM				Н
Connector	+	_	Voltage (V)		
	Terminal	Terminal			1
M107	106 (Fuel tank temperature sensor signal)	128 (Sensor ground)	3.1 - 4.0		
4. Check <u>Is 1st trip I</u> YES >: NO >:	ngine and wait at least 60 second 1st trip DTC. <u>DTC detected?</u> > Go to <u>EC-325. "Diagnosis Proce</u> > GO TO 5. RM DTC CONFIRMATION PROC	dure".			J K
<ol> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Turn ig</li> <li>Start e</li> <li>Check</li> <li>Is 1st trip I</li> <li>YES &gt;</li> </ol>	<b>ST</b> Ingine and warm it up to normal op gnition switch OFF and wait at leas gnition switch OFF and wait at leas ingine and let it idle for at least 20 1st trip DTC. <u>DTC displayed?</u> > Go to <u>EC-325. "Diagnosis Proce</u> > INSPECTION END	st 10 seconds. st 10 seconds. seconds.	rature.		M
-	is Procedure			INFOID:000000010839620	0
1.снеск	EVAP CANISTER PURGE VOLU	IME CONTRO	L SOLENOID V	ALVE POWER SUPPLY CIRCUIT	Ρ

2. Disconnect EVAP canister purge volume control solenoid valve harness connector.

3. Turn ignition switch ON.

 Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

### P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

### < DTC/CIRCUIT DIAGNOSIS >

EVAP canister purge volume control solenoid valve		Ground	Voltage
Connector	Terminal		
F7	1	Ground	Battery voltage

Is the inspection result normal?

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

 $\sim 3000$  > 0002.

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 volume control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	F101	21	Existed

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

Is the inspection result normal?

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

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F104, F105

Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

### **5.**CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check connectors for water.

### Water should not exist.

Is the inspection result normal?

NO >> Replace EVAP control system pressure sensor.

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-343. "Component Inspection".

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 7.

YES-2 >> Without CONSULT: GO TO 8.

P0443 EVAP CANISTER	PURGE VOLUME C	ONTROL SOLENOID	VALVE

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]	
NO >> Replace EVAP control system pressure sensor.	
<b>7.</b> CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	А
<ul> <li>With CONSULT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Reconnect harness connectors disconnected.</li> <li>3. Start engine.</li> <li>4. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.</li> </ul>	EC C
Does engine speed vary according to the valve opening? YES >> GO TO 9. NO >> GO TO 8.	D
8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to EC-328, "Component Inspection".	Е
Is the inspection result normal? YES >> GO TO 9. NO >> Replace EVAP canister purge volume control solenoid valve.	F
9.CHECK RUBBER TUBE FOR CLOGGING	
<ol> <li>Disconnect rubber tube connected to EVAP canister vent control valve.</li> <li>Check the rubber tube for clogging.</li> </ol>	G
Is the inspection result normal? YES >> GO TO 10. NO >> Clean the rubber tube using an air blower. <b>10.</b> CHECK EVAP CANISTER VENT CONTROL VALVE	Η
Refer to EC-334, "Component Inspection".	
Is the inspection result normal? YES >> GO TO 11.	
NO >> Replace EVAP canister vent control valve. 11.CHECK IF EVAP CANISTER IS SATURATED WITH WATER	J
1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.	K
<ul> <li>2. Check if water will drain from EVAP canister (1).</li> <li>2 : EVAP canister vent control valve</li> </ul>	L
Does water drain from the EVAP canister?         YES       >> GO TO 12.         NO       >> GO TO 14.         2	M
→ PBIB2731E	Ν

# 12.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

### The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following. • EVAP canister for damage Ο

Ρ

### P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

### < DTC/CIRCUIT DIAGNOSIS >

• EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

14. CHECK INTERMITTENT INCIDENT

### Refer to GI-44, "Intermittent Incident".

>> INSPECTION END

### Component Inspection

INFOID:000000010839621

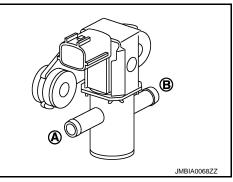
[VQ37VHR]

### 1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### With CONSULT

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Start engine.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
- Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



### **Without CONSULT**

- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

MBIA0082Z

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve.

### P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

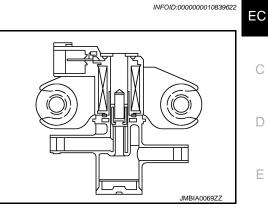
### [VQ37VHR]

А

# 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:000000010839623

### DTC Logic

### DTC DETECTION LOGIC

	Ι		
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	<ul> <li>Harness or connectors (The solenoid valve circuit is open or shorted.)</li> <li>EVAP canister purge volume control solenoid valve</li> </ul>
P0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	<ul> <li>Harness or connectors (The solenoid valve circuit is shorted.)</li> <li>EVAP canister purge volume control solenoid valve</li> </ul>
DTC CC	<b>NFIRMATION PROCEI</b>	DURE	
1.CONE	DITIONING		
If DTC C	Confirmation Procedure h	has been previously conducte	d, always perform the following procedure
before co 1. Turn 2. Turn	onducting the next test. i ignition switch OFF and v i ignition switch ON.	vait at least 10 seconds.	
	ignition switch OFF and v G CONDITION:	valt at least 10 seconds.	
Before p	performing the following	procedure, confirm battery v	oltage is more than 11 V at idle.
	>> GO TO 2.		
•	ORM DTC CONFIRMATION		
	t engine and let it idle for a ck 1st trip DTC.	it least 13 seconds.	
	DTC detected?		
	>> Go to EC-329, "Diagnotes of the second	osis Procedure".	
Diagno	sis Procedure		INFOID:000000010839624
1			ENOID VALVE POWER SUPPLY CIRCUIT

### I.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

### EC-329

### P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

### < DTC/CIRCUIT DIAGNOSIS >

EVAP canister purge volume<br/>control solenoid valveGroundVoltageConnectorTerminalGroundBattery voltageF71GroundBattery voltage

Is the inspection result normal?

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

 $\sim 30002$ .

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 volume control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	F101	21	Existed

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

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 5. YES-2 >> Without CONSULT: GO TO 6. NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F104, F105

• Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

### With CONSULT

- 1. Reconnect all harness connectors disconnected.
- 2. Start engine.
- 3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 7.

NO >> GO TO 6.

**6.**CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-331, "Component Inspection".

Is the inspection result normal?

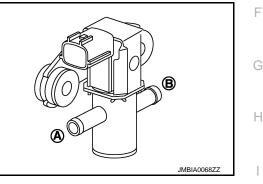
[VQ37VHR]

### P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > YES >> GO TO 7. NO >> Replace EVAP canister purge volume control solenoid valve. А 7. CHECK INTERMITTENT INCIDENT Refer to GI-44, "Intermittent Incident". EC >> INSPECTION END Component Inspection INFOID:000000010839625 1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE D With CONSULT 1. Turn ignition switch OFF. 2. Reconnect all harness connectors disconnected. Е 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve. 4. Start engine. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. 5. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG 6.

 Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



### Without CONSULT

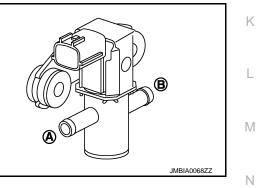
- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve.



#### < DTC/CIRCUIT DIAGNOSIS >

### P0447 EVAP CANISTER VENT CONTROL VALVE

### Description

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

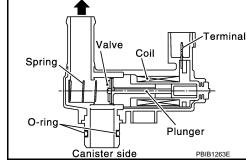
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.

### DTC Logic

### DTC DETECTION LOGIC



To atmosphere

INFOID:000000010839627

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.	<ul> <li>Harness or connectors (The valve circuit is open or shorted.)</li> <li>EVAP canister vent control valve</li> </ul>

### 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-332, "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.

NO >> GO 10 3.

**2.**CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

#### With CONSULT

1. Turn ignition switch OFF and then ON.

2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

### EC-332

#### 2015 370Z

[VQ37VHR]

INFOID:000000010839626

INFOID:000000010839628

	-	-	ANISTE	ER VENT CONTROL VALVE [VQ37VHR]	
<ol> <li>Touch "ON/OF</li> <li>Check for ope</li> </ol>					А
Clicking se	ound shoul	d be hear	d.		
Is the inspection re	sult normal	<u>?</u>			EC
YES >> GO TO NO >> GO TO				I I I I I I I I I I I I I I I I I I I	
-	-	VENT CO		ALVE POWER SUPPLY CIRCUIT	С
1. Turn ignition s					
<ol> <li>Disconnect E\</li> <li>Turn ignition s</li> </ol>		vent cont	rol valve h	arness connector.	D
5		n EVAP ca	anister ven	t control valve harness connector and ground.	
	-				Е
EVAP canister vent o trol valve					
Connector Termin	Ground	Voltag	je		
B31 1	Ground	Battery vo	oltage		F
Is the inspection re			<u> </u>		
YES >> GO TO	) 5.	-			G
NO >> GO TO					
4.DETECT MALF	UNCTIONIN	IG PART			
Check the followin					Н
<ul> <li>Harness connect</li> <li>Harness connect</li> </ul>		116			
<ul> <li>Harness connect</li> </ul>	ors M7, B1				
<ul> <li>Harness for oper</li> </ul>	or short be	tween EV	AP caniste	er vent control valve and IPDM E/R	
>> Renai	open circui	t short to	around or	short to power in harness or connectors.	J
	•		-	LVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	-
1. Turn ignition s					IZ.
2. Disconnect EC	M harness				K
<ol><li>Check the con nector.</li></ol>	tinuity betwe	en EVAP	canister v	ent control valve harness connector and ECM harness con-	
					L
EVAP canister vent	E	СМ		-	
control valve			Continuity		М
Connector Termina B31 2	M107	Terminal 121	Existed	-	
4. Also check ha				-	
Is the inspection re		-	nu anu sh		Ν
YES >> GO TO		-			
NO >> GO TO					0
6.DETECT MALF	UNCTIONIN	IG PART			
Check the followin					Р
<ul> <li>Harness connect</li> <li>Harness for oper</li> </ul>		tween FV/	AP caniste	r vent control valve and ECM	Г
			. sundu		
>> Repair	open circui	t, short to	ground or	short to power in harness or connectors.	
7.CHECK RUBBE	ER TUBE FO		GING		
1. Disconnect rul	ber tube co	nnected to	EVAP ca	nister vent control valve.	

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

< 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-334. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP canister vent control valve.

**9.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

### >> INSPECTION END

### Component Inspection

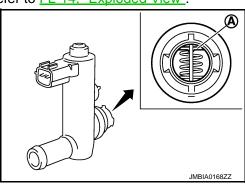
INFOID:000000010839629

### 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-14, "Exploded View".
- 3. Check portion (A) of EVAP canister vent control valve for rust.

#### Is it rusted?

- YES >> Replace EVAP canister vent control valve
- NO >> GO TO 2.



### 2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

### With CONSULT

- 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

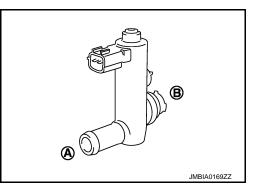
- T. Disconnect EVAP canister vent control valve harness connector.
- 2. Check air passage continuity and operation delay time under the following conditions.

#### 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 loss than 1 see	and



Is the inspection result normal?



< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve.



EC

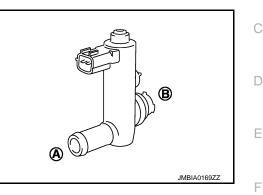
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#### < DTC/CIRCUIT DIAGNOSIS >

### 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.

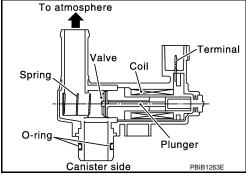
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

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:000000010839631

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.	<ul> <li>EVAP canister vent control valve</li> <li>EVAP control system pressure sensor and the circuit</li> <li>Blocked rubber tube to EVAP canister vent control valve</li> <li>EVAP canister is saturated with water</li> </ul>

### DTC CONFIRMATION PROCEDURE

### 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.

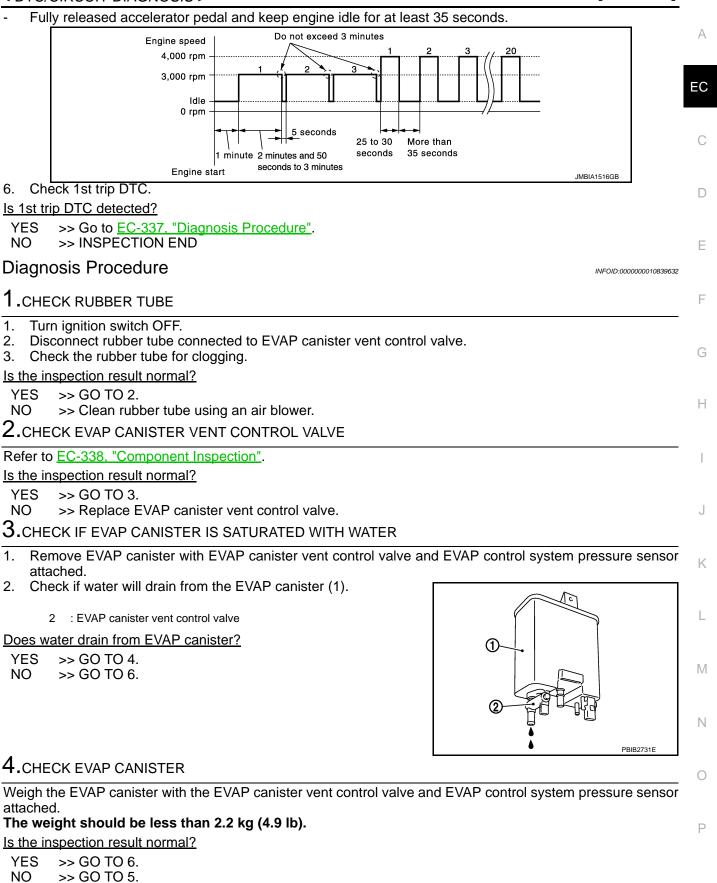
### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 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:000000010839630

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]



**5.**DETECT MALFUNCTIONING PART

Check the following.EVAP canister for damage

### < DTC/CIRCUIT DIAGNOSIS >

• EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

### 6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check connectors for water.

#### Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace EVAP control system pressure sensor.

**1.**CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-343, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP control system pressure sensor.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

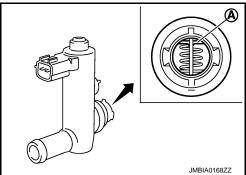
### Component Inspection

### 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-14, "Exploded View".
- 3. Check portion (A) of EVAP canister vent control valve for being rusted.

#### Is it rusted?

- YES >> Replace EVAP canister vent control valve.
- NO >> GO TO 2.



### **2.**CHECK EVAP CANISTER VENT CONTROL VALVE-II

### With CONSULT

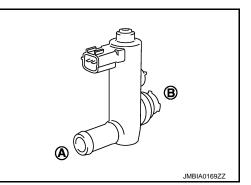
- 1. Reconnect harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- 4. Check air passage continuity and operation delay time. Make sure that new O-ring is installed properly.

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.



INFOID:000000010839633

### < DTC/CIRCUIT DIAGNOSIS >

2. Check air passage continuity and operation delay time under the following conditions. **Make sure that new O-ring is installed properly.** 

wake sure that new t	o-ring is installed property.	
Condition	Air passage continuity between (A) and (B)	
12 V direct current supply betw terminals 1 and 2	een Not existed	-
OFF	Existed	_
Operation takes less than	1 second.	-
Is the inspection result nor	mal?	
YES >> INSPECTION NO >> GO TO 3.		
<b>3.</b> CHECK EVAP CANIST	ER VENT CONTROL VALVE-III	
<ol> <li>Perform "VENT CONT</li> <li>Check air passage cor</li> </ol>	[portion (A) to (B)] of EVAP canister vent ROL/V" in "ACTIVE TEST" mode. ntinuity and operation delay time. <b>D-ring is installed properly.</b>	control valve using an air blower.
Condition VENT CONT/V	Air passage continuity between (A) and (B)	
ON	Not existed	K B
OFF	Existed	
following conditions.	ntinuity and operation delay time under th D-ring is installed properly.	JMBIA0169ZZ
Condition	Air passage continuity between (A) and (B)	<del>,</del>
12 V direct current supply betweet terminals 1 and 2	een Not existed	-
OFF	Existed	
Operation takes less than	1 second.	-
Is the inspection result nor YES >> INSPECTION NO >> Replace EVAF		

[VQ37VHR]

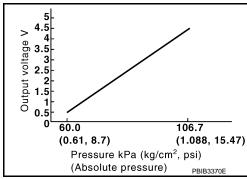
А

### < 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

INFOID:000000010839635

[VQ37VHR]

INFOID:000000010839634

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	<ul> <li>Harness or connectors (EVAP control system pressure sensor circuit is shorted.)</li> <li>[CKP sensor (POS) circuit is shorted.]</li> <li>(APP sensor 2 circuit is shorted.)</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>(Brake booster pressure sensor circuit is shorted)</li> <li>(Gear lever position sensor circuit is shorted)</li> <li>EVAP control system pressure sensor</li> <li>Crankshaft position sensor (POS)</li> <li>Accelerator pedal position sensor</li> <li>Refrigerant pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Gear lever position sensor</li> </ul>

# DTC CONFIRMATION PROCEDURE **NOTE**:

Never remove fuel filler cap during DTC confirmation procedure.

### 1.PRECONDITIONING

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

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

With CONSULT>>GO TO 2. Without CONSULT>>GO TO 5.

### 2. PERFORM DTC CONFIRMATION PROCEDURE-1

#### ()With CONSULT

1. Start engine and let it idle for least 40 seconds. NOTE:

### Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR		
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]	
YES >> Proceed to EC-341, "Diagnosis Procedure".		
NO >> GO TO 3.		А
<b>3.</b> PERFORM DTC CONFIRMATION PROCEDURE-2		
(P)With CONSULT		
1. Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE".		EC
<ol><li>Let it idle until "OFF" of "EVAP DIAG READY" changes to "ON".</li></ol>		
NOTE: It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".		С
3. Turn ignition switch OFF and wait at least 90 minutes.		0
NOTE:		
Never turn ignition switch ON during 90 minutes.		D
<ol> <li>Turn ignition switch ON.</li> <li>Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ENGINE".</li> </ol>		
6. Check that "EVAP LEAK DIAG" indication.		
Which is displayed on CONSULT?		Е
CMPLT>> GO TO 4.		
YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.		
2. GO TO 1.		F
4.PERFORM DTC CONFIRMATION PROCEDURE-3		
(P)With CONSULT		G
Check 1st trip DTC.		0
Is 1st trip DTC detected?		
YES >> Proceed to EC-341, "Diagnosis Procedure".		Н
NO >> INSPECTION END		
5. PERFORM DTC CONFIRMATION PROCEDURE-4		
With GST		
1. Start engine and let it idle for least 40 seconds.		
NOTE:		J
Do not depress accelerator pedal even slightly.		J
2. Check 1st trip DTC. Is 1st trip DTC detected?		
		Κ
YES >> Proceed to <u>EC-341, "Diagnosis Procedure"</u> . NO >> GO TO 6.		
6. PERFORM DTC CONFIRMATION PROCEDURE-5		
		L
With GST		
<ol> <li>Let it idle for at least 2 hours.</li> <li>Turn ignition switch OFF and wait at least 90 minutes.</li> </ol>		
NOTE:		M
Never turn ignition switch ON during 90 minutes.		
3. Turn ignition switch ON.		NI
4. Check 1st trip DTC.		Ν
Is 1st trip DTC detected?		
YES >> Proceed to <u>EC-341. "Diagnosis Procedure"</u> . NO >> INSPECTION END		0
Diagnosis Procedure	INFOID:000000010839636	
		Р
1.CHECK GROUND CONNECTION		
1. Turn ignition switch OFF.		
2. Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u> .		
Is the inspection result normal?		

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

### < DTC/CIRCUIT DIAGNOSIS >

## 2. Check evap control system pressure sensor connector for water

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check sensor harness connector for water.

#### Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

	trol system e sensor	Ground	Voltage (V)	
Connector	Terminal			
B30 3		Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 4.

#### **4.**CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor			
Connector	Terminal	Name	Connector	Terminal	
F101	45	Brake booster pressure sensor	E48	1	
46	CKP sensor (POS)	F2	1		
F102	74	Gear lever position sensor	57	3	
	103	APP sensor	E112	6	
M107	107	EVAP control system pressure sensor	B30	3	
		Refrigerant pressure sensor	E172	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-309. "Component Inspection".)

- Gear lever position sensor (Refer to EC-399, "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-386, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-527, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

\_NO >> GO TO 7.

**7.**REPLACE ACCELERATOR PEDAL ASSEMBLY

# < DTC/CIRCUIT DIAGNOSIS >

Defe n la da d \/i . . ....

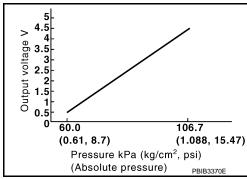
	ccelerator p	edal asse	mbly. Refer to <u>ACC-4, "Explode</u>	<u>d View"</u> .		٨
	> INSPECT					А
•		-	STEM PRESSURE SENSOR			
Refer to E						EC
Is the inspe					_	
	> GO TO 9.					С
NO >= 9.CHECK	•		rol system pressure sensor.			
Refer to GI						D
	<u>-44, inten</u>		<u>uent</u> .			
>:	> INSPECT	ION END				Е
Compon	ent Inspe	ection			INFOID:000000010839637	
			STEM PRESSURE SENSOR			F
	nition swite		ISTEM FRESSURE SENSOR			Г
2. Remov	ve EVAP co	ontrol syste	em pressure sensor with its har	ness connector.		
			<b>h a new one.</b> VAP control system pressure se	nsor		G
4. Turn ig	nition swite	ch ÓN and		ECM harness connector term	inals under the	
followi	ng conditio	ns.				Н
	ECM					
Connector	+	_	Condition [Applied vacuum kPa (kg/cm <sup>2</sup> , psi)]	Voltage (V)		
Connector	Terminal	Terminal	- [Applied vacuum kr a (kg/cm , psi)]			
			Not applied			
M107	102	112		1.8 - 4.8		J
	_	112	-26.7 (-0.272, -3.87)	1.8 - 4.8       2.1 to 2.5 lower than above value		J
CAUT	ION:		-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value		J
CAUT • Alwa • Neve	ION: ays calibra er apply be	te the vac	-26.7 (-0.272, -3.87) cuum pump gauge when usin	2.1 to 2.5 lower than above value	(1.033 kg/cm <sup>2</sup> ,	J K
CAUT • Alwa • Neve 14.69	ION: ays calibra er apply be 9 psi).	te the vac low -93.3	-26.7 (-0.272, -3.87) cuum pump gauge when usin	2.1 to 2.5 lower than above value g it.	(1.033 kg/cm <sup>2</sup> ,	J
CAUT • Alwa • Neve 14.69	ION: ays calibra er apply be 9 psi). ection resul	te the vac low -93.3 It normal?	-26.7 (-0.272, -3.87) cuum pump gauge when usin	2.1 to 2.5 lower than above value g it.	(1.033 kg/cm <sup>2</sup> ,	J K L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin	2.1 to 2.5 lower than above value g it.	(1.033 kg/cm <sup>2</sup> ,	J K L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	J K L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L M N
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L M N
CAUT • Alwa • Neve 14.69 Is the inspective YES >>	ION: ays calibra er apply be 9 psi). ection resul > INSPECT	te the vac slow -93.3 t <u>normal?</u> TON END	-26.7 (-0.272, -3.87) cuum pump gauge when usin kPa (-0.952 kg/cm <sup>2</sup> , -13.53 ps	2.1 to 2.5 lower than above value g it.	-	L M N

#### < DTC/CIRCUIT DIAGNOSIS >

### P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

### Description

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



### DTC Logic

### DTC DETECTION LOGIC

INFOID:000000010839639

[VQ37VHR]

INFOID:000000010839638

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.	<ul> <li>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) (Gear lever position sensor)</li> <li>EVAP control system pressure sensor</li> <li>Crankshaft position sensor (POS)</li> <li>Accelerator pedal position sensor</li> <li>Refrigerant pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Gear lever position sensor</li> <li>Gear lever position sensor</li> </ul>

### 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).

< DTC/CIF	P0452 EV RCUIT DIAGNOSI		OL SYSTEM PRESSURE SENSOR	[VQ37VHR]	
8. Start e 9. Check	ngine and wait at le 1st trip DTC. ST	east 20 seconds			A
			erating temperature. nnector terminals as per the following.	E	EC
		ECM			
Connector	+		_		С
Connector	Termir	al	Terminal		
M107	106 (Fuel tank temperatu	re sensor signal)	128		D
4. Turn ig 5. Turn ig 6. Turn ig 7. Start e	sure that the voltag gnition switch OFF gnition switch ON. gnition switch OFF ngine and wait at le	and wait at least and wait at least	t 10 seconds. t 10 seconds.		E
	1st trip DTC.				F
YES >: NO >:	<u>DTC detected?</u> > Go to <u>EC-345, "D</u> > INSPECTION EN		<u>lure"</u> .		G
Diagnosi	is Procedure			INFOID:000000010839640	
	GROUND CONNE	ECTION			Н
2. Check Is the inspe	<pre>gnition switch OFF. ground connectior action result norma &gt; GO TO 2.</pre>		Ground Inspection in <u>GI-47, "Circuit Inspection"</u> .		I
NO >:	<ul> <li>Repair or replace</li> <li>CONNECTOR</li> </ul>	ground connect	tion.		J
1. Discor			e sensor harness connector.		IZ.
2. 011001					K
	ter should not exi				I
•	> GO TO 3.	<u></u>			
-	> Repair or replace				
3.CHECK	EVAP CONTROL	SYSTEM PRES	SURE SENSOR POWER SUPPLY CIRCUIT-I		Μ
	gnition switch ON. the voltage betwee	en EVAP control	system pressure sensor harness connector and g	ground.	Ν
	ntrol system re sensor Ground	Voltage (V)	_		0
Connector	Terminal		_		<u> </u>
B30	3 Ground		_		
•	ection result norma	<u>l?</u>			Ρ
NO >:	> GO TO 10. > GO TO 4.				
4.CHECK	EVAP CONTROL	SYSTEM PRES	SURE SENSOR POWER SUPPLY CIRCUIT-II		

Turn ignition switch OFF.
 Disconnect ECM harness connector.

#### < DTC/CIRCUIT DIAGNOSIS >

 Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		EC	Continuity	
Connector	Terminal	Connector	Terminal	
B30	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 M7, B1

Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

### **6.**CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor				
Connector	Terminal	Name	Connector	Terminal		
F101	45	Brake booster pressure sensor	E48	1		
46		CKP sensor (POS)	F2	1		
F102	74	Gear lever position sensor	F57	3		
	103	APP sensor	E112	6		
M107	107	EVAP control system pressure sensor	B30	3		
	111	Refrigerant pressure sensor	E77	3		

Is the inspection result normal?

YES >> GO TO 7.

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

**7.**CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-309. "Component Inspection".)
- Gear lever position sensor (Refer to EC-399, "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-386, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-527, "Diagnosis Procedure")

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 9.

9.replace accelerator pedal assembly

Replace accelerator pedal assembly. Refer to ACC-4, "Exploded View".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

	CK EVAP	CONTRO	)L SYSTE	EM PRES	SURE SENSOR GROUND CIRCUIT FOR OPEN AND	А
<ol> <li>Discor</li> <li>Check</li> </ol>		I harness of			ystem pressure sensor harness connector and ECM har-	EC
EVAP cont	•	EC	CM			С
Connector	Terminal	Connector	Terminal	Continuity		
B30	1	M107	112	Existed		D
4. Also cl	neck harn	ess for sho	ort to grou	nd and sho	ort to power.	
Is the inspe YES >> NO >>	ection res GO TO GO TO	<u>ult normal?</u> 12. 11.	2			E
<b>11.</b> DETE	CT MALF	UNCTION	ING PAR	Γ		F
Check the • Harness • Harness	connecto		tween EV/	AP control	system pressure sensor and ECM	G
	•	•		0	short to power in harness or connectors. IRE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND	Η
1. Check		nuity betw	een EVAF	control s	ystem pressure sensor harness connector and ECM har-	
ness c	onnector.					
EVAP cont pressure		EC	M	Continuity		J
Connector	Terminal	Connector	Terminal			
B30	2	M107	102	Existed		Κ
				nd and sho	ort to power.	
Is the inspective YES >>	oction res		-			L
	• GO TO					
13.dete		UNCTION	IING PAR	т		M
Check the • Harness	following. connecto	rs B1, M7			system pressure sensor and ECM	N
	-					
	•	•		-	short to power in harness or connectors. RE SENSOR	0
Refer to E	<u>C-348,</u> "C	omponent	Inspectior	<u>)"</u> .		
Is the inspe				_		Р
	GO TO					1
·	-	EVAP cor	-	-	e sensor.	
15.CHEC				I		
Refer to G	-44. "Inte	imment ind	Jident".			

>> INSPECTION END

### < DTC/CIRCUIT DIAGNOSIS >

### Component Inspection

[VQ37VHR]

INFOID:000000010839641

### 1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Remove EVAP control system pressure sensor with its harness connector.
- Always replace O-ring with a new one.
- 3. Install a vacuum pump to EVAP control system pressure sensor.
- 4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

	ECM					
Connector	+	_	Condition [Applied vacuum kPa (kg/cm <sup>2</sup> , psi)]	Voltage (V)		
	Terminal	Terminal				
M107	102	112	Not applied	1.8 - 4.8		
101107	M107 102	102	112	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/cm<sup>2</sup>, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm<sup>2</sup>, 14.69 psi).

Is the inspection result normal?

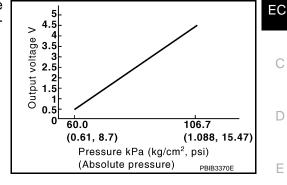
- YES >> INSPECTION END
- NO >> Replace EVAP control system pressure sensor

### < 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

Trouble diagnosis name DTC No. DTC detecting condition Possible cause 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

- 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.

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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					

- 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-350, "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-47, "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.

 ${f 3.}$  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	Giouna	voltage (v)	
B30	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 4.

### **4.**CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

### EC-350

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#### < DTC/CIRCUIT DIAGNOSIS >

3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

Connector         Terminal         Connector         Terminal           B30         3         M107         107         Existed	EVAP control system	n pressure sensor	EC	М	Continuity
B30 3 M107 107 Existed	Connector	Terminal	Connector	Terminal	Continuity
	B30	3	M107	107	Existed

Is the inspection result normal?

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

-100 >> 00105.

**5.**DETECT MALFUNCTIONING PART

#### Check the following.

Harness connectors M7, B1

Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

### 6. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

EC				
	M	Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
FIUI	46	CKP sensor (POS)	F2	1
	103	APP sensor	E112	6
M107	107	EVAP control system pressure sensor	B30	3
	111	Refrigerant pressure sensor	E77	3
Is the insp	ection res	sult normal?		
YES >	> GO TO	7.		
NO >	> Repair	short to ground or short to power	in harness	or conn
7.CHECK		NENTS		
Check the	following			
		on sensor (POS) (Refer to <u>EC-30</u> 9	9, "Compoi	nent Insp
<ul> <li>Brake bo</li> </ul>	poster pre	essure sensor (Refer to EC-386.	Componer	nt Inspec
-	-	ure sensor (Refer to <u>EC-527, "Dia</u>	agnosis Pro	ocedure"
Is the insp	ection res			
		sult normal?		<u></u>
YES >	> GO TO	8.		
YES > NO >	> Replac	8. e malfunctioning component.		
YES >	> Replac	8. e malfunctioning component.		
YES > NO > 8.CHECK	> Replac K APP SE	8. e malfunctioning component.		
YES > NO > 8.CHECK Refer to E	> Replace ( APP SE <u>C-483, "C</u>	8. e malfunctioning component. NSOR		
YES > NO > 8.CHECK Refer to <u>E</u> Is the insp YES >	> Replace ( APP SE <u>C-483, "C</u> ection res > GO TO	8. e malfunctioning component. NSOR <u>Component Inspection"</u> . <u>sult normal?</u> 20.		
YES > NO > 8.CHECK Refer to <u>E</u> Is the insp YES >	> Replace ( APP SE <u>C-483, "C</u> ection res	8. e malfunctioning component. NSOR <u>Component Inspection"</u> . <u>sult normal?</u> 20.		
YES > NO > 8.CHECK Refer to E Is the insp YES > NO >	> Replace ( APP SE <u>C-483, "C</u> ection res > GO TO > GO TO	8. e malfunctioning component. NSOR <u>Component Inspection"</u> . <u>sult normal?</u> 20.		

### >> INSPECTION END

10.check evap control system pressure sensor ground circuit for open and short

1. Turn ignition switch OFF.

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#### < DTC/CIRCUIT DIAGNOSIS >

- 2. Disconnect ECM harness connector.
- 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	Connector Terminal		Terminal	Continuity
B30	1	M107	112	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1, M7

• Harness for open or short between EVAP control system pressure sensor and ECM

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

12. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

 Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system	ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity
B30	2	M107	102	Existed

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

Is the inspection result normal?

YES >> GO TO 14.

NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B1, M7

• Harness for open or short between EVAP control system pressure sensor and ECM

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

### **14.**CHECK 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-334, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP canister vent control valve.

16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-353, "Component Inspection".

Is the inspection result normal?

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P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR < DTC/CIRCUIT DIAGNOSIS > YES >> GO TO 17. NO >> Replace EVAP control system pressure sensor. 17.CHECK IF EVAP CANISTER IS SATURATED WITH WATER 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. 2. Check if water will drain from the EVAP canister (1). Λc 2 : EVAP canister vent control valve Does water drain from EVAP canister? በ YES >> GO TO 18. NO >> GO TO 20. PBIB2731F 18. CHECK EVAP CANISTER Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached. The weight should be less than 2.2 kg (4.9 lb). Is the inspection result normal? YES >> GO TO 20. NO >> GO TO 19. 19. DETECT MALFUNCTIONING PART Check the following. EVAP canister for damage EVAP hose between EVAP canister and vehicle frame for clogging or poor connection >> Repair hose or replace EVAP canister. 20. CHECK INTERMITTENT INCIDENT Refer to GI-44, "Intermittent Incident". >> INSPECTION END **Component Inspection** INFOID:000000010839645 1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR Turn ignition switch OFF. 1. 2. Remove EVAP control system pressure sensor with its harness connector. Always replace O-ring with a new one. 3. Install a vacuum pump to EVAP control system pressure sensor. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the 4. following conditions.

	ECM		Condition	Voltage (V)	
Connector	+	-	Condition [Applied vacuum kPa (kg/cm <sup>2</sup> , psi)]		
Connector	Terminal	Terminal	[,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
M107	102	112	Not applied	1.8 - 4.8	
101107	102	112	-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value	

CAUTION:

Always calibrate the vacuum pump gauge when using it.

< DTC/CIRCUIT DIAGNOSIS >

Do not apply below -93.3 kPa (-0.952 kg/cm<sup>2</sup>, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm<sup>2</sup>, 14.69 psi).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor.

#### < DTC/CIRCUIT DIAGNOSIS >

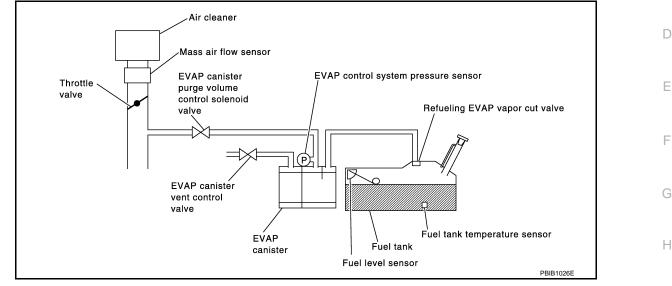
### P0456 EVAP CONTROL SYSTEM

### **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 there are no leaks, the diagnosis will be OK.



DTC No. Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 Evaporative emission control system leak	<ul> <li>EVAP system has a leak.</li> <li>EVAP system does not operate properly.</li> </ul>	<ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister purge volume control valve and the circuit</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister is saturated with water</li> <li>EVAP control system pressure sensor</li> <li>ORVR system leaks</li> <li>Fuel level sensor and the circuit</li> <li>Foreign matter caught in EVAP canister purge volume control solenoid valve</li> </ul>

### CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

### DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

- 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 DTC CONFIRMATION PROCEDURE-II

#### Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-356, "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 <u>EC-356, "Diagnosis Procedure"</u>. NO >> INSPECTION END.

### **Diagnosis Procedure**

### **1.**CHECK FUEL FILLER CAP DESIGN

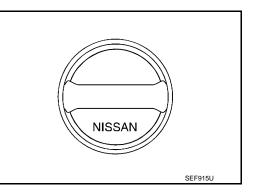
1. Turn ignition switch OFF.

2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace with genuine NISSAN fuel filler cap.



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Check for air releasing sound while opening the fuel filler cap.         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> GO TO 4.         4.CHECK FUEL TANK VACUUM RELIEF VALVE         Refer to EC-523, "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> Replace fuel filler cap with a genuine one.	blower. Then retighten
Is the inspection result normal? YES >> GO TO 3. NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air until ratcheting sound is heard. 3.CHECK FUEL FILLER CAP FUNCTION Check for air releasing sound while opening the fuel filler cap. Is the inspection result normal? YES >> GO TO 5. NO >> GO TO 4. 4.CHECK FUEL TANK VACUUM RELIEF VALVE Refer to EC-523, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. NO >> Replace fuel filler cap with a genuine one.	blower. Then retighten
YES       >> GO TO 3.         NO       >> Open fuel filler cap, then clean cap and fuel filler neck threads using air luntil ratcheting sound is heard.         3.CHECK FUEL FILLER CAP FUNCTION         Check for air releasing sound while opening the fuel filler cap.         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> GO TO 4.         4.CHECK FUEL TANK VACUUM RELIEF VALVE         Refer to EC-523, "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> E0 TO 5.         NO       >> GO TO 5.         NO       >> GO TO 5.         Refer to EC-523, "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> Replace fuel filler cap with a genuine one.	blower. Then retighten
<ul> <li>NO &gt;&gt; Open fuel filler cap, then clean cap and fuel filler neck threads using air until ratcheting sound is heard.</li> <li>CHECK FUEL FILLER CAP FUNCTION</li> <li>Check for air releasing sound while opening the fuel filler cap.</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 5.</li> <li>NO &gt;&gt; GO TO 4.</li> <li>CHECK FUEL TANK VACUUM RELIEF VALVE</li> <li>Refer to EC-523, "Component Inspection".</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 5.</li> </ul>	blower. Then retighten
until ratcheting sound is heard.         3.CHECK FUEL FILLER CAP FUNCTION         Check for air releasing sound while opening the fuel filler cap.         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> GO TO 4.         4.CHECK FUEL TANK VACUUM RELIEF VALVE         Refer to EC-523, "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> Replace fuel filler cap with a genuine one.	
Check for air releasing sound while opening the fuel filler cap. Is the inspection result normal? YES $>>$ GO TO 5. NO $>>$ GO TO 4. 4. CHECK FUEL TANK VACUUM RELIEF VALVE Refer to EC-523, "Component Inspection". Is the inspection result normal? YES $>>$ GO TO 5. NO $>>$ Replace fuel filler cap with a genuine one.	
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	
YES >> GO TO 5. NO >> GO TO 4. 4.CHECK FUEL TANK VACUUM RELIEF VALVE Refer to EC-523, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. NO >> Replace fuel filler cap with a genuine one.	
NO       >> GO TO 4.         4.CHECK FUEL TANK VACUUM RELIEF VALVE         Refer to EC-523, "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 5.         NO       >> Replace fuel filler cap with a genuine one.	
4.CHECK FUEL TANK VACUUM RELIEF VALVE Refer to EC-523, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. NO >> Replace fuel filler cap with a genuine one.	
Refer to <u>EC-523, "Component Inspection"</u> . <u>Is the inspection result normal?</u> YES >> GO TO 5. NO >> Replace fuel filler cap with a genuine one.	
Is the inspection result normal? YES >> GO TO 5. NO >> Replace fuel filler cap with a genuine one.	
YES >> GO TO 5. NO >> Replace fuel filler cap with a genuine one.	
NO >> Replace fuel filler cap with a genuine one.	
Refer to EC-632, "Inspection".	
Is there any leak in EVAP line?	
YES >> Repair or replace.	
NO $>>$ GO TO 6.	
6.check evap canister vent control valve	
Check the following.	
<ul> <li>EVAP canister vent control valve is installed properly.</li> </ul>	
<ul> <li>Refer to <u>FL-16, "Removal and Installation"</u>.</li> <li>EVAP canister vent control valve.</li> </ul>	
Refer to <u>EC-334, "Component Inspection"</u> .	
Is the inspection result normal?	
YES >> GO TO 7.	
NO >> Repair or replace EVAP canister vent control valve and O-ring.	
CHECK IF EVAP CANISTER SATURATED WITH WATER	
<ol> <li>Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.</li> </ol>	$\sim$
2. Check if water will drain from the EVAP canister.	
Does water drain from EVAP canister?	
YES >> GO TO 8.	
NO-1 >> With CONSULT: GO TO 10. NO-2 >> Without CONSULT: GO TO 11.	
	u uli
	PBIB2731E
8. CHECK EVAP CANISTER	FDID2/31E
Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVA	D control ovotom pro-

YES-1 >> With CONSULT: GO TO 10.

YES-2 >> Without CONSULT: GO TO 11.

NO >> GO TO 9.

#### < DTC/CIRCUIT DIAGNOSIS >

### 9. DETECT MALFUNCTIONING PART

#### Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

### **10.**CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### With CONSULT

- 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 2. Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- 4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100%.
- 5. Check vacuum hose for vacuum.

#### Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### **Without CONSULT**

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine.
- 3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

#### Vacuum should exist.

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-98, "System Diagram".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or reconnect the hose.

**13.**CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-328, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace EVAP canister purge volume control solenoid valve.

14.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-283, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel level sensor unit.

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-343, "Component Inspection".

Is the inspection result normal?

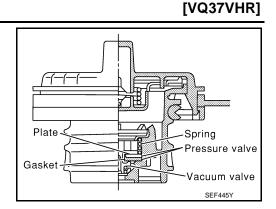
YES >> GO TO 16.

NO >> Replace EVAP control system pressure sensor.

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
16. CHECK EVAP PURGE LINE	
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or imp Refer to <u>EC-98, "System Description"</u> .	proper connection.
Is the inspection result normal?	
YES >> GO TO 17. NO >> Repair or reconnect the hose.	
NO >> Repair or reconnect the hose. 17.CLEAN EVAP PURGE LINE	
Clean EVAP purge line (pipe and rubber tube) using air blower.	
>> GO TO 18.	
18. CHECK EVAP/ORVR LINE	
Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, loosenes nection. For location, refer to <u>EC-520, "Description"</u> .	ss and improper con-
Is the inspection result normal?	
YES >> GO TO 19. NO >> Repair or replace hoses and tubes.	
19. CHECK RECIRCULATION LINE	
Check recirculation line between fuel filler tube and fuel tank for clogging, kink, cra improper connection.	cks, looseness and
Is the inspection result normal?	
YES >> GO TO 20. NO >> Repair or replace hose, tube or fuel filler tube.	
20. CHECK REFUELING EVAP VAPOR CUT VALVE	
Refer to <u>EC-523</u> , "Component Inspection". Is the inspection result normal?	
YES >> GO TO 21.	
NO >> Replace refueling EVAP vapor cut valve with fuel tank.	
21.CHECK FUEL LEVEL SENSOR	
Refer to MWI-50, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 22. NO >> Replace fuel level sensor unit.	
22. CHECK INTERMITTENT INCIDENT	
Refer to <u>GI-44, "Intermittent Incident"</u> .	
Noise to of ++, intermittent insident.	
>> INSPECTION END	
Component Inspection	INFOID:000000010839648
1. CHECK FUEL TANK VACUUM RELIEF VALVE	
1. Turn ignition switch OFF.	
2. Remove fuel filler cap.	

#### < DTC/CIRCUIT DIAGNOSIS >

3. Wipe clean valve housing.



-Vacuum/Pressure gauge

One-way valve

- Fuel filler cap

Fuel filler cap adapter

ī

-Vacuum/

Pressure

pump

SEF943S

4. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm<sup>2</sup>, -0.87 to -0.48 psi)

Is the inspection result normal?

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

2.REPLACE FUEL FILLER CAP

### Replace fuel filler cap.

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

>> INSPECTION END

## **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 combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

### DTC Logic

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### 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-392, "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.	<ul> <li>Harness or connectors (The CAN communication line is open or shorted)</li> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Combination meter</li> <li>Fuel level sensor</li> </ul>	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 Start engine and wait maximum of 2 consecutive minutes. 1. 2. Check 1st trip DTC. Is 1st trip DTC detected? Ν >> Go to EC-361, "Diagnosis Procedure". YES NO >> INSPECTION END Diagnosis Procedure INFOID:000000010839651 CHECK DTC WITH COMBINATION METER Refer to MWI-34, "CONSULT Function (METER/M&A)". P Is the inspection result normal? YES >> GO TO 2. NO >> Go to MWI-48, "Component Function Check". 2.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

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## **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 combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

### DTC Logic

INFOID:000000010839653

### 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-392, "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 F been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	G
P0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long dis- tance.	<ul> <li>Harness or connectors (The CAN communication line is open or shorted)</li> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Combination meter</li> <li>Fuel level sensor</li> </ul>	Н

### DTC CONFIRMATION PROCEDURE

## **1.**PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-363, "Component Function Check"</u>. Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-364, "Diagnosis Procedure".

### Component Function Check

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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  $\ell$  (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.

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## P0461 FUEL LEVEL SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

- 2. Release fuel pressure from fuel line, refer to <u>EC-631, "Inspection"</u>.
- 3. Remove the fuel feed hose on the fuel level sensor unit.
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- 5. Turn ignition switch 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  $\ell$  (7-7/8 US gal, 6-5/8 Imp gal).
- 12. Check "FUEL LEVEL SE" output voltage and note it.

13. Confirm whether the voltage changes more than 0.03 V during step 7 to 10 and 10 to 12.

Is the inspection result normal?

#### YES >> INSPECTION END

NO >> Go to EC-364, "Diagnosis Procedure".

**3.**PERFORM COMPONENT FUNCTION CHECK

## Without CONSULT

#### NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30  $\ell$  (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-631, "Inspection".
- 3. Remove the fuel feed hose on the fuel level sensor unit.
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- 5. Turn ignition switch ON.
- 6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
- 7. Confirm that the fuel gauge indication varies.
- 8. Fill fuel into the fuel tank for 30  $\ell$  (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-364, "Diagnosis Procedure".

#### **Diagnosis** Procedure

INFOID:000000010839655

[VQ37VHR]

#### **1.**CHECK DTC WITH COMBINATION METER

Refer to MWI-34, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to <u>MWI-48</u>, "Component Function Check".

2. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

## 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 combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output volt-

age changes depending on the movement of the fuel mechanical float.

#### DTC Logic

INFOID:000000010839657

### 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-392, "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.	<ul> <li>shorted)</li> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Combination meter</li> <li>Fuel level sensor</li> </ul>

### 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.

#### 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-365, "Diagnosis Procedure". NO >> INSPECTION END C Diagnosis Procedure INFOID:000000010839658 1. CHECK DTC WITH COMBINATION METER P Refer to MWI-34, "CONSULT Function (METER/M&A)". Is the inspection result normal? YES >> GO TO 2. NO >> Go to MWI-48, "Component Function Check". 2.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

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## P0500 VSS A/T MODELS

### A/T MODELS : Description

The vehicle speed signal is sent to the combination meter from the "ABS actuator and electric unit (control unit)" by CAN communication line. The combination meter then sends a signal to the ECM by CAN communication line.

## A/T MODELS : DTC Logic

### 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-392, "DTC Logic"</u>.

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause	F
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).	<ul> <li>Harness or connector (The CAN communication line is open or shorted.)</li> <li>Combination meter</li> <li>ABS actuator and electric unit (control unit)</li> <li>Wheel sensor</li> <li>TCM</li> <li>Output speed sensor</li> </ul>	G

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

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

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

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

#### TESTING CONDITION:

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

	PERFORM DTC CONFIRMATION PROCEDURE	M
1. 2.	Start engine. Shift the selector lever to D range and wait at least for 2 seconds.	
3.	Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.	
	CAUTION: Always drive vehicle at a safe speed. NOTE:	Ν
4.	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.	0
<u>ls 1</u>	st trip DTC detected?	
YE Ng	<ul> <li>&gt;&gt; Proceed to <u>EC-367, "A/T MODELS : Diagnosis Procedure"</u></li> <li>&gt;&gt; INSPECTION END</li> </ul>	Ρ
A/1	Image: TMODELS : Diagnosis Procedure       Image: The second	
1.	CHECK DTC WITH TCM	
Che	eck DTC with TCM. Refer to TM-204, "CONSULT Function".	

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YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to <u>BRC-23, "CONSULT Function"</u>. Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble shooting relevant to DTC indicated.

 ${f 3.}$  CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to MWI-34, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform trouble shooting relevant to DTC indicated.

CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to <u>TM-344, "Inspection"</u>.

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 <u>BRC-110, "FRONT WHEEL SENSOR : Removal and Installation"</u> (Front), <u>BRC-111, "REAR WHEEL SENSOR : Removal and Installation"</u> (Rear).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to <u>GI-44, "Intermittent Incident"</u>.

NO >> Replace or replace error-detected parts.

#### M/T MODELS

#### M/T MODELS : Description

The vehicle speed signal is sent to the combination meter from the "ABS actuator and electric unit (control unit)" via the CAN communication line. The combination meter then sends a signal to the ECM via the CAN communication line.

M/T MODELS : DTC Logic

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# 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-392, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	VEH SPEED SEN/CIRC (Vehicle speed sensor)	The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven.	<ul> <li>Harness or connectors (The CAN communication line is open or shorted)</li> <li>Harness or connectors (The vehicle speed signal circuit is open or shorted)</li> <li>Wheel sensor</li> <li>Combination meter</li> <li>ABS actuator and electric unit (control unit)</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### **1.**INSPECTION START

Do you have CONSULT? Do you have CONSULT?

< DTC/CIRCUIT DIAGNOSIS >	

YES >> GO TO 2. NO >> GO TO 5.		A
2.PRECONDITIONING	·	
If DTC Confirmation Pr before conducting the ne 1. Turn ignition switch 2. Turn ignition switch	ocedure has been previously conducted, always perform the following ext test. OFF and wait at least 10 seconds. ON.	EC
3. Turn ignition switch	OFF and wait at least 10 seconds.	С
>> GO TO 3.		
3.CHECK VEHICLE SF	PEED SIGNAL	D
	e conducted with the drive wheels lifted in the shop or by driving the o be easier, it is unnecessary to lift the vehicle.	vehicle. If a $_{\rm E}$
2. Read "VHCL SPEE should exceed 10 ki	D SE" in "DATA MONITOR" mode with CONSULT. The vehicle speed on m/h (6 MPH) when rotating wheels with suitable gear position.	n CONSULT F
Is the inspection result n YES >> GO TO 4. NO >> Go to EC-37	<u>iormal?</u> 70, "M/T MODELS : Diagnosis Procedure".	G
4	NFIRMATION PROCEDURE	Н
2. Warm engine up to	TOR" mode with CONSULT. normal operating temperature.	n
<ol> <li>Maintain the followir CAUTION: Always drive vehic</li> </ol>	ng conditions for at least 50 consecutive seconds. <b>Ie at a safe speed.</b>	I
ENG SPEED	1,800 - 6,000 rpm	J
COOLAN TEMP/S	More than 70°C (158°F)	
B/FUEL SCHDL	5.0 - 31.8 msec	K
Selector lever	Except Neutral position	
PW/ST SIGNAL	OFF	
4. Check 1st trip DTC.		L
Is 1st trip DTC detected'YES>> Go to EC-37NO>> INSPECTIO	70, "M/T MODELS : Diagnosis Procedure".	M
5.PERFORM COMPON	NENT FUNCTION CHECK	
	ction check. Refer to <u>EC-369, "M/T MODELS : Component Function Chech</u> in check to check the overall function of the vehicle speed signal circuit ght not be confirmed.	
Is the inspection result n YES >> INSPECTIO NO >> Go to EC-37		0
M/T MODELS : Co	mponent Function Check	NFOID:000000010839664
1.PERFORM COMPON	NENT FUNCTION CHECK	
<ul><li>With GST</li><li>1. Lift up drive wheels.</li></ul>		

- Start engine.
   Read vehicle speed signal in Service \$01 with GST.

## P0500 VSS

< DTC/CIRCUIT DIAGNOSIS >

The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-370, "M/T MODELS : Diagnosis Procedure".

M/T MODELS : Diagnosis Procedure

INFOID:000000010839665

1. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to <u>BRC-23, "CONSULT Function"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

**2.**CHECK DTC WITH COMBINATION METER

Refer to MWI-34, "CONSULT Function (METER/M&A)".

## **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:000000010839667

### DTC DETECTION LOGIC

#### NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506	Idle speed control sys- tem RPM lower than ex- pected	The idle speed is less than the target idle speed by 100 rpm or more.	<ul><li>Electric throttle control actuator</li><li>Intake air leak</li></ul>
OTC CON	FIRMATION PROC	EDURE	
	NDITIONING		
f DTC Co	nfirmation Procedure	has been previously conducted, alwa	ys perform the following procedure
	ducting the next test.	weit at least 10 accords	
	nition switch OFF and	I wait at least 10 seconds.	
		wait at least 10 seconds. pecified value, perform <u>EC-21, "IDLE</u>	
<u>Repair Rec</u>	uirement", before c	onducting DTC Confirmation Procedu	
	CONDITION: erforming the follow	ing procedure, confirm that battery ve	oltage is more than 11 V at idle
		temperature above $-10^{\circ}$ C (14°F).	olage is more than 11 v at lule.
	0 0 <del>-</del> 0 0		
-	· GO TO 2. RM DTC CONFIRMA <sup>-</sup>		
	nition switch OFF and	to normal operating temperature.	
	nition switch ON.		
4. Turn ig	nition switch ON. nition switch OFF and	I wait at least 10 seconds.	
4. Turn ig 5. Restari 6. Check	nition switch ON. nition switch OFF and engine and run it for 1st trip DTC.		
4. Turn ig 5. Restari 6. Check <u>Is 1st trip D</u>	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. at least 1 minute at idle speed.	
4. Turn ig 5. Restart 6. Check <u>Is 1st trip D</u> YES >>	nition switch ON. nition switch OFF and engine and run it for 1st trip DTC.	l wait at least 10 seconds. at least 1 minute at idle speed.	
4. Turn ig 5. Restart 6. Check <u>Is 1st trip D</u> YES >> NO >>	nition switch ON. nition switch OFF and engine and run it for 1st trip DTC. <u>TC detected?</u> Go to <u>EC-371, "Diag</u> INSPECTION END	l wait at least 10 seconds. at least 1 minute at idle speed.	
4. Turn iğ 5. Restari 6. Check I <u>s 1st trip D</u> YES >> NO >> Diagnosi	nition switch ON. nition switch OFF and engine and run it for 1st trip DTC. <u>TC detected?</u> Go to <u>EC-371, "Diag</u> INSPECTION END S <b>Procedure</b>	l wait at least 10 seconds. at least 1 minute at idle speed.	INFOID:000000010839668
4. Turn iğ 5. Restari 6. Check I <u>s 1st trip D</u> YES >> NO >> Diagnosi	nition switch ON. nition switch OFF and engine and run it for 1st trip DTC. <u>TC detected?</u> Go to <u>EC-371, "Diag</u> INSPECTION END	l wait at least 10 seconds. at least 1 minute at idle speed.	INFOID:000000010839668

2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

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YES >> Discover air leak location and repair. NO >> GO TO 2.

# 2.REPLACE ECM

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

## **P0507 ISC SYSTEM**

### < DTC/CIRCUIT DIAGNOSIS >

## P0507 ISC SYSTEM

### Description

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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:000000010839670

### 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.	<ul><li>Electric throttle control actuator</li><li>Intake air leak</li><li>PCV system</li></ul>
DTC CON	FIRMATION PROCI	EDURE	
	NDITIONING		
f DTC Co	nfirmation Procedure	has been previously conducted, alwa	avs perform the following procedure
pefore cond	ducting the next test.		, , , , , , , , , , , , , , , , , , , ,
	nition switch OFF and nition switch ON.	wait at least 10 seconds.	
		wait at least 10 seconds.	
Repair Rec	uirement", before c	pecified value, perform <u>EC-21, "IDLE</u> onducting DTC Confirmation Proced	
	ONDITION:	ing procedure, confirm that bottoms	altere is more then 44 V at idle
	ertorming the follow	ing procedure, confirm that battery v	oltage is more than 11 v at idle.
		temperature above –10°C (14°F).	
		temperature above –10°C (14°F).	
Always p	erform the test at a $\cdot$ GO TO 2.		
Always p	erform the test at a		
Always p Always p >> 2.PERFOR 1. Start er	GO TO 2. M DTC CONFIRMAT	TION PROCEDURE to normal operating temperature.	
Always p >> 2.PERFOR 1. Start er 2. Turn ig	GO TO 2. M DTC CONFIRMAT ngine and warm it up t nition switch OFF and	TION PROCEDURE	
Always p >> 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig	GO TO 2. M DTC CONFIRMAT ngine and warm it up t nition switch OFF and nition switch ON. nition switch OFF and	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds.	
Always p >> 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig 5. Start er	GO TO 2. M DTC CONFIRMAT ngine and warm it up to nition switch OFF and nition switch ON. nition switch OFF and nition switch OFF and ngine and run it for at	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds.	
Always p >> 2.PERFOR 1. Start er 2. Turn ig 3. Turn ig 5. Start er 5. Start er 5. Check	GO TO 2. MOTE CONFIRMAT Ingine and warm it up to nition switch OFF and nition switch OFF and nition switch OFF and ngine and run it for at 1st trip DTC.	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds.	
Always p Always p 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig 5. Start er 5. Start er 6. Check <u>s 1st trip D</u> YES >>	GO TO 2. CO TO 2. CO TO 2. CONFIRMAT Ingine and warm it up to nition switch OFF and nition switch ON. nition switch OFF and ngine and run it for at 1st trip DTC. TC detected? Go to EC-373. "Diag	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds. I wait at least 10 seconds. least 1 minute at idle speed.	
Always p Always p 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig 5. Start er 5. Start er 6. Check <u>s 1st trip D</u> YES >>	GO TO 2. M DTC CONFIRMAT orgine and warm it up to nition switch OFF and nition switch ON. nition switch ON. nition switch OFF and ngine and run it for at 1st trip DTC. TC detected?	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds. I wait at least 10 seconds. least 1 minute at idle speed.	
Always p Always p 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig 5. Start er 5. Start er 6. Check <u>s 1st trip D</u> YES >> NO >>	GO TO 2. CO TO 2. CO TO 2. CONFIRMAT Ingine and warm it up to nition switch OFF and nition switch ON. nition switch OFF and ngine and run it for at 1st trip DTC. TC detected? Go to EC-373. "Diag	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds. I wait at least 10 seconds. least 1 minute at idle speed.	INF0ID:000000010839671
Always p Always p 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig 5. Start er 5. Check <u>s 1st trip D</u> YES >> NO >> Diagnosis	GO TO 2. RM DTC CONFIRMAT regine and warm it up to nition switch OFF and nition switch ON. nition switch OFF and ngine and run it for at 1st trip DTC. <u>TC detected?</u> Go to <u>EC-373, "Diag</u> INSPECTION END	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds. I wait at least 10 seconds. least 1 minute at idle speed.	INFOID:000000010839671
Always p Always p 2.PERFOF 1. Start er 2. Turn ig 3. Turn ig 4. Turn ig 5. Start er 6. Check <u>s 1st trip D</u> YES >> NO >> Diagnosis 1.CHECK	GO TO 2. CONFIRMATION Market CONFIRMATION Market	TION PROCEDURE to normal operating temperature. I wait at least 10 seconds. I wait at least 10 seconds. least 1 minute at idle speed. nosis Procedure".	INFOID:000000010839671

YES >> GO TO 2.

## P0507 ISC SYSTEM

#### < DTC/CIRCUIT DIAGNOSIS >

### NO >> Repair or replace. 2.CHECK INTAKE AIR LEAK

# 1. Start engine and let it idle.

Listen for an intake air leak after the mass air flow sensor.

#### Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 3.

# 3.REPLACE ECM

- 1. Stop engine.
- 2. Replace ECM.
- 3. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".

## P050A, P050E COLD START CONTROL

### Description

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

### DTC Logic

#### DTC DETECTION LOGIC

#### NOTE: If DTC P050A or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

P050A P050E	Cold start idle air control system performance	ECM does not control engine idle speed properly when	
		engine is started with pre-warming up condition.	<ul> <li>Fuel injection system</li> </ul>
	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.	<ul> <li>ECM</li> <li>Lack of intake air volume</li> </ul>
	FIRMATION PROCEDU	JRE	
1.PRECO	NDITIONING		
before cond 1. Turn ig 2. Turn ig 3. Turn ig <b>TESTING (</b>	ducting the next test. nition switch OFF and wa nition switch ON. nition switch OFF and wa CONDITION:		
>>	GO TO 2.		
2.PERFO	RM DTC CONFIRMATION	N PROCEDURE-I	
<ol> <li>Turn ig</li> <li>Select</li> <li>Check</li> <li>With GS</li> <li>Follow the point</li> </ol>	nition switch OFF and wa nition switch ON. "DATA MONITOR" mode the indication of "COOLA <b>T</b> procedure "With CONSUL	with CONSULT. N TEMP/S".	
	• GO TO 3.		
NO-1 [If it NO-2 [If it	is below 4°C (39°F)]>>W (39°F) or more. Retry fro	Cool engine down to less than 36°C (97°F). R	
<ol> <li>Start th 40°C (7</li> <li>Check</li> <li>With GS</li> </ol>	e select lever in N range. ne engine and warm up i 104°F) for more than 15 s 1st trip DTC.		between –10°C (14°F) and

YES >> Go to EC-376, "Diagnosis Procedure".

NO >> INSPECTION END

## EC-375

INFOID:000000010839672

INFOID:000000010839673

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EC

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## P050A, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Diagnosis Procedure

INFOID:000000010839674

**1.**PERFORM IDLE AIR VOLUME LEARNING

Perform EC-21, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 2.

NO >> Follow the instruction of Idle Air Volume Learning.

2. CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace malfunctioning part

 $\mathbf{3}$ . CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-272, "DTC Logic".

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Go to <u>EC-273. "Diagnosis Procedure"</u> for DTC P0171, P0174.

**4.**PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-375, "DTC Logic"</u>.

Is the 1st trip DTC P050A or P050E displayed again?

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

**5.**REPLACE ECM

- 1. Replace ECM.
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".

### **P0524 ENGINE OIL PRESSURE**

#### < DTC/CIRCUIT DIAGNOSIS >

## P0524 ENGINE OIL PRESSURE

Trouble diagnosis

# DTC Logic

### DTC DETECTION LOGIC

#### NOTE:

DTC No.

If DTC P0524 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to <u>EC-194, "DTC Logic"</u>

DTC No.	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.	<ul> <li>Engine oil pressure or level too low</li> <li>Crankshaft position sensor (POS)</li> <li>Camshaft position sensor (PHASE)</li> <li>Intake valve control solenoid valve</li> <li>Accumulation of debris to the signal pick-up portion of the camshaft</li> <li>Timing chain installation</li> <li>Foreign matter caught in the oil groove for intake valve timing control</li> </ul>
	NFIRMATION PI	ROCEDURE	
<b>1.</b> PRECO	ONDITIONING-I		
before cor 1. Turn i 2. Turn i	nducting the next gnition switch OF gnition switch ON	and wait at least 10 seconds.	ways perform the following procedure
	CONDITION:		
Before pe	erforming the fol	lowing procedure, confirm that battery	voltage is between 10 V and 16 V at
Before pe idle.	-> GO TO 2.	lowing procedure, confirm that battery	voltage is between 10 V and 16 V at
Before pe idle. > 2.PRECC	-> GO TO 2. ONDITIONING-II		voltage is between 10 V and 16 V at
Before periode.	-> GO TO 2. ONDITIONING-II	ure. Refer to <u>LU-7, "Inspection"</u> .	voltage is between 10 V and 16 V at
Before periode.	<ul> <li>&gt; GO TO 2.</li> <li>ONDITIONING-II</li> <li>level and oil press</li> <li>pection result norn</li> <li>&gt; GO TO 3.</li> </ul>	ure. Refer to <u>LU-7, "Inspection"</u> . al?	voltage is between 10 V and 16 V at
Before periode.	<ul> <li>&gt; GO TO 2.</li> <li>ONDITIONING-II</li> <li>level and oil press</li> <li>pection result norn</li> <li>&gt; GO TO 3.</li> <li>&gt; Go to LU-7, "In:</li> </ul>	ure. Refer to <u>LU-7, "Inspection"</u> . al? spection".	voltage is between 10 V and 16 V at
Before periode.	<ul> <li>&gt; GO TO 2.</li> <li>&gt; DNDITIONING-II</li> <li>level and oil press</li> <li>pection result norm</li> <li>&gt; GO TO 3.</li> <li>&gt; Go to LU-7, "In:</li> <li>&gt; CONFI</li> </ul>	ure. Refer to <u>LU-7, "Inspection"</u> . al? spection". RMATION PROCEDURE	voltage is between 10 V and 16 V at
Before periode.	<ul> <li>&gt; GO TO 2.</li> <li>&gt; DNDITIONING-II</li> <li>level and oil press</li> <li>&gt; ection result norn</li> <li>&gt; GO TO 3.</li> <li>&gt; Go to LU-7, "In:</li> <li>&gt; CONFI</li> <li>t "DATA MONITO</li> </ul>	ure. Refer to <u>LU-7, "Inspection"</u> . al? spection".	
Before periode.	<ul> <li>&gt; GO TO 2.</li> <li>ONDITIONING-II</li> <li>level and oil press</li> <li>pection result norm</li> <li>&gt; GO TO 3.</li> <li>&gt; GO to <u>LU-7</u>, "In:</li> <li>DRM DTC CONFI</li> <li>t "DATA MONITO ain the following compared by the following com</li></ul>	ure. Refer to <u>LU-7, "Inspection"</u> . al? spection". RMATION PROCEDURE R" mode with CONSULT.	
Before periode.	-> GO TO 2. DNDITIONING-II level and oil press -> GO TO 3> GO TO 3> GO to LU-7, "In: DRM DTC CONFI t "DATA MONITO ain the following c	ure. Refer to <u>LU-7, "Inspection"</u> . <u>hal?</u> <u>spection"</u> . RMATION PROCEDURE R" mode with CONSULT. onditions for at least 20 consecutive seco	
Before periode.	-> GO TO 2. DNDITIONING-II level and oil press Dection result norn -> GO TO 3> GO TO 3> GO to LU-7, "In: DRM DTC CONFI t "DATA MONITO ain the following c D D More TEMP/S More	ure. Refer to <u>LU-7, "Inspection"</u> . aal? spection". RMATION PROCEDURE R" mode with CONSULT. onditions for at least 20 consecutive seco	

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-378. "Diagnosis Procedure"

NO >> INSPECTION END

INFOID:000000010839675

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### Diagnosis Procedure

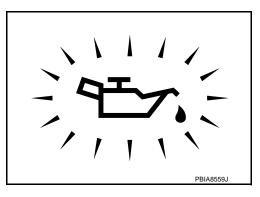
INFOID:0000000010839676

[VQ37VHR]

- 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-186, "Component Inspection".

Is the inspection result normal?

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

 ${f 3.}$ CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-309. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS).

**4.**CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-313, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE).

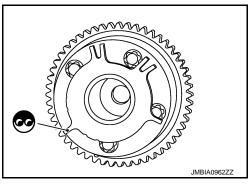
5. CHECK CAMSHAFT (INTAKE)

#### 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.



## 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-57, "Removal and Installation".
- NO >> GO TO 7.

**1**.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to <u>EM-101, "Inspection"</u>. <u>Is the inspection result normal?</u>

## **P0524 ENGINE OIL PRESSURE**

< DTC/CIRCUIT	DIAGNOSIS >	[VQ37VHR]	
YES >> GO T			
-	lubrication line.	4	Ą
8.CHECK INTER	MITTENT INCIDENT		
Refer to GI-44, "In	termittent Incident".	EO	С
>> INSPI	ECTION END		
Component In	spection	INF0ID:000000010839677	2
1.CHECK INTAK	E VALVE TIMING CONTROL SOLENOID VALVE-I		
1. Turn ignition s			)
2. Disconnect in	take valve timing control solenoid valve harness con	nector.	
3. Check resista	nce between intake valve timing control solenoid val		
Terminals	Resistance (Ω)	_	_
1 and 2	7.0 - 7.7 [at 20°C (68°F)]		
1 410 2		F	-
1 or 2 and ground	(Continuity should not exist)		
Is the inspection re	esult normal?	C.	G
YES >> GO T		_	
•	ce malfunctioning intake valve timing control soleno	id valve.	
2.CHECK INTAK	E VALVE TIMING CONTROL SOLENOID VALVE-II	F	-
	e valve timing control solenoid valve.		
	DC between intake valve timing control solenoid		_
	s 1 and 2, and then interrupt it. Make sure that the s as shown in the figure.		
CAUTION:			
	12 V DC continuously for 5 seconds or more.	S LLB	J
	y result in damage to the coil in intake valve ol solenoid valve.	S Malan	
NOTE:			
	ace O-ring when intake valve timing control /e is removed.	ĸ	<
Is the inspection re YES >> INSPI	ECTION END	JMBIA0079ZZ	
		L	

#### YES >> INSPECTION END

>> Replace malfunctioning intake valve timing control solenoid valve. NO

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## 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:000000010839679

### DTC DETECTION LOGIC

#### NOTE:

# If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-393, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	<ul> <li>Harness or connectors (The sensor circuit is open or shorted)</li> <li>Power steering pressure sensor</li> </ul>

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

YES >> Go to EC-380, "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-47, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure (PSP) sensor harness connector.

- 2. Turn ignition switch ON.
- 3. Check the voltage between PSP sensor harness connector and ground.

PSP s	sensor	Ground	Voltage (V)
Connector	Terminal	Giouna	vollage (v)
F35	3	Ground	Approx. 5

## EC-380

INFOID-000000010839680

INFOID:000000010839678

## P0550 PSP SENSOR

				PU550 F	SP SENSOR			
< DTC/CIR		AGNOSIS	>			[VQ37VHR]		
Is the inspe	ection res	ult normal?						
	GO TO						А	
•				-	short to power in harness or connectors.			
J.CHECK	PSP SEI	NSOR GR	JUND CIF	RCUIT FOI	R OPEN AND SHORT		EC	
	Inition swi	itch OFF. I harness (	oonnootor					
					ness connector and ECM harness connector.			
		-					С	
PSP s	ensor	EC	M	Continuity				
Connector	Terminal	Connector	Terminal	Continuity			D	
F35	1	F102	96	Existed				
				nd and sho	ort to power.		_	
Is the inspe			-				Е	
-	> GO TO 4 > Repair c		short to	around she	ort to power in harness or connectors.			
	•	•		-	T FOR OPEN AND SHORT		F	
					ness connector and ECM harness connector.			
T. Oncor		iaity betwe					G	
PSP s	ensor	EC	M				0	
Connector	Terminal	Connector	Terminal	Continuity				
F35	2	F102	87	Existed			Н	
2. Also cł	neck harn	ess for sho	ort to grou	nd and sho	ort to power.			
Is the inspe			-					
	> GO TO { > Repair c		short to	around or	short to power in harness or connectors.			
5.снеск			., 511011 10	ground or				
Refer to EC			Inspection	<u>, "</u>			J	
Is the inspe				<u>.</u> .				
YES >>			-				Κ	
•	-	PSP sens						
<b>6.</b> CHECK	INTERM	ITTENT IN	CIDENT				1	
Refer to GI	-44, "Inte	rmittent Inc	<u>cident"</u> .				_	
>>	> INSPEC	TION END	)				M	
Compon	ent Insp	pection				INFOID:000000010839681		
1.снеск	1.CHECK POWER STEERING PRESSURE SENSOR							

1. Turn ignition switch OFF.

Reconnect all harness connectors disconnected. 2.

Start engine and let it idle. 3.

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	30	Steering wheel	Not being turned	0.4 - 0.8

Is the inspection result normal?

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## **P0550 PSP SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

- YES >> INSPECTION END
- NO >> Replace power steering pressure sensor.

#### < DTC/CIRCUIT DIAGNOSIS >

## P0555 BRAKE BOOSTER PRESSURE SENSOR

### Description

Brake booster pressure sensor is connected to brake booster by a hose. It detects brake booster pressure and sends the voltage signal to the ECM. The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.

## **DTC Logic**

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0555	Brake booster pressure sensor circuit	<ul> <li>An excessively low voltage from the sensor is sent to ECM.</li> <li>An excessively high voltage from the sensor is sent to ECM.</li> </ul>	<ul> <li>Harness or connectors (The sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Gear lever position sensor circuit is shorted.)</li> <li>Brake booster pressure sensor</li> <li>Crankshaft position sensor (POS)</li> <li>Accelerator pedal position sensor</li> <li>EVAP control system pressure sensor</li> <li>Refrigerant pressure sensor</li> <li>Gear lever position sensor</li> <li>Gear lever position sensor</li> </ul>
TC CONF	IRMATION PROCEDURE		
PRECON	IDITIONING		

before conducting the next test.

- 1. Turn ignition 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

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

#### Is DTC detected?

YES >> Go to EC-383, "Diagnosis Procedure". >> INSPECTION END

## NO

### **Diagnosis** Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF. INFOID:000000010839684

INFOID:000000010839682

INFOID:000000010839683

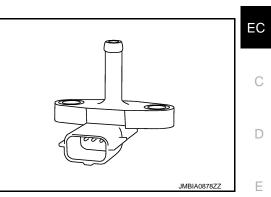
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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2. Check ground connection M95. Refer to Ground Inspection in <u>GI-47. "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK BRAKE BOOSTER PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect brake booster pressure sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between brake booster pressure sensor harness connector and ground.

Brake booster	pressure sensor	Ground	Voltage (V)	
Connector	Terminal	Ground		
E48	1	Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 3.

# **3.**CHECK BRAKE BOOSTER PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between Brake booster pressure sensor harness connector and ECM harness connector.

Brake booster pres- sure sensor		EC	CM	Continuity
Connector	Terminal	Connector	Terminal	
E48	1	F101	45	Existed

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

### **4.**DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F1, E3
- · Harness for open between ECM and brake booster pressure sensor

>> Repair open circuit.

## 5. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor				
Connector	Terminal	Name	Connector	Terminal		
F101	45	Brake booster pressure sensor	E48	1		
1 101	46	CKP sensor (POS)	F2	1		
F102	74	Gear lever position sensor	F57	3		
	103	APP sensor	E112	6		
M107	107	EVAP control system pressure sensor	B30	3		
	107	Refrigerant pressure sensor	E172	3		

Is the inspection result normal?

YES >> GO TO 6.

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

DTC/CIRCL	JIT DIAGNOS	IS >			[VQ37VHR]
<b>3.</b> снеск са	OMPONENTS				
Gear lever p EVAP contro Refrigerant p the inspection YES >> G	position sensor position sensor ol system press	(Refer to <u>EC-3</u> sure sensor (R or (Refer to <u>EC</u> al?	399, "Compon efer to <u>EC-34</u> 2-527, "Compo	Component Inspection".) ent Inspection") 3. "Component Inspection onent Function Check".)	<u>"</u> .)
CHECK AF	•	compo	Jineni.		
	83, "Componer	nt Inspection".			
YES >> G NO >> G	on result norma O TO 14. O TO 8. ACCELERATO		SEMBLY		
				xploded View".	
	AKE BOOSTE				PEN AND SHORT
. Turn igniti . Disconne	ion switch OFF ct ECM harnes	s connector.		ROUND CIRCUIT FOR C	OPEN AND SHORT
<ul> <li>Turn igniti</li> <li>Disconnet</li> <li>Check the nector.</li> </ul>	ion switch OFF ct ECM harnes	: s connector. ween brake b		re sensor harness connec	
Turn igniti Disconne Check the nector. Brake booster Connector	ion switch OFF ct ECM harnes e continuity bet pressure sensor Terminal	s connector. ween brake b	ooster pressu ECM Terminal	re sensor harness connec	
<ul> <li>Turn igniti</li> <li>Disconnee</li> <li>Check the nector.</li> <li>Brake booster</li> <li>Connector</li> <li>E48</li> </ul>	ion switch OFF ct ECM harnes e continuity bet pressure sensor	s connector. ween brake b Connector F101	ooster pressu ECM Terminal 36	re sensor harness connec	
<ul> <li>Turn igniti</li> <li>Disconnet</li> <li>Check the nector.</li> <li>Brake booster</li> <li>Connector</li> <li>E48</li> <li>Also chect</li> <li>the inspection</li> <li>YES &gt;&gt; G</li> <li>NO &gt;&gt; G</li> <li>O.DETECT</li> <li>Check the follow</li> <li>Harness cor</li> </ul>	ion switch OFF ct ECM harnes e continuity bet pressure sensor Terminal 3 k harness for s on result norma 0 TO 11. 0 TO 11. 0 TO 10. MALFUNCTIO owing. nnectors F1, E3	S connector. ween brake b Connector F101 short to ground al? DNING PART	ooster pressu	re sensor harness connec	
Turn igniti Disconnee Check the nector. Brake booster Connector E48 Also chec the inspecti YES >> G NO >> G O.DETECT heck the folle Harness for >> R	ion switch OFF, ct ECM harnes e continuity bet pressure sensor Terminal 3 k harness for s on result norma 0 TO 11. 0 TO 11. 0 TO 11. 0 TO 10. MALFUNCTIO owing. nnectors F1, E3 open or short b	s connector. ween brake b Connector F101 short to ground al? ONING PART Soetween brake	ooster pressu	Continuity Existed Sure sensor and ECM	ctor and ECM harness con-
Turn igniti Disconnee Check the nector. Brake booster Connector E48 Also chec the inspecti YES >> G NO >> G O.DETECT heck the folle Harness for >> R 1.CHECK E	ion switch OFF, ct ECM harnes e continuity bet pressure sensor Terminal 3 k harness for s on result norma 0 TO 11. 0 TO 11. 0 TO 11. 0 TO 10. MALFUNCTIO owing. nnectors F1, E3 open or short to epair open circ BRAKE BOOS	s connector. ween brake b Connector F101 short to ground al? ONING PART ONING PART Soetween brake	ooster pressu ECM Terminal 36 d and power. booster press ound or short IRE SENSOR	Continuity Existed Sure sensor and ECM to power in harness or co	ctor and ECM harness con-
Turn igniti Disconnee Check the nector. Brake booster Connector E48 Also chece the inspecti YES >> G NO >> G O.DETECT heck the folle Harness for >> R 1.CHECK E Check the nector.	ion switch OFF, ct ECM harnes e continuity bet pressure sensor Terminal 3 k harness for s on result norma 0 TO 11. 0 TO 11. 0 TO 11. 0 TO 10. MALFUNCTIO owing. nnectors F1, E3 open or short to epair open circ BRAKE BOOS	s connector. ween brake b Connector F101 short to ground al? ONING PART ONING PART Soetween brake	ooster pressu ECM Terminal 36 and power. booster press ound or short IRE SENSOR ooster pressu	Continuity Existed Sure sensor and ECM to power in harness or co	nnectors.
<ul> <li>Turn igniti</li> <li>Disconnee</li> <li>Check the nector.</li> <li>Brake booster</li> <li>Connector</li> <li>E48</li> <li>Also chece</li> <li>the inspection</li> <li>YES &gt;&gt; G</li> <li>NO &gt;&gt; G</li> <li>D.DETECT</li> <li>check the folled</li> <li>Harness for</li> <li>&gt;&gt; R</li> <li>1.CHECK IN</li> <li>Check the folled</li> <li>Check the folled</li> </ul>	ion switch OFF, ct ECM harnes e continuity bet pressure sensor Terminal 3 k harness for s on result norma 0 TO 11. 0 TO 11. 0 TO 11. 0 TO 10. MALFUNCTIO owing. nnectors F1, E3 open or short to epair open circ BRAKE BOOST e continuity bet	S connector. Ween brake b Connector F101 Short to ground al? DNING PART Solution brake suit, short to gr TER PRESSU Sween brake b	ooster pressu ECM Terminal 36 and power. booster press ound or short IRE SENSOR ooster pressu	Continuity Existed Sure sensor and ECM to power in harness or co INPUT SIGNAL CIRCUIT re sensor harness connect	nnectors.

YES >> GO TO 13. NO >> GO TO 12.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 12. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F1, E3

Harness for open or short between brake booster pressure sensor and ECM

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

### **13.**CHECK BRAKE BOOSTER PRESSURE SENSOR

Refer to EC-386, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace brake booster pressure sensor.

14.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

>> INSPECTION END

#### Component Inspection

INFOID:000000010839685

# 1.CHECK BRAKE BOOSTER PRESSURE SENSOR-I

- 1. Turn ignition switch OFF.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
- 4. Check the voltage between ECM harness connector terminals as per the following.

ECM				
Connector	+	_		
Connector	Terminal	Terminal		
F101	39	36		

#### NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depends on atmospheric pressure and altitude.
- 5. Measure the atmospheric pressure.

#### NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

Altitude (m)	Compensated pressure (hPa)
0	0
200	-24
400	-47
600	-70
800	-92
1000	-114
1500	-168
2000	-218

6. Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

(V)

5.0 4.5

3.5 3.0

Voltage 4 0

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

1000 1050 (hPa)

JMBIA0870GB

А

EC

D

Ε

F

Κ

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Ν

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Atmospheric pressure (hPa)	Voltage (V)
800	3.1 – 3.7
850	3.3 – 3.9
900	3.5 – 4.1
950	3.8 – 4.3
1000	4.0 - 4.6
1050	4.2 - 4.8

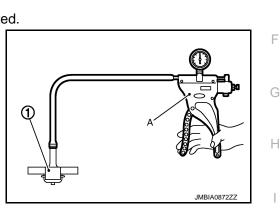
Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace brake booster pressure sensor.

2.CHECK BRAKE BOOSTER PRESSURE SENSOR-II

- 1. Turn ignition switch OFF.
- 2. Remove brake booster pressure sensor with its harness connected.
- Connect the hose of vacuum pump (A) to brake booster pres-3. sure sensor (1).
- 4. Turn ignition switch ON.



950

850

800

900

Atmospheric pressure

Check the voltage between ECM harness connector terminals as per the following. 5.

ECM				
	+		_	
Connector	Terminal	Connector	Terminal	
F101	39	F101	36	

6. Check that the difference of the voltage when engine is stopped and that when negative pressure is L applied with vacuum pump is within the following limits.

Vacuum [kPA (mmHg)]	Voltage difference (V)
-40 (-300)	1.5 – 2.0
-53.3 (-400)	2.0 - 2.6
-66.7 (-500)	2.6 - 3.2
-80 (-600)	3.2 – 3.8

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace brake booster pressure sensor.

### 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 circuit	ECM back up RAM system does not function properly.	<ul> <li>Harness or connectors [ECM power supply (back up) circuit is open or shorted.]</li> <li>ECM</li> </ul>

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### >> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON, wait at least 10 seconds. 1.
- Turn ignition switch OFF and wait at least 5 minutes. 2.
- 3. Turn ignition switch ON, wait at least 10 seconds.
- Repeat steps 2 and 3 for five times. 4.
- Check 1st trip DTC. 5.
- Is 1st trip DTC detected?

YES >> Go to EC-388, "Diagnosis Procedure".

>> INSPECTION END NO

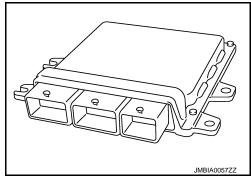
#### **Diagnosis** Procedure

### **1.**CHECK ECM POWER SUPPLY

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the voltage between ECM harness connector terminals as per the following.

INFOID:000000010839686

INFOID:000000010839687



INFOID:000000010839688

## P0603 ECM POWER SUPPLY

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

ECM				А		
	+	-	_	Voltage	_	
Connector	Terminal	Connector	Terminal			EC
F102	93	M107	128	Battery voltage		
Is the inspe						
	• GO TO 3.					С
-	• GO TO 2.		DADT			
-		CTIONING	PARI			D
Check the f • Harness		E3 E1				
<ul> <li>15 A fuse</li> </ul>		LJ, I I				
<ul> <li>IPDM E/F</li> </ul>	R harness c	onnector E				Ε
<ul> <li>Harness</li> </ul>	for open or	short betwe	en ECM ar	nd battery		
	Renair or	replace har	ness or con	nectors		F
-	•	TENT INCI		inectors.		I
Is the inspe		<u>nittent Incide</u> t pormal2	<u>ent</u> .			G
	• GO TO 4.					
		replace har	ness or con	nectors.		Н
4.PERFO	RM DTC C	ONFIRMAT	ION PROC	EDURE		
1. Turn ig	nition switc	h ON.				
2. Erase		<i>c</i>	-			I
	m DTC Co C-388, "DT(	nfirmation	Procedure	•		
		603 displaye	ed again?			J
YES >>	GO TO 5.		-			
_	INSPECT	ION END				12
5.REPLAC	CE ECM					Κ
	e ECM.					
	<u>EC-17, "AI</u> ement".	DDITIONAL	SERVICE	WHEN REPLA	CING CONTROL UNIT (ECM) : Special Repair	L
<u>rtequir</u>	<u>ement</u> .					
>>	INSPECT	ION END				Μ
						IVI
						Ν
						0
						0
						Ρ

## 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-391, "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-391, "Diagnosis Procedure".

NO >> GO TO 4.

#### 4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

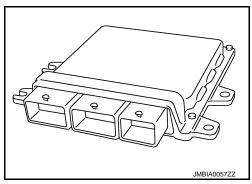
- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- 3. Repeat step 2 for 32 times.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

#### EC-390

[VQ37VHR]

INFOID:000000010839690



< DTC/CIRCUIT DIAGNOSIS > [VQ3	7VHR]
YES >> Go to <u>EC-391, "Diagnosis Procedure"</u> . NO >> INSPECTION END	A
Diagnosis Procedure	0000010839691
1.INSPECTION START	EC
<ol> <li>Turn ignition switch ON.</li> <li>Erase DTC.</li> <li>Perform DTC Confirmation Procedure. See EC-390, "DTC Logic".</li> </ol>	С
Is the 1st trip DTC P0605 displayed again?	D
YES >> GO TO 2. NO >> INSPECTION END	
2.REPLACE ECM	E
<ol> <li>Replace ECM.</li> <li>Go to <u>EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Requirement"</u>.</li> </ol>	<u>Repair</u> F
>> INSPECTION END	G
	Н
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## P0607 ECM

## Description

INFOID:000000010839692

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:000000010839693

### 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-392, "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-392, "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.
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".

>> INSPECTION END

Revision: 2014 September

INFOID:000000010839694

DTC detecting condition

#### < DTC/CIRCUIT DIAGNOSIS >

# P0643 SENSOR POWER SUPPLY

Trouble diagnosis

name

# DTC Logic

DTC No.

DTC DETECTION LOGIC

P0643	Sensor power supply circuit short	ECM detects that the voltage of power source for sensor is excessively low or high.	<ul> <li>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.]</li> <li>Accelerator pedal position sensor</li> <li>Throttle position sensor (PHASE) (bank 1)</li> <li>Manifold absolute pressure (MAP) sensor</li> <li>Power steering pressure sensor</li> <li>Camshaft position sensor (PHASE) (bank 2)</li> </ul>			
DTC CON	FIRMATION PRO	CEDURE				
1.PRECO	NDITIONING					
before cond 1. Turn ig 2. Turn ig 3. Turn ig TESTING ( Before per	ducting the next test inition switch OFF ar inition switch ON. inition switch OFF ar <b>CONDITION:</b> forming the follow	nd wait at least 10 seconds. nd wait at least 10 seconds.	ucted, always perform the following procedure battery voltage is more than 10 V at idle.			
•	> GO TO 2.					
		ATION PROCEDURE				
<ol> <li>Start ei</li> <li>Check</li> </ol>	ngine and let it idle f DTC.	or 1 second.				
Is DTC det	ected?					
	> Go to <u>EC-393, "Dia</u> > INSPECTION END					
		)				
Diagnosi	s Procedure		INFOID:000000010839696			
<b>1.</b> CHECK	GROUND CONNEG	CTION				
2. Check Is the inspe YES >>	ection result normal? > GO TO 2.	<u>.</u>	on in <u>GI-47, "Circuit Inspection"</u> .			
•	NO >> Repair or replace ground connection. 2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT					
1. Discon 2. Turn ig	2. Turn ignition switch ON.					

Possible cause

INFOID:000000010839695

А

EC

С

## P0643 SENSOR POWER SUPPLY

#### < DTC/CIRCUIT DIAGNOSIS >

APP	sensor	Ground	Voltage (V)	
Connector	Terminal	Ground	voltage (v)	
E112	5	Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

**3.**CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor			
Connector	Terminal	Name	Connector	Terminal	
F101	43	Electric throttle control actuator (bank 2)	F27	1	
FIUI	44	Electric throttle control actuator (bank 1)	F6	6	
F102 60	CMP sensor (PHASE) (bank 1)	F5	1		
	60	Manifold absolute pressure (MAP) sen- sor	F50	1	
		PSP sensor	F35	3	
	64 CMP sensor (PHASE) (bank 2)		F18	1	
M107	99	APP sensor	E112	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-313, "Component Inspection".)
- Manifold absolute pressure (MAP) sensor (Refer to EC-210, "Component Inspection".)
- Power steering pressure sensor (Refer to <u>EC-381, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-313, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

**5.**CHECK TP SENSOR

Refer to EC-226, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 6.

**6.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-34, "Exploded View".

>> INSPECTION END

**7.**CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-4, "Exploded View".

## **P0643 SENSOR POWER SUPPLY**

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
>> INSPECTION END	А
9. CHECK INTERMITTENT INCIDENT	
Refer to GI-44, "Intermittent Incident".	EC
>> INSPECTION END	
	С
	D
	E
	F
	G
	Н
	Ι
	J
	K
	L
	M
	Ν
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	Р

### **P0820 GEAR LEVER POSITION SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

## P0820 GEAR LEVER POSITION SENSOR

### Description

Gear lever position sensor is installed in transmission and detects the gear position. When shift lever is shifted, position sensor magnet on striking rod in transmission moves and changes magnetic field of the coil in gear lever position sensor. Gear lever position sensor converts the changes in magnetic field to voltage signals and transmits them to ECM. ECM detects the gear position by these voltage signal changes.

JMBIA2050Z INFOID:000000010839698

DTC Logic

#### DTC DETECTION LOGIC NOTE:

- If DTC P0820 is displayed with DTC P0335, P0340 or P0345, first perform the trouble diagnosis for DTC P0335, P0340 or P0345. Refer to EC-306, "DTC Logic" or EC-310, "DTC Logic".
- If DTC P0820 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-368, "M/T MODELS : DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0820	Gear lever position sen- sor circuit	А	<ul> <li>An excessively low voltage from the sensor is sent to ECM.</li> <li>An excessively high voltage from the sensor is sent to ECM.</li> </ul>	<ul> <li>Harness or connectors (Gear lever position sensor circuit is open or short- ed.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted.)</li> <li>Gear lever position sensor</li> <li>Crankshaft position sensor (POS)</li> <li>Accelerator pedal position sensor</li> <li>EVAP control system pressure</li> <li>Refrigerant pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Transmission</li> </ul>
		В	<ul> <li>There is a difference between target engine speed calculated by ECM and actual engine speed.</li> </ul>	

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### **TESTING CONDITION:**

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

>> GO TO 2.

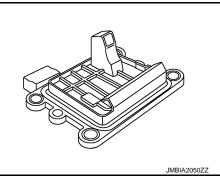
2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

Check DTC. 2.

Is DTC detected?

INFOID:000000010839697



-	IT DIAGNOS	SIS >				[VQ37VHR]
		"Diagnosis Pro	<u>cedure"</u> .			
	) TO 3. DTC CONFII	RMATION PRO				
. Start engin						<u> </u>
. Drive the v		ry gear positior	n from 1st to	6th gear for 10	) seconds each a	t 20 km/h or more.
NOTE: Fully depr	ess clutch	oedal when sh	nifting and fu	ully release c	utch pedal after	gear shifting is com-
plete.						
Always dr	ive vehicle a	at a safe speed	d.			
Check DTC						
		"Diagnosis Pro	cedure".			
	SPECTION E		<u> </u>			
iagnosis P	rocedure					INFOID:000000010839699
.CHECK GR						
	on switch OFI		to Ground In	spection in GI	47, "Circuit Inspe	ection".
the inspectio						
/ES >> GC	D TO 2.					
NO >> Re	pair or replac	ce ground conr				
NO >> Re	pair or replac	ce ground conr POSITION SEN		R SUPPLY C	RCUIT-I	
NO >> Re CHECK GE	pair or replac AR LEVER F t gear lever p	POSITION SEN	ISOR POWE		RCUIT-I	
NO >> Re CHECK GE. Disconnec Turn ignitic	pair or replac AR LEVER F t gear lever p on switch ON	POSITION SEN	ISOR POWE harness con	nector.	RCUIT-I	Ind.
NO >> Re CHECK GE. Disconnect Turn ignitic	pair or replac AR LEVER F t gear lever p on switch ON	POSITION SEN	ISOR POWE harness con	nector.		ind.
NO >> Re CHECK GE. Disconnect Turn ignitic Check the	pair or replac AR LEVER F t gear lever p on switch ON	POSITION SEN position sensor	ISOR POWE harness con position sen	nector. sor harness co		ind.
NO >> Re CHECK GE. Disconnec: Turn ignitic Check the Gear lever Connector	pair or replac AR LEVER F t gear lever p on switch ON voltage betw	POSITION SEN	ISOR POWE harness con position sen	nector. sor harness co Voltage (V)		ınd.
NO >> Re CHECK GE. Disconnect Turn ignitic Check the Gear lever Connector F57	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 3	POSITION SEN position sensor reen gear lever al Gro	ISOR POWE harness con position sen	nector. sor harness co		ınd.
NO >> Re CHECK GE. Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 3 n result norm	POSITION SEN position sensor reen gear lever al Gro	ISOR POWE harness con position sen	nector. sor harness co Voltage (V)		ınd.
NO >> Re .CHECK GE. Disconnec: Turn ignitic Check the Gear lever Connector F57 the inspectio (ES >> GC	pair or replace AR LEVER F t gear lever points witch ON voltage betw position sensor Termin 3 n result norm O TO 8.	POSITION SEN position sensor reen gear lever al Gro	ISOR POWE harness con position sen	nector. sor harness co Voltage (V)		ınd.
NO >> Re CHECK GE. Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC NO >> GC	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 3 n result norm O TO 8. O TO 3.	POSITION SEN position sensor reen gear lever ral Gro nal?	ISOR POWE harness con position sen	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	Ind.
NO >> Re CHECK GE. Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC NO >> GC CHECK GE.	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 3 n result norm O TO 8. O TO 3. AR LEVER F	POSITION SEN position sensor reen gear lever al Gro nal? POSITION SEN	ISOR POWE harness con position sen	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	ınd.
NO >> Re CHECK GE Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC NO >> GC CHECK GE Turn ignitic Disconnect	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor position sensor Termin 3 n result norm O TO 8. O TO 8. O TO 3. AR LEVER F on switch OFI t ECM harne	POSITION SEN position sensor reen gear lever Gro al Gro mal? POSITION SEN F. ss connector.	ISOR POWE harness con position sen ound	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	
NO >> Re CHECK GE Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC NO >> GC CHECK GE Turn ignitic Disconnect	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor position sensor Termin 3 n result norm O TO 8. O TO 8. O TO 3. AR LEVER F on switch OFI t ECM harne	POSITION SEN position sensor reen gear lever Gro al Gro mal? POSITION SEN F. ss connector.	ISOR POWE harness con position sen ound	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	Ind.
NO >> Re CHECK GE Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC YES >> GC NO >> GC CHECK GE Turn ignitic Disconnect Check the	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor position sensor Termin 3 n result norm O TO 8. O TO 8. O TO 8. O TO 3. AR LEVER F on switch OFI t ECM harner continuity be	POSITION SEN position sensor reen gear lever al Gro nal? POSITION SEN F. ss connector.	ISOR POWE harness con position sen ound NSOR POWE	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	
NO >> Re CHECK GE Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC YES >> GC NO >> GC CHECK GE Disconnect Check the Gear lever pos	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 3 n result norm O TO 8. O TO 8. O TO 3. AR LEVER F on switch OFI t ECM harnes continuity be	POSITION SEN position sensor reen gear lever al Gro nal? POSITION SEN F. ss connector. tween gear lev	ISOR POWE harness con position sen ound ISOR POWE ver position se	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	
NO >> Re .CHECK GE. Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC .CHECK GE. Turn ignitic Disconnect Check the	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor position sensor Termin 3 n result norm O TO 8. O TO 8. O TO 8. O TO 3. AR LEVER F on switch OFI t ECM harner continuity be	POSITION SEN position sensor reen gear lever al Gro nal? POSITION SEN F. ss connector.	ISOR POWE harness con position sen ound NSOR POWE	nector. sor harness co Voltage (V) Approx. 5	onnector and grou	
NO >> Re CHECK GE Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC NO >> GC CHECK GE Turn ignitic Disconnect Check the Gear lever pos Connector F57	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 0 TO 8. 0 TO 8. 0 TO 3. AR LEVER F on switch OFI t ECM harner continuity be sition sensor Terminal 3	POSITION SEN position sensor reen gear lever al Gro nal? POSITION SEN F. ss connector. tween gear lev EC Connector F102	ISOR POWE harness con position sen ound NSOR POWE ver position se cm Terminal	nector. sor harness co Voltage (V) Approx. 5 R SUPPLY CI ensor harness Continuity	onnector and grou	
NO >> Re CHECK GE Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC CHECK GE Turn ignitic Disconnect Check the Gear lever pos Connector F57 the inspectio YES >> GC	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Terminal 0 TO 8. 0 TO 8. 0 TO 8. 0 TO 8. 0 TO 3. AR LEVER F on switch OFI t ECM harner continuity be sition sensor Terminal 3 n result norm 0 TO 4.	POSITION SEN position sensor reen gear lever al Gro al Gro mal? POSITION SEN F. ss connector. tween gear lev EC Connector F102 mal?	ISOR POWE harness con position sen ound NSOR POWE ver position se cm Terminal	nector. sor harness co Voltage (V) Approx. 5 R SUPPLY CI ensor harness Continuity	onnector and grou	
NO >> Re CHECK GE. Disconnect Turn ignitic Check the Gear lever Connector F57 the inspectio YES >> GC OCHECK GE. Turn ignitic Disconnector Gear lever pos Connector F57 the inspectio YES >> GC NO >> GC Check the Gear lever pos Connector F57 Sthe inspectio YES >> GC NO >> Re	pair or replace AR LEVER F t gear lever p on switch ON voltage betw position sensor Termin 3 n result norm O TO 8. O TO 8. O TO 3. AR LEVER F on switch OFf t ECM harner continuity be sition sensor Terminal 3 n result norm O TO 4. pair open cir	POSITION SEN position sensor reen gear lever al Gro al Gro mal? POSITION SEN F. ss connector. tween gear lev EC Connector F102 mal?	ISOR POWE harness con position sen ound JSOR POWE ver position se ver position se ZM Terminal 74	nector. sor harness co Voltage (V) Approx. 5 R SUPPLY CI ensor harness Continuity Existed	RCUIT-II	

### **P0820 GEAR LEVER POSITION SENSOR**

EC	CM	Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
1 101	46	CKP sensor (POS)	F2	I
F102	74	Gear lever position sensor	F57	3
	103	APP sensor	E112	6
M107	107	EVAP control system pressure sensor	B30	3
	107	Refrigerant pressure sensor	E172	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-309, "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-386. "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-343. "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>HAC-57, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 7.

**7.**REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-4, "Exploded View".

#### >> INSPECTION END

#### $\mathbf{8}$ . CHECK GEAR LEVER POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

3. Check the continuity between gear lever position sensor harness connector and ECM harness connector.

Gear lever p	osition sensor	E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F57	1	F102	88	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.

 ${f 9.}$  CHECK GEAR LEVER POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between gear lever position sensor harness connector and ECM harness connector.

### **P0820 GEAR LEVER POSITION SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Gear lever po	sition sensor	EC	M		
Connector	Terminal	Connector	Terminal	Continuity	_
F57	2	F101	26	Existed	
F37	4	FIUI	27	Existed	
		short to ground	and short to	oower.	
	on result norm	al?			
	O TO 10. Poair open circ	cuit short to are	ound or short	to power in harness or conn	ectors
		POSITION SE			
		nt Inspection".			
s the inspection					
	O TO 12.				
	O TO 11.				
		ER POSITION S			
Replace gear l	ever position	sensor. Refer to	o <u>TM-36, "Ex</u>	<u>oloded View"</u> .	
ss IN	SPECTION E	ND			
		ON SHIFT CON	ITROL		
	7, "Inspection"				<u> </u>
	on result norm				
YES >> G	O TO 13.				
	epair or replac				
		NT INCIDENT			
Refer to GI-44	<u>, "Intermittent</u>	Incident".			
>> IN	SPECTION E	ND			
Component	t Inspectior	า			INFOID:000000010839700
.CHECK GE	AR LEVER P	OSITION SEN	SOR-I		
	on switch OFF				
2. Disconnec	t gear lever p	osition sensor I			
		er to <u>TM-36, "E</u> or for chipping.	xploded view		
s the inspection					•••
	O TO 2.				
NO >> G(	O TO 3.				H
					JMBIA2061ZZ
		OSITION SEN		L	JWBIA200122

Check resistance between gear lever position sensor terminals as per the following items.

Terminals (Polarity)

Resistance ( $\Omega$ )

### **P0820 GEAR LEVER POSITION SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

1 (+) - 2 (-)	
1 (+) - 3 (-)	
1 (+) - 4 (-)	Except 0 or ∞ [at 25°C (77°F)
2 (+) - 3 (-)	
2 (+) - 4 (-)	
3 (+) - 4 (-)	

Is the inspection result normal?

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

**3.**REPLACE GEAR LEVER POSITION SENSOR

Replace gear lever position sensor. Refer to TM-36, "Exploded View".

>> INSPECTION END

#### < DTC/CIRCUIT DIAGNOSIS >

### P0830 CLUTCH INTERLOCK SWITCH

#### Description

When the clutch pedal is depressed, clutch interlock switch turns ON and clutch pedal position switch turns OFF. ECM detects the state of the clutch pedal by those two types of input (ON/OFF signal).

### DTC Logic

INFOID:000000010839702

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition	
P0830	Clutch interlock switch	A)	ON signals from the clutch interlock switch and the clutch pedal position switch are sent to the ECM at the same time.	<ul> <li>Harness or connectors (Clutch interlock switch circuit is open or shorted.) (Clutch pedal position switch circuit is open or shorted.)</li> <li>Clutch interleade switch</li> </ul>
	circuit	B)	Clutch interlock switch ON signal is not sent to ECM for extremely long time.	<ul> <li>Clutch interlock switch</li> <li>Clutch pedal position switch</li> <li>Incorrect clutch interlock switch installation</li> <li>Incorrect clutch pedal position switch installation</li> </ul>
DTC CO	NFIRMATION PROC	CED	DURE	
1.PREC	ONDITIONING			
before cor 1. Turn i 2. Turn i 3. Turn i <b>TESTING</b>	nducting the next test. gnition switch OFF ar gnition switch ON. gnition switch OFF ar <b>CONDITION:</b>	nd w nd w	vait at least 10 seconds. vait at least 10 seconds.	d, always perform the following procedure ery voltage is more than 10 V at idle.
>	> GO TO 2.			
2.PERFC	ORM DTC CONFIRM	ATIC	ON PROCEDURE FOR MALFU	INCTION A
<ol> <li>Fully</li> <li>Fully</li> <li>Fully</li> <li>Repeated</li> </ol>	gnition switch ON. depress clutch pedal. release clutch pedal. at steps 2 and 3 for fiv < DTC.	/e ti	mes.	
Is DTC de				
	→ Go to <u>EC-402, "Dia</u> → GO TO 3.	<u>gno</u>	ISIS Procedure".	
3.PERFC	ORM DTC CONFIRM	ATIC	ON PROCEDURE FOR MALFL	INCTION B
	omponent function ch	eck	. Refer to EC-401, "Componen	t Function Check".
	ponent function che DTC might not be co			of the clutch switch circuit. During this
	ection result normal?			
	INSPECTION END Go to <u>EC-402, "Dia</u>		sis Procedure".	
Compor	nent Function Ch	ecł	K	INF0ID:000000010839703
<b>1.</b> PERFC	ORM COMPONENT F	UN	CTION CHECK FOR MALFUN	CTION B
With C	ONSULT			

1. Turn ignition switch ON.

2. Select "CPP SW" and "CLUTCH INTLCK SW" in "DATA MONITOR" mode with CONSULT.

### EC-401

# [VQ37VHR]

INFOID:000000010839701

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#### < DTC/CIRCUIT DIAGNOSIS >

#### 3. Check "CPP SW" and "CLUTCH INTLCK SW" indication under the following conditions.

Monitor item	C	Condition	Indication
CPP SW		Fully released	ON
CFF SW	Clutch pedal	Fully depressed	OFF
CLUTCH INTLCK SW	Ciuton pedai	Fully released	OFF
GEOTOITINTECK SW		Fully depressed	ON

#### **Without CONSULT**

1. Turn ignition switch ON.

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

	ECM						
	+	-	-	C	ondition	Voltage (V)	
Connector	Terminal	Connector	Terminal				
	41				Fully released	Approx. 0	
F101	(Clutch pedal position switch signal)	M107	128	Fully de	Fully depressed	Battery voltage	
	42			Clutch pedal Fully released		Approx. 0	
	(Clutch interlock switch signal)				Fully depressed	Battery voltage	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>EC-402</u>, "Diagnosis Procedure".

#### **Diagnosis Procedure**

INFOID:000000010839704

#### **1.**CHECK OVERALL FUNCTION-I

#### With CONSULT

1. Turn ignition switch ON.

2. Select "CPP SW" in "DATA MONITOR" mode with CONSULT.

3. Check "CPP SW" indication under the following conditions.

Monitor item	Co	ndition	Indication
CPP SW	Clutch pedal	Fully released	ON
CFF SW	Clutch pedal	Fully depressed	OFF

#### **Without CONSULT**

1. Turn ignition switch ON.

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

	ECM					
	+		_		Condition	
Connector	Terminal	Connector	Terminal			
=	41				Fully released	Approx. 0
F101	(Clutch pedal position switch signal)	M107	128	Clutch pedal	Fully depressed	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

#### (I) With CONSULT

Select "CLUTCH INTLCK SW" and check indication under the following conditions.

### EC-402

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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EC

Monitor item	Cor	ndition	Indication
CLUTCH INTLCK SW	Clutch podal	Fully released	OFF
CLUTCH INTLOK SW	Ciulon peual	Fully depressed	ON

### **Without CONSU**

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

ECM				ECM	
– Condition Voltage (	_ Conc	_	-	+	
Terminal Connector Terminal	ector Terminal	Terminal	Connector	Terminal	Connector
	07 128 Clutch pedal	128	M107	42 (Clutch interlock switch signal)	F101
on result normal?			mal?		the inspe
O TO 12. O TO 7.				GO TO 12. GO TO 7.	YES >> NO >>
UTCH PEDAL POSITION SWITCH GROUND CIRCUIT FOR OPEN AND	SITION SWITCH GROUND CI	ON SWITC	AL POSITI	CLUTCH PED/	CHECK
on switch OFF. ct clutch pedal position switch harness connector. continuity between clutch pedal position switch harness connector and gro			al position		. Discon
lal position switch	Oracina de Caratianita	Oneveral	ch	pedal position swit	Clutch
Ground Continuity	Ground Continuity	Ground	nal	or Termi	Connec
2 Ground Existed	Ground Existed	Ground		2	E108
on result normal? O TO 4. epair open circuit or short to power in harness or connectors.	or short to power in harness or	ort to powe		GO TO 4.	YES >>
O TO 4.	OSITION SWITCH INPUT SIGN	ON SWITC	rcuit or she AL POSITI	GO TO 4. Repair open c CLUTCH PED/ nect ECM harn	YES >> NO >> 1.CHECK
O TO 4. epair open circuit or short to power in harness or connectors. UTCH PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN et ECM harness connector. continuity between clutch pedal position switch harness connector and E	DSITION SWITCH INPUT SIGN onnector. en clutch pedal position switch	ON SWITC ctor. utch pedal	rcuit or she AL POSITI	GO TO 4. Repair open c CLUTCH PED/ nect ECM harn	YES >> NO >> 1.CHECK Discon 2. Check tor.
O TO 4. epair open circuit or short to power in harness or connectors. UTCH PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN et ECM harness connector. e continuity between clutch pedal position switch harness connector and E	ECM	ON SWITC ctor. utch pedal ECM	rcuit or sho AL POSITI ess connec etween clu	GO TO 4. Repair open c CLUTCH PED/ nect ECM harm the continuity b	YES >> NO >> 1.CHECK Discon 2. Check tor.
O TO 4. epair open circuit or short to power in harness or connectors. UTCH PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN et ECM harness connector. continuity between clutch pedal position switch harness connector and E continuity between clutch pedal position switch harness connector and E continuity between clutch pedal position switch harness connector and E continuity between clutch pedal position switch harness connector and E continuity between clutch pedal position switch harness connector and E	SITION SWITCH INPUT SIGN         onnector.         en clutch pedal position switch         ECM         nnector       Terminal         F101       41       Exister	ON SWITC ctor. utch pedal ECM or Term 4	rcuit or she AL POSITH ess connec etween clu Connecto F101	GO TO 4. Repair open c CLUTCH PED/ nect ECM harn the continuity b al position switch Terminal 1	YES >> NO >> 1.CHECK . Discon 2. Check tor. Clutch peo Connector E108
O TO 4. epair open circuit or short to power in harness or connectors. UTCH PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN et ECM harness connector. continuity between clutch pedal position switch harness connector and E continuity between clutch pedal position switch harness connector and E continuity terminal Connector Terminal 1 F101 41 Existed k harness for short to ground and short to power. con result normal? O TO 6. O TO 5. IALFUNCTIONING PART	DSITION SWITCH INPUT SIGN         onnector.         en clutch pedal position switch         ECM         Innector         Terminal         F101       41         Exister         t to ground and short to power.	ON SWITC ctor. utch pedal ECM or Tern 4 ground and	rcuit or she AL POSITH ess connect etween clu Connecto F101 r short to g mal? DNING PAR	GO TO 4. Repair open c CLUTCH PED/ nect ECM harn the continuity b al position switch Terminal 1 eck harness fo ction result nor GO TO 6. GO TO 5. MALFUNCTIC pollowing.	YES >> NO >> 4.CHECK 1. Discon 2. Check tor. Clutch pec Connector E108 3. Also ch Is the inspec YES >> NO >> 5.DETEC Check the

Refer to <u>EC-405</u>. "Component Inspection (Clutch Pedal Position Switch)". Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 12.

NO >> Replace clutch pedal position switch.

### 7. CHECK CLUTCH INTERLOCK SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect clutch interlock switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between clutch interlock switch harness connector and ground.

Clutch inte	rlock switch	Ground	Voltage (V)	
Connector	Terminal	Ground	voltage (v)	
E111	1	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 E106, M6
- Fuse block (J/B) connector M1
- 10 A fuse (No. 9)
- Harness for open or short between clutch interlock switch and fuse

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

### 9. Check clutch interlock switch input signal circuit for open and short

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

3. Check the continuity between clutch interlock switch harness connector and ECM harness connector.

Clutch inte	rlock switch	E	Continuity	
Connector	Terminal	Connector Terminal		
E111	2	F101	42	Existed

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

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors E3, F1

• Harness for open or short between clutch interlock switch and ECM

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

### 11.CHECK CLUTCH INTERLOCK SWITCH

Refer to EC-405. "Component Inspection (Clutch Interlock Switch)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace clutch interlock switch.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

>> INSPECTION END

#### < DTC/CIRCUIT DIAGNOSIS >

### Component Inspection (Clutch Pedal Position Switch)

[VQ37VHR INFOID:000000010839705

### 1. CHECK CLUTCH PEDAL POSITION SWITCH-I

- Turn ignition switch OFF. 1.
- 2. Disconnect clutch pedal position switch harness connector.
- 3. Check the continuity between clutch pedal position switch terminals under the following conditions.

Terminals	С	ondition	Continuity
1 and 2	Clutch podal	Fully released	Existed
	Clutch pedal	Fully depressed	Not existed

Is the inspection result normal?

	YES	>> INSPECTION END
--	-----	-------------------

NO >> GO TO 2.

### 2. CHECK CLUTCH PEDAL POSITION SWITCH-II

- Adjust clutch pedal position switch installation. Refer to CL-8, "Inspection and Adjustment". 1.
- Check the continuity between clutch pedal position switch terminals under the following conditions. 2.

				-
Terminals	C	ondition	Continuity	
1 and 2	Clutch podol	Fully released	Existed	—
T and Z	Clutch pedal	Fully depressed	Not existed	
s the inspe	ction result n	ormal?		—
NO >>	•	N END tch pedal positic tion (Clutch		vitch)
1.снеск	CLUTCH INT	FERLOCK SWIT	СН-І	
2. Disconr		terlock switch h		or. h terminals under the following conditions.
Terminals	Cor	dition	Continuity	

1 and 2	Clutch pedal	Fully released	Not existed	
		Fully depressed	Existed	

#### Is the inspection result normal?

YES	>> INSPECTION END
-	

### 2. CHECK CLUTCH INTERLOCK SWITCH-II

- Adjust clutch interlock switch installation. Refer to CL-8. "Inspection and Adjustment". 1.
- Check the continuity between clutch interlock switch terminals under the following conditions. 2.

Terminals	C	Continuity	
1 and 2	Clutch pedal	Fully released	Not existed
	oluteri pedal	Fully depressed	Existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace clutch interlock switch. А

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#### < DTC/CIRCUIT DIAGNOSIS >

### P0833 CPP SWITCH

### Description

INFOID:000000010839707

[VQ37VHR]

When the clutch pedal is depressed, clutch interlock switch turns ON and clutch pedal position switch turns OFF. ECM detects the state of the clutch pedal by those two types of input (ON/OFF signal).

### DTC Logic

INFOID:000000010839708

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition		Possible cause
P0833	Clutch pedal position	A)	ON signals from the clutch pedal po- sition switch and the clutch interlock switch are sent to the ECM at the same time.		Harness or connectors (Clutch pedal position switch circuit is open or shorted.) (Clutch interlock switch circuit is open or shorted.)
switch circuit	B)	Clutch pedal position switch ON sig- nal is not sent to ECM for extremely long time.	•	Clutch pedal position switch Clutch interlock switch Incorrect clutch pedal position switch installation Incorrect clutch interlock switch installation	

#### 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 FOR MALFUNCTION A

- 1. Turn ignition switch ON.
- 2. Fully depress clutch pedal.
- 3. Fully release clutch pedal.
- 4. Repeat steps 2 and 3 for five times.
- 5. Check DTC.

Is DTC detected?

YES >> Go to EC-407, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

Perform component function check. Refer to <u>EC-406, "Component Function Check"</u>.

#### NOTE:

# Use component function check to check the overall function of the clutch switch circuit. During this check, a DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-407, "Diagnosis Procedure".

#### Component Function Check

INFOID:000000010839709

#### **1.**PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

#### With CONSULT

1. Turn ignition switch ON.

2. Select "CPP SW" and "CLUTCH INTLCK SW" in "DATA MONITOR" mode with CONSULT.

### EC-406

#### < DTC/CIRCUIT DIAGNOSIS >

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INFOID:000000010839710

#### 3. Check "CPP SW" and "CLUTCH INTLCK SW" indication under the following conditions.

Monitor item	C	Indication	
CPP SW		Fully released	ON
CFF SW	- Clutch pedal	Fully depressed	OFF
CLUTCH INTLCK SW		Fully released	OFF
CLOTOIT INTLOK SW		Fully depressed	ON

#### **Without CONSULT**

1. Turn ignition switch ON.

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

ECM						
	+	-	-	c	ondition	Voltage (V)
Connector	Terminal	Connector	Terminal	al		
	41				Fully released	Approx. 0
F101	(Clutch pedal position switch signal)	M107	128	Clutch pedal	Fully depressed	Battery voltage
	42	MITO/	120	120 Oluton podul	Fully released	Approx. 0
	(Clutch interlock switch signal)				Fully depressed	Battery voltage

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-407, "Diagnosis Procedure".

#### **Diagnosis Procedure**

#### 1.CHECK OVERALL FUNCTION-I

#### () With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "CPP SW" in "DATA MONITOR" mode with CONSULT.
- 3. Check "CPP SW" indication under the following conditions.

Monitor item	Co	Indication	
CPP SW	Clutch pedal	Fully released	ON
CPP SW	Ciuton pedal	Fully depressed	OFF

#### **Without CONSULT**

1. Turn ignition switch ON.

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

	ECM						١
	+	-	-	Co	ndition	Voltage (V)	
Connector	Terminal	Connector	Terminal				
_	41				Fully released	Approx. 0	(
F101	(Clutch pedal position switch signal)	M107	128	Clutch pedal	Fully depressed	Battery voltage	-
s the insp	ection result normal	?					F

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

#### With CONSULT

Select "CLUTCH INTLCK SW" and check indication under the following conditions.

#### < DTC/CIRCUIT DIAGNOSIS >

Monitor item	Condition		Indication
CLUTCH INTLCK SW	Clutch pedal	Fully released	OFF
	Ciuton pedal	Fully depressed	ON

#### **Without CONSULT**

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

ECM				Condition		Voltage (V)
+ –						
Connector	Terminal	Connector	Terminal			
	42			<b>.</b>	Fully released	Approx. 0
F101	(Clutch interlock switch signal)	M107	128 Clutch pedal		Fully depressed	Battery voltage

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

## ${f 3.}$ CHECK CLUTCH PEDAL POSITION SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect clutch pedal position switch harness connector.
- 3. Check the continuity between clutch pedal position switch harness connector and ground.

Clutch pedal	oosition switch	Ground	Continuity
Connector	Terminal	Ground	Continuity
E108	2	Ground	Existed

4. 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 CLUTCH PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check the continuity between clutch pedal position switch harness connector and ECM harness connector.

Clutch pedal	position switch	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E108	1	F101	41	Existed

3. 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 E3, F1

Harness for open or short between clutch pedal position switch and ECM

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

#### **6.**CHECK CLUTCH PEDAL POSITION SWITCH

Refer to <u>EC-405</u>, "Component Inspection (Clutch Pedal Position Switch)". Is the inspection result normal?

#### EC-408

DTC/CIRCUIT	DIAGNOS	SIS >	1 0055 C		[VQ37VHR]
YES >> GO T					
- · ·		pedal positio			
CHECK CLUT	CH INTER	RLOCK SWIT	CH POWE	R SUPPLY CIR	(CUIT
. Turn ignition . Disconnect c	lutch interl	ock switch ha	arness coni	nector.	
. Turn ignition . Check the vo			torlook owi	tob bornooo oor	anastar and ground
Check the vo	litage betw	een clutch in	teriock swi	tch namess cor	nnector and ground.
Clutch inter	look owitch				-
Connector	Termin		Ground	Voltage (V)	
E111	1		Ground	Battery voltage	-
	-		fiouriu	Ballery vollage	-
the inspection 'ES >> GO 1 IO >> GO 1	FO 9.	<u>181 (</u>			
DETECT MAL	FUNCTIO	NING PART			
neck the followi					
larness conne	ctors E106				
Fuse block (J/B		or M1			
10 A fuse (No. 9		hetween clu	tch interloc	k switch and fus	20
		between old		R Switch and ru	
	ir onon oir	auit abart ta	around or a	abort to power i	n hornoon or connectors
•	•		-	•	n harness or connectors.
CHECK CLUT	CHINIER	RLOCK SWIT	CH INPUT	SIGNAL CIRC	UIT FOR OPEN AND SHORT
Turn ignition					
Disconnect E				witch harpoon o	connector and ECM barness connector
			IIIIEIIUCK S	witch hamess t	connector and ECM harness connector.
Clutch interlock	switch	F	СМ		-
	Terminal	Connector	Terminal	Continuity	
E111	2	F101	42	Existed	_
					-
Also check h		-	nd and sho	ort to power.	
the inspection		<u>nal?</u>			
'ES >> GO 1 IO >> GO 1					
-			Ŧ		
O.DETECT M	ALFUNCTI	ONING PAR			
eck the followi					
larness conne			امما المنامية	k awitah and EC	~~~
namess for ope	en or short	between clu	ICH INTERIOC	k switch and EC	
		مباط مام مند	ana	hart to serve '	
	-		-	snort to power I	n harness or connectors.
<b>1</b> .CHECK CLU	JTCH INTE	ERLOCK SW	ITCH		
efer to <u>EC-410.</u>	"Compone	ent Inspection	n (Clutch In	terlock Switch)'	
the inspection		-			
/ES >> GO 1	ΓO 12.				
		interlock swi			
2.CHECK INT	ERMITTE	NT INCIDEN	Т		
ofor to CL 11 "I					

Refer to GI-44, "Intermittent Incident".

>> INSPECTION END

#### < DTC/CIRCUIT DIAGNOSIS >

### Component Inspection (Clutch Pedal Position Switch)

[VQ37VHR]

INFOID:0000000010839711

### 1. CHECK CLUTCH PEDAL POSITION SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect clutch pedal position switch harness connector.
- 3. Check the continuity between clutch pedal position switch terminals under the following conditions.

Terminals	С	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
i anu z	Clutch pedal	Fully depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK CLUTCH PEDAL POSITION SWITCH-II

- 1. Adjust clutch pedal position switch installation. Refer to CL-8, "Inspection and Adjustment".
- 2. Check the continuity between clutch pedal position switch terminals under the following conditions.

Terminals	С	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
		Fully depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace clutch pedal position switch.

### Component Inspection (Clutch Interlock Switch)

INFOID:000000010839712

### 1. CHECK CLUTCH INTERLOCK SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect clutch interlock switch harness connector.
- 3. Check the continuity between clutch interlock switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Not existed
	Clutch pedal	Fully depressed	Existed

Is the inspection result normal?

#### YES >> INSPECTION END

NO >> GO TO 2.

### 2. CHECK CLUTCH INTERLOCK SWITCH-II

- 1. Adjust clutch interlock switch installation. Refer to <u>CL-8</u>, "Inspection and Adjustment".
- 2. Check the continuity between clutch interlock switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Not existed
r and z	Ciutori pedar	Fully depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace clutch interlock switch.

#### < DTC/CIRCUIT DIAGNOSIS >

### P0850 PNP SWITCH

### Description

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM.(A/ T models)

When the selector lever position is Neutral position, park/neutral position (PNP) switch is ON.(M/T models) ECM detects the position because the continuity of the line (the ON signal) exists.

### DTC Logic

INFOID:000000010839714

### 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.	<ul> <li>Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.]</li> <li>Park/neutral position (PNP) switch (M/T models)</li> <li>TCM (A/T models)</li> </ul>
DTC CON	FIRMATION PROCI	EDURE	
1.INSPEC	TION START		
Do you hav	e CONSULT?		
•	<u>e CONSULT?</u>		
	• GO TO 2. • GO TO 5.		
•	NDITIONING		
If DTC Co before cond	nfirmation Procedure ducting the next test.	has been previously conducted, alwa	ays perform the following procedure
	nition switch OFF and nition switch ON.	wait at least 10 seconds.	
		wait at least 10 seconds.	
	00 70 0		
•	GO TO 3. PNP SWITCH SIGNA		
2. Select	nition switch ON.	ATA MONITOR" mode with CONSULT. 1 s.	Then check the "P/N POSI SW" signal
Posi	ition (Selector lever)	Known-good signal	
N or P positi Neutral posi		ON	
Except abov	e position	OFF	(
-	ection result normal?		
	<ul> <li>GO TO 4.</li> <li>Go to <u>EC-412, "Diag</u></li> </ul>	nosis Procedure".	
	RM DTC CONFIRMAT		
<ol> <li>Select</li> <li>Start et</li> <li>Mainta</li> <li>CAUTI</li> </ol>	"DATA MONITOR" mongine and warm it up to the following condition of the fol	ode with CONSULT. to normal operating temperature. tions for at least 50 consecutive seconds	S.

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#### < DTC/CIRCUIT DIAGNOSIS >

ENG SPEED	1,400 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-412, "Diagnosis Procedure".

NO >> INSPECTION END

**5.**PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-412, "Component Function Check".

#### NOTE:

Use component function check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-412, "Diagnosis Procedure".

### **Component Function Check**

INFOID:000000010839715

### **1.**PERFORM COMPONENT FUNCTION CHECK

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM					
Connector	+	_	Condition		Voltage (V)
Connector	Terminal	Terminal			
M107	109	128	Selector lever	P or N (A/T) Neutral (M/T)	Battery voltage
WITO7				Except above	Approx. 0

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-412, "Diagnosis Procedure".

### **Diagnosis Procedure**

INFOID:000000010839716

### **1.**INSPECTION START

Check which type of transmission the vehicle is equipped with.

Which type of transmission?

A/T >> GO TO 2.M/T >> GO TO 7.

2. СНЕСК DTC WITH TCM

Refer to TM-203, "Diagnosis Description".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START. Does starter motor operate?

< DTC/CIR	RCUIT DIA	GNOSIS	>		[VQ37VHR]	
	> GO TO 4 > Check D <u>MON ITE</u>	TC with B	CM. Refe	er to <u>BCS-</u>	20, "COMMON ITEM : CONSULT Function (BCM - COM-	A
<b>4.</b> CHECK	PNP INP	UT SIGNA		T FOR O	PEN AND SHORT	
<ol> <li>Discon</li> <li>Discon</li> </ol>	nect ECM	assembly h harness o	connector.		arness connector and ECM harness connector.	EC C
A (T					-	
A/T ass	-	EC		Continuity		D
Connector F51	Terminal 9	Connector M107	Terminal 109	Existed	-	
	_	_			- ort to power.	_
Is the inspe			-			E
	> GO TO 6					
_	> GO TO 5					F
5.DETEC		NCTIONIN	IG PART			
<ul><li>Check the</li><li>Harness</li></ul>		s F1 F3				G
<ul> <li>Harness</li> </ul>	connector	s E106, M				
<ul> <li>Harness</li> </ul>	for open o	or short bet	tween A/T	assembly	and ECM	
	Popair o	non circuit	short to	around or	short to power in harness or connectors.	Н
<b>6.</b> CHECK		•		ground of	short to power in namess of connectors.	
Refer to GI						
	<u>-44, IIIICI</u>		<u>Juent</u> .			
>>	> INSPEC		)			J
7.снеск	PNP SWI	TCH POV	VER SUPI	PLY CIRC	UIT	
1. Turn ig	nition swit	tch OFF.				V
			sition (PN	P) switch	harness connector.	Κ
	nition swit the voltag		n PNP swi	tch harnes	ss connector and ground.	
	0				J. J	L
PNP	switch	Ground	Voltag	e		
Connector	Terminal	Cround	_			M
F55	2	Ground	Battery vo	oltage		
Is the inspe			-			NI
	> GO TO 9 > GO TO 8					Ν
8.DETEC	T MALFU	NCTIONIN	IG PART			
Check the						0
<ul> <li>Harness</li> </ul>	connector	s E3, F1				
<ul> <li>10 A fuse</li> <li>IPDM E/F</li> </ul>		connector	. E2			Ρ
Harness				P switch a	nd fuse	
	_					
•	•	•		-	short to power in harness or connectors.	
J.CHECK	PNP INP	UT SIGNA	L CIRCU	I FOR O	PEN AND SHORT	

1.

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

#### < DTC/CIRCUIT DIAGNOSIS >

3. Check the continuity between PNP switch harness connector and ECM harness connector.

PNP switch		EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F55	1	M107	109	Existed

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

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F103, M116

• Harness for open or short between PNP switch and ECM

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

**11.**CHECK PNP SWITCH

Refer to TM-18, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace PNP switch.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace.

### P100A, P100B VVEL SYSTEM

#### < 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-427, "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-197</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.	<ul> <li>VVEL actuator motor</li> <li>VVEL actuator sub assembly</li> <li>VVEL ladder assembly</li> <li>VVEL control module</li> </ul>	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	engine.

2. Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.

- 3. Wait at idle for 5 seconds or more.
- 4. Repeat steps 2 to 3 for three times.
- 5. Check 1st trip DTC.

#### Is DTC detected?

### YES >> Go to EC-415, "Diagnosis Procedure".

NO >> INSPECTION END

#### Diagnosis Procedure

**1.**CHECK GROUND CONNECTION

Turn ignition switch OFF.
 Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.vvel actuator motor output signal circuit for open and short

1. Disconnect VVEL control module harness connector.

2. Disconnect VVEL actuator motor harness connector.

3. Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

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### P100A, P100B VVEL SYSTEM

#### < DTC/CIRCUIT DIAGNOSIS >

DTC No.	V	VEL control mode	ule	VVEL actuator motor		Continuity
	Bank	Connector	Terminal	Connector	Terminal	Continuity
			40		1	Existed
P100A	1		12	F48	2	Not existed
FIUUA	I	E15	25	140	1	Not existed
					2	Existed
		EIS	2	2 F49	1	Existed
<b>D100</b>	2				2	Not existed
P100B	2		15	Г49	1	Not existed
					2	Existed

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

Harness for open or short between VVEL actuator motor and VVEL control module

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

**4.**CHECK VVEL ACTUATOR MOTOR

Refer to EC-417, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

**5.**REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-91, "Exploded View".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace.

**7.**REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to <u>EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL</u> <u>UNIT (VVEL CONTROL MODULE) : Special Repair Requirement"</u>.

>> GO TO 8.

**8.**PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-415, "DTC Logic"</u>.

Is the DTC P100A or P100B displayed again?

YES >> GO TO 9.

NO >> INSPECTION END

### P100A, P100B VVEL SYSTEM

< DTC/CIRCUIT DIAGN	OSIS >		[VQ37VHR]
9. CHECK VVEL ACTUA	TOR SUB ASSEMBLY		0
Refer to EC-417, "Compo	ment Inspection (VVEL ACTU	ATOR SUB ASSEMBLY)".	A
Is the inspection result no	ormal?		
YES >> GO TO 11.			EC
NO >> GO TO 10.			
	TUATOR SUB ASSEMBLY		
Replace VVEL actuator s	ub assembly. Refer to <u>EM-91</u> ,	<u>"Exploded View"</u> .	0
>> INSPECTION			D
<b>11.</b> CHECK VVEL LADE	ER ASSEMBLY		
Refer to EM-101, "Inspec	<u>tion"</u> .		
Is the inspection result no	ormal?		E
YES >> GO TO 13. NO >> GO TO 12.			
	ER HEAD, VVEL LADDER AS	SEMBLY AND VVEL ACTUATOR SUE	ASSEMBLY
Replace cylinder head, V	VEL ladder assembly and VVI	EL actuator sub assembly. Refer to $\underline{\sf EM}$	
View" and EM-91, "Explo	<u>ded View"</u> .		G
>> INSPECTION			
13. CHECK INTERMITT	ENT INCIDENT		Н
Refer to GI-44, "Intermitte	<u>ent Incident"</u> .		
>> INSPECTION	I END		I
	ion (VVEL ACTUATOR	MOTOR)	INFOID:000000010839719
1. CHECK VVEL ACTUA	,		J
	tuator motor harness connecto ween VVEL actuator motor te		K
VVEL actuator motor		-	L
Terminal	Resistance		
1 and 2	16 $\Omega$ or less	-	M
Is the inspection result no	ormal?	-	
YES >> INSPECTION	I END		
NO $>>$ GO TO 2.			Ν
	UATOR SUB ASSEMBLY ub assembly. Refer to <u>EM-91</u> ,	"Exploded View"	
			0
>> INSPECTION			
Component Inspect	ion (VVEL ACTUATOR	SUB ASSEMBLY)	INFOID:000000010839720
1.CHECK VVEL ACTUA	TOR SUB ASSEMBLY		
<ol> <li>Turn ignition switch C</li> <li>Remove VVEL actual</li> </ol>		1-92, "Disassembly and Assembly".	

3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

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

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-91, "Exploded View".

>> INSPECTION END

#### < 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 EC-423. "DTC Logic".

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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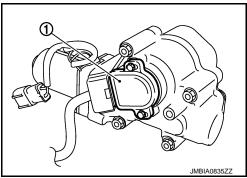
### P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

### P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

#### Description

VVEL control shaft position sensor (1) is placed on VVEL actuator sub assembly and detects the control shaft position angle. A magnet is pressed into the arm on the edge of control shaft. The magnetic field changes as the magnet rotates together with the arm resulting in the output voltage change of the sensor. VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.



[VQ37VHR]

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DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608. Refer to <u>EC-471, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1089	VVEL control shaft position sensor (bank 1) circuit	sensor is sent to VVEL control module.	
P1092	VVEL control shaft position sensor (bank 2) circuit	<ul> <li>An excessively high voltage from the sensor is sent to VVEL control module.</li> <li>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.</li> </ul>	<ul> <li>Harness or connectors (VVEL control shaft position sensor circuit is open or shorted.)</li> <li>VVEL control shaft position sensor</li> <li>VVEL control module</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### **1.**PRECONDITIONING

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

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

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

#### >> GO TO 2.

#### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

#### Is DTC detected?

- YES >> Go to EC-420, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

#### **1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

### EC-420

INFOID:000000010839724

### P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

	ion result nor	)SIS > mal?					37VHR]
	O TO 2. epair or repla	ace ground cor	nnection.				
		T POSITION		WER SUPPL	Y CIRCUIT		
. Disconne	ct VVEL con	trol shaft positi					
	ion switch OI		ntrol shaft po	sition sensor	harness conn	ector and ground.	
	o vonago sor		ind of offait po			ootor and ground.	
DTC No. Ba	VVEL	VVEL control shaft position sensor		Ground	Voltage (V)		
	Bank	Connector	Terminal	Clound	voltage (v)		
P1089	1	F46	3				
			6	Ground	Approx. 5		
P1092	2	F47	3				
(h. a. )			6			_	
	ion result nor iO TO 4.	mal?					
	60 TO 4. 60 TO 3.						
.DETECT N	/ALFUNCTIC	ONING PART					
neck the foll							
Harness cor	nnectors F1,						
Harness for				e			
>> R	epair open c	ircuit, short to	ground or sho	ort to power in	harness or c		
>> R •.CHECK V\ •. Turn igniti •. Disconne •. Check the	epair open c /EL CONTR( ion switch OI ct VVEL con	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL	ground or sho SITION SEN rness connec	ort to power in SOR GROUN tor.	harness or c ID CIRCUIT F		
>> R CHECK V Turn igniti Disconne Check the	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector.	ground or sho SITION SEN rness connec . control shaf	ort to power in SOR GROUN tor. t position ser	harness or c ID CIRCUIT F sor harness o	onnectors. OR OPEN AND SH	
>> R .CHECK V\ Turn igniti Disconne Check the	epair open c /EL CONTR ion switch OI ct VVEL cont e continuity I arness conne VVEL co	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector.	ground or sho SITION SEN rness connec control shaf	ort to power in SOR GROUN tor. t position ser	n harness or co ID CIRCUIT F nsor harness of trol module	onnectors. OR OPEN AND SH	
>> R CHECK V Turn igniti Disconne Check the module ha	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector.	ground or sho SITION SEN rness connec . control shaf	ort to power in SOR GROUN tor. t position ser	harness or c ID CIRCUIT F sor harness o	onnectors. OR OPEN AND SH connector and VVE	
>> R CHECK V Turn igniti Disconne Check the module ha	epair open c /EL CONTR ion switch OI ct VVEL cont e continuity I arness conne VVEL co	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector.	ground or sho SITION SEN rness connec control shaf	ort to power in SOR GROUN tor. t position ser VVEL con Connector	a harness or co ID CIRCUIT F nsor harness of trol module Terminal	onnectors. OR OPEN AND SH connector and VVE	
>> R .CHECK VV Turn igniti Disconne Check the module ha DTC No.	epair open c /EL CONTR ion switch OI ct VVEL cont e continuity b arness conne VVEL co Bank	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector. ontrol shaft position Connector F46	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2	ort to power in SOR GROUN tor. t position ser	trol module	onnectors. OR OPEN AND SH connector and VVE	
>> R • CHECK VV Turn igniti Disconne Check the module ha	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne VVEL cont Bank	ircuit, short to g OL SHAFT PO FF. trol module har between VVEL ector.	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2 5	ort to power in SOR GROUN tor. t position ser VVEL con Connector	trol module Terminal	onnectors. OR OPEN AND SH connector and VVE	
>> R .CHECK VV Turn igniti Disconne Check the module ha DTC No. P1089 P1092	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne VVEL co Bank 1 1	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector.	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2 5 2 5 5	ort to power in SOR GROUN tor. t position ser VVEL con Connector E15	trol module Terminal 4 17 6	onnectors. OR OPEN AND SH connector and VVE	
>> R •CHECK VV Turn igniti Disconne Check the module ha DTC No. P1089 P1092 Also chec	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne VVEL co Bank 1 1	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector. Dontrol shaft positio Connector F46 F47 r short to groun	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2 5 2 5 5	ort to power in SOR GROUN tor. t position ser VVEL con Connector E15	trol module Terminal 4 17 6	onnectors. OR OPEN AND SH connector and VVE	
>> R •CHECK VV Turn igniti Disconne Check the module ha DTC No. P1089 P1092 Also chece the inspecti YES >> G	epair open c /EL CONTR ion switch OI ct VVEL cont e continuity b arness conne VVEL co Bank 1 1 2 ck harness fo	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector. Dontrol shaft positio Connector F46 F47 r short to groun	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2 5 2 5 5	ort to power in SOR GROUN tor. t position ser VVEL con Connector E15	trol module Terminal 4 17 6	onnectors. OR OPEN AND SH connector and VVE	
>> R •CHECK VV Turn igniti Disconne Check the module ha DTC No. P1089 P1092 Also chect the inspecti YES >> G NO >> G	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 ck harness fo ion result nor io TO 6. io TO 5.	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector. ontrol shaft positio Connector F46 F47 r short to groun mal?	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2 5 2 5 5	ort to power in SOR GROUN tor. t position ser VVEL con Connector E15	trol module Terminal 4 17 6	onnectors. OR OPEN AND SH connector and VVE	
>> R •CHECK VV • Turn igniti Disconne Check the module ha DTC No. P1089 P1092 • Also check the inspecti YES >> G NO >> G •DETECT M	Lepair open c VEL CONTRO ion switch OI ct VVEL cont e continuity b arness conne VVEL co Bank 1 2 ck harness for ion result nor io TO 6. io TO 5. MALFUNCTIO	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector. Dontrol shaft positio Connector F46 F47 r short to groun	ground or sho SITION SEN rness connec control shaf n sensor Terminal 2 5 2 5 5	ort to power in SOR GROUN tor. t position ser VVEL con Connector E15	trol module Terminal 4 17 6	onnectors. OR OPEN AND SH connector and VVE	
>> R •CHECK VV Turn igniti Disconne Check the module ha DTC No. P1089 P1092 Also chect the inspecti YES >> G NO >> G •DETECT M heck the foll Harness cor	epair open c /EL CONTRO ion switch OI ct VVEL cont e continuity b arness conne VVEL cont e continuity b arness conne VVEL cont Bank 1 2 ck harness fo ion result nor ion TO 6. io TO 5. /ALFUNCTIO owing. nnectors F1,	ircuit, short to g OL SHAFT PO FF. trol module han between VVEL ector. Dontrol shaft positio Connector F46 F47 r short to grout mal? DNING PART E3	ground or sho SITION SEN rness connect control shaf n sensor Terminal 2 5 2 5 nd and power	ort to power in SOR GROUN tor. t position ser VVEL con Connector E15	a harness or ca ID CIRCUIT F nsor harness of trol module Terminal 4 17 6 19	onnectors. OR OPEN AND SH connector and VVE	

 $6. \ensuremath{\mathsf{VVel}}$  control shaft position sensor input signal circuit for open and short

1. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

### P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity	
	Bank	Connector	Terminal	Connector	Terminal	Continuity	
P1089	1	F46	1		3		
F 1009	I	F46	4	E15	16	Existed	
P1092	2	F47	1		5		
F 1092	2	Г47	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.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F1, E3

Harness for open or short between VVEL control shaft position sensor and VVEL control module

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

**8.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

**9.**REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to <u>EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL</u> UNIT (VVEL CONTROL MODULE) : Special Repair Requirement".

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-420, "DTC Logic"</u>.

Is the DTC P1089 or P1092 displayed again?

YES >> GO TO 11.

NO >> INSPECTION END

**11.**REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-91, "Exploded View".

>> INSPECTION END

### P1090, P1093 VVEL ACTUATOR MOTOR

#### < DTC/CIRCUIT DIAGNOSIS >

### 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-427, "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)	<ul> <li>Event angle difference between the actual and the target is detected.</li> <li>Abnormal current is sent to VVEL actuator motor.</li> </ul>	<ul> <li>(VVEL actuator motor circuit is open or shorted.)</li> <li>VVEL actuator motor</li> <li>VVEL actuator sub assembly</li> <li>VVEL ladder assembly</li> <li>VVEL control module</li> </ul>	

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

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

Turn ignition switch ON.

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

#### **TESTING CONDITION:**

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

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 10 second.

- 2. Keep the engine speed at about 3,500 rpm for at least 10 seconds under no load.
- 3. Check DTC.

#### Is DTC detected?

YES >> Go to <u>EC-423, "Diagnosis Procedure"</u>. NO >> INSPECTION END

### **Diagnosis Procedure**

**1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "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.

### EC-423

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### P1090, P1093 VVEL ACTUATOR MOTOR

#### < DTC/CIRCUIT DIAGNOSIS >

DTC No.	V	VEL control mode	ule	VVEL actuator motor		Continuity
DIC NO.	Bank	Connector	Terminal	Connector	Terminal	Continuity
			12		1	Existed
P1090	1			F48	E 49	Not existed
1 1030		E15 25	25	_	1	Not existed
			25		2	Existed
	2		2		1	Existed
P1093			2	F49	2	Not existed
			15	F49	1	Not existed
				G	2	Existed

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

Is the inspection result normal?

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

**3.**DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F1, E3

• Harness for open or short between VVEL actuator motor and VVEL control module

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

**4.**CHECK VVEL ACTUATOR MOTOR

Refer to EC-425, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

**5.**REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-91, "Exploded View".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace.

**7.**REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to <u>EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL</u> <u>UNIT (VVEL CONTROL MODULE) : Special Repair Requirement"</u>.

>> GO TO 8.

**8.**PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-423, "DTC Logic"</u>.

Is the DTC P1090 or P1093 displayed again?

YES >> GO TO 9.

NO >> INSPECTION END

### P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS > [VQ37\			
9. CHECK VVEL ACTUA	ATOR SUB ASSEMBLY		
Refer to EC-425, "Compo	onent Inspection (VVEL ACTU)	ATOR SUB ASSEMBLY)".	/-
Is the inspection result no			-
YES >> GO TO 11.			E
NO >> GO TO 10.			
1	CTUATOR SUB ASSEMBLY		
Replace VVEL actuator s	sub assembly. Refer to <u>EM-91,</u>	"Exploded View".	
>> INSPECTIO	N END		Γ
11.CHECK VVEL LAD	DER ASSEMBLY		L
Refer to EM-101, "Inspec	<u>tion"</u> .		
Is the inspection result no	ormal?		E
YES >> GO TO 13. NO >> GO TO 12.			
	ER HEAD, VVEL LADDER AS	SEMBLY AND VVEL ACTUATOR SUB	ASSEMBLY
		L actuator sub assembly. Refer to EM-	
View" and EM-91, "Explo			
>> INSPECTION 13.CHECK INTERMIT			ŀ
			1
Refer to GI-44, "Intermitte	<u>ent Incident"</u> .		
>> INSPECTIO	N END		
	tion (VVEL ACTUATOR	MOTOR)	NEO ID-000000040000700
	,		INFOID:000000010839728
<b>1.</b> CHECK VVEL ACTUA	ATOR MOTOR		
1. Turn ignition switch (			-
	tuator motor harness connecto tween VVEL actuator motor ter		1
VVEL actuator motor			I
Terminal	Resistance ( $\Omega$ )		
1 and 2	16 or less		Ν
Is the inspection result no	ormal?		I
YES >> INSPECTIO	N END		
NO >> GO TO 2.			1
2.REPLACE VVEL ACT	UATOR SUB ASSEMBLY		
Replace VVEL actuator s	sub assembly. Refer to EM-91,	"Exploded View".	(
>> INSPECTIO	N END		
Component Inspect	tion (VVEL ACTUATOR	SUB ASSEMBLY)	INFOID:000000010839729
1. CHECK VVEL ACTUA	ATOR SUB ASSEMBLY		
1. Turn ignition switch (			
2. Remove VVEL actua	ator sub assembly. Refer to <u>EM</u>	-92, "Disassembly and Assembly".	

3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

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

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-91, "Exploded View".

>> INSPECTION END

### P1091 VVEL ACTUATOR MOTOR RELAY

#### < DTC/CIRCUIT DIAGNOSIS >

### P1091 VVEL ACTUATOR MOTOR RELAY

#### Description

Power supply for the VVEL actuator motor is provided to the VVEL control module via VVEL actuator motor relay. VVEL actuator motor relay is ON/OFF controlled by the VVEL control module. In addition, when the VVEL actuator motor relay cannot be controlled by the VVEL control module for some reason, it ON/OFF controlled by ECM.

### DTC Logic

INFOID:000000010839731

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause		
P1091	VVEL actuator motor relay circuit	<ul> <li>VVEL control module detects the VVEL actuator motor relay is stuck OFF.</li> <li>VVEL control module detects the VVEL actuator motor relay is stuck ON.</li> </ul>	<ul> <li>Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.)</li> <li>VVEL actuator motor relay</li> <li>VVEL control module</li> <li>ECM</li> </ul>	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 more than 10 V at idle.

## 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-427, "Diagnosis Procedure"</u>. NO >> INSPECTION END

### Diagnosis Procedure

### **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 actua	tor motor relay	Ground	Voltage	
Connector	Terminal	Ground		
	1	- Ground Battery volta		
LIU	5	Cround	Dattery Voltage	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

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### P1091 VVEL ACTUATOR MOTOR RELAY

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## 2. DETECT MALFUNCTIONING PART

Check the following.

• 50 A fusible link (letter M)

• Harness for open or short between VVEL actuator motor relay and battery

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

### 3.VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-II

- 1. Disconnect VVEL control module harness connector.
- 2. Disconnect VVEL actuator motor relay harness connector.
- 3. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module		VVEL actuat	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E15	23	E16	2	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

#### **4.**VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module			VVEL actuator motor relay		Continuity
Bank	Connector	Terminal	Connector	Terminal	Continuity
1	E15	13	E16	з	Existed
2		1		5	LXISIEU

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

Is the inspection result normal?

YES >> GO TO 5.

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

 ${f 5.}$ CHECK VVEL ACTUATOR MOTOR RELAY

Refer to EC-429. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace VVEL actuator motor relay.

 $\mathbf{6}.$ CHECK ABORT CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between VVEL control module harness connector and ECM harness connector.

VVEL control module		E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E15	21	F101	28	Existed

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

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

#### ACTUATOR MOTOR RELAV

P1091 VVEL ACTUATO	
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
<ul><li>Check the following.</li><li>Harness connector E3, F1</li><li>Harness for open or short between ECM and VVEL con</li></ul>	trol module A
>> Repair open circuit, short to ground or short t $8.$ CHECK INTERMITTENT INCIDENT	o power in harness or connectors.
Refer to <u>GI-44, "Intermittent Incident"</u> .	
<u>Is the inspection result normal?</u> YES >> GO TO 9.	C
NO >> Repair or replace. 9.REPLACE VVEL CONTROL MODULE	D
<ol> <li>Replace VVEL CONTROL MODULE</li> <li>Replace VVEL control module.</li> <li>Go to EC-18, "ADDITIONAL SERVICE WHEN REP ULE) : Special Repair Requirement".</li> </ol>	LACING CONTROL UNIT (VVEL CONTROL MOD-
>> GO TO 10. <b>10.</b> PERFORM DTC CONFIRMATION PROCEDURE	F
<ol> <li>Turn ignition switch ON.</li> <li>Erase DTC.</li> </ol>	G
<ol> <li>Perform DTC Confirmation Procedure. See <u>EC-427, "DTC Logic"</u>.</li> <li><u>Is the DTC P1091 displayed again?</u></li> </ol>	Н
YES >> GO TO 11. NO >> INSPECTION END <b>11.</b> REPLACE ECM	I
<ol> <li>Replace ECM.</li> <li>Go to <u>EC-17, "ADDITIONAL SERVICE WHEN REF</u> <u>Requirement"</u>.</li> </ol>	PLACING CONTROL UNIT (ECM) : Special Repair J
>> INSPECTION END Component Inspection	INFOID:000000010839733
<b>1.</b> CHECK VVEL ACTUATOR MOTOR RELAY	L
<ol> <li>Turn ignition switch OFF.</li> <li>Remove VVEL actuator motor relay.</li> <li>Check the continuity between VVEL actuator motor in nals under the following conditions.</li> </ol>	relay termi-
Terminal Condition Continu	
3 and 5 12 V direct current supply between Exister	
No current supply Not exis	
<u>Is the inspection result normal?</u> YES >> INSPECTION END	
NO >> Replace VVEL actuator motor relay.	JMBIA0876ZZ

NO >> Replace VVEL actuator motor relay.

### P1148, P1168 CLOSED LOOP CONTROL

#### < DTC/CIRCUIT DIAGNOSIS >

## P1148, P1168 CLOSED LOOP CONTROL

### **DTC** Logic

#### DTC DETECTION LOGIC

#### NOTE:

DTC P1148 or P1168 is displayed with another 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.	<ul> <li>Harness or connectors (The A/F sensor 1 circuit is open or shorted.)</li> </ul>
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.	<ul> <li>A/F sensor 1</li> <li>A/F sensor 1 heater</li> </ul>

INFOID:000000010839734

[VQ37VHR]

#### Trouble diagnosis name DTC detecting condition ECM receives malfunction information from

DTC CONFIRMATION PROCEDURE

TCS control unit

### 1.PRECONDITIONING

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

"ABS actuator and electric unit (control unit)".

>> GO TO 2.	Н
2. PERFORM DTC CONFIRMATION PROCEDURE	
<ol> <li>Start engine and let it idle for at least 60 seconds.</li> <li>Check 1st trip DTC.</li> </ol>	I
Is 1st trip DTC detected?	J
YES >> <u>EC-431, "Diagnosis Procedure"</u> NO >> INSPECTION END	0
Diagnosis Procedure	Κ
Go to <u>BRC-5, "Work Flow"</u> .	
	L
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	Ν

< DTC/CIRCUIT DIAGNOSIS >

### Description

DTC No.

P1211

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.

INFOID:000000010839736

Possible cause

· ABS actuator and electric unit (control

unit)

· TCS related parts

# DTC Logic

DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

### P1211 TCS CONTROL UNIT

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< 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

INFOID:000000010839739

#### 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-392, "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
P1212	TCS communication line	ECM cannot receive the information from "ABS actuator and electric unit (control unit)" continuously.	<ul> <li>Harness or connectors (The CAN communication line is open or short- ed.)</li> <li>ABS actuator and electric unit (control unit)</li> <li>Dead (Weak) battery</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

### **TESTING CONDITION:**

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

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

YES >> Go to <u>EC-432, "Diagnosis Procedure"</u>.

NO >> INSPECTION END

#### **Diagnosis** Procedure

Go to BRC-5, "Work Flow".

INFOID:000000010839738

## P1217 ENGINE OVER TEMPERATURE

#### < 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-392</u>, "<u>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  $\Box$  indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over tempera- ture (Overheat)	<ul> <li>Cooling fan does not operate properly (Overheat).</li> <li>Cooling fan system does not operate properly (Overheat).</li> <li>Engine coolant was not added to the system using the proper filling method.</li> <li>Engine coolant is not within the specified range.</li> </ul>	<ul> <li>Harness or connectors (The cooling fan circuit is open or short- ed.)</li> <li>IPDM E/R</li> <li>Cooling fan control module</li> <li>Cooling fan motor</li> <li>Radiator hose</li> <li>Radiator</li> <li>Radiator cap</li> <li>Water pump</li> <li>Thermostat</li> </ul>
CAUTION:			
		ed, always replace the coolant. Refe ngine oil. Refer to <u>LU-8, "Draining"</u> ar	
1. Fill radi	iator with coolant up	o to specified level with a filling speed	d of 2 liters per minute. Always use
		xture ratio. Refer to <u>MA-17, "FOR NO</u>	RTH AMERICA : Anti-Freeze Cool-
	<u>xture Ratio"</u> . efilling coolant, run (	engine to ensure that no water-flow n	oise is emitted.
	FIRMATION PROCI	•	
	RM COMPONENT FL		
Perform con <b>NOTE:</b>	nponent function che	ck. Refer to <u>EC-433, "Component Funct</u>	<u>ion Check"</u> .
-	nent function check to	o check the overall function of the cooling	g fan. During this check, a DTC might
not be confi			
is the inspec	ction result normal?		
	INSPECTION END		
NO >>	Go to EC-434, "Diag	nosis Procedure".	
Compone	ent Function Che	ck	INFOID:000000010839742
1.PERFOR	RM COMPONENT FU	INCTION CHECK-I	
WARNING:			
-		when the engine is hot. Serious bu	rns could be caused by high pres-
sure fluid e	escaping from the ra	diator.	

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up P pressure to escape. Then turn the cap all the way off.

EC

[VQ37VHR]

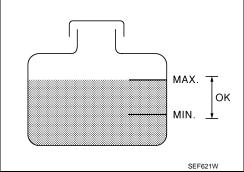
## P1217 ENGINE OVER TEMPERATURE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the coolant level in the reservoir tank and radiator. **Allow engine to cool before checking coolant level.** <u>Is the coolant level in the reservoir tank and/or radiator below the</u> <u>proper range?</u>

YES >> Go to <u>EC-434</u>, "<u>Diagnosis Procedure</u>". NO >> GO TO 2.



## 2. PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Go to EC-434, "Diagnosis Procedure".

NO >> GO TO 3.

**3.**PERFORM COMPONENT FUNCTION CHECK-III

#### With CONSULT

- 1. Turn ignition switch ON.
- 2. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that cooling fan speed varies according to the percentage.

#### **Without CONSULT**

Perform IPDM E/R auto active test and check cooling fan motors operation, refer to <u>PCS-10, "Diagnosis</u> <u>Description"</u>.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-434, "Diagnosis Procedure".

#### **Diagnosis Procedure**

INFOID:000000010839743

**1.**CHECK COOLING FAN OPERATION

#### (I) With CONSULT

- 1. Turn ignition switch ON.
- 2. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that cooling fan speed varies according to the percentage.

#### **Without CONSULT**

- Perform IPDM E/R auto active test and check cooling fan motors operation, refer to <u>PCS-10</u>, "<u>Diagnosis</u> <u>Description</u>".
- 2. Make sure that cooling fan operates.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Go to <u>EC-502</u>, "Diagnosis Procedure".

**2.**CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-11, "Inspection".

Is leakage detected?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak.

- Hose
- Radiator
- Water pump

## **P1217 ENGINE OVER TEMPERATURE**

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
>> Repair or replace malfunctioning part.	
4. CHECK RADIATOR CAP	A
Check radiator cap. Refer to CO-15, "RESERVOIR TANK CAP : Inspection".	
Is the inspection result normal?	EC
YES >> GO TO 5. NO >> Replace radiator cap.	
5.CHECK THERMOSTAT	С
Check thermostat. Refer to CO-28, "Inspection".	
<u>Is the inspection result normal?</u> YES >> GO TO 6.	D
NO >> Replace thermostat	
6.CHECK ENGINE COOLANT TEMPERATURE SENSOR	E
Refer to EC-223, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 7. NO >> Replace engine coolant temperature sensor.	F
7.CHECK MAIN 12 CAUSES	
If the square connect he isolated, sheak the following	G

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	<ul> <li>Blocked radiator</li> <li>Blocked condenser</li> <li>Blocked radiator grille</li> <li>Blocked bumper</li> </ul>	• Visual	No blocking	_
	2	Coolant mixture	Coolant tester	MA-17, "FOR NORTH AME ant Mixture Ratio"	ERICA : Anti-Freeze Cool
-	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-11, "Inspection"
-	4	Radiator cap	Pressure tester	107 kPa (1.1 kg/cm <sup>2</sup> , 16 psi) (Limit)	CO-15, "RESERVOIR TANK CAP : Inspection
ON* <sup>2</sup>	5	Coolant leaks	Visual	No leaks	CO-11, "Inspection"
ON* <sup>2</sup>	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	CO-28, "Inspection"
ON* <sup>1</sup>	7	Cooling fan	CONSULT	Operating	EC-502, "Component Function Check"
OFF	8	Combustion gas leak	Color checker chemical Negative tester 4 Gas analyzer		
ON* <sup>3</sup>	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-11, "Inspection"
OFF* <sup>4</sup>	10	Coolant return from res- ervoir tank to radiator	Visual	Should be initial level in reservoir tank	CO-11, "Inspection"
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maxi- mum distortion (warping)	EM-114, "Inspection"
	12	Cylinder block and pis- tons	• Visual	No scuffing on cylinder walls or piston	EM-128, "Inspection"

\*1: Turn the ignition switch ON.

\*2: Engine running at 3,000 rpm for 10 minutes.

\*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

\*4: After 60 minutes of cool down time. For more information, refer to <u>CO-5, "Troubleshooting Chart"</u>.

>> INSPECTION END

## 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.

Trouble diagnosis name

# 0<sup>L</sup> 0

DTC detecting condition

## DTC Logic

DTC No.

#### DTC DETECTION LOGIC

P1225	Closed throttle position learning performance (bank 1)	Closed throttle position learning value is	Electric throttle control actuator
P1234	Closed throttle position learning performance (bank 2)	excessively low.	(TP sensor 1 and 2)
	FIRMATION PROCEDURE		
1.PRECOM	NDITIONING		
before cond 1. Turn igr 2. Turn igr 3. Turn igr <b>TESTING C</b>	ucting the next test. nition switch OFF and wait at le nition switch ON. nition switch OFF and wait at le CONDITION:		
>>	GO TO 2.		

- Turn ignition switch OFF. 2. Remove the intake air duct.
- Revision: 2014 September

INFOID:000000010839744

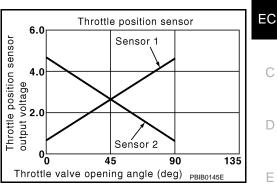
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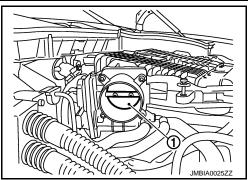
Possible cause

M DTC CONFIRMATION PROCED

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</u> : <u>Special Repair Requirement</u>".



## 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

>> INSPECTION END

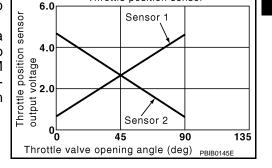
#### [VQ37VHR]

#### 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.



Throttle position sensor

## DTC Logic

#### DTC DETECTION LOGIC

DTC No. DTC detecting condition Possible cause Trouble diagnosis name Closed throttle position learning P1226 performance (bank 1) Closed throttle position learning is not performed Electric throttle control actuator successfully, repeatedly. (TP sensor 1 and 2) Closed throttle position learning P1235 Н performance (bank 2) DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test. 1. Turn ignition switch OFF and wait at least 10 seconds. 2. Turn ignition switch ON. 3. Turn ignition switch OFF and wait at least 10 seconds. **TESTING CONDITION:** Before performing the following procedure, confirm that battery voltage is more than 10 V at idle. >> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE 1. Turn ignition switch ON. M 2. Turn ignition switch OFF and wait at least 10 seconds. 3. Turn ignition switch ON. Repeat steps 2 and 3 for 32 times. 4. Check 1st trip DTC. Ν 5 Is 1st trip DTC detected? YES >> Go to EC-439, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure INFOID:000000010839749 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY 1. Turn ignition switch OFF.

2. Remove the intake air duct.

# [VQ37VHR]

INFOID:000000010839747

INFOID:000000010839748

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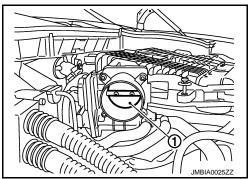
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3. Check if foreign matter is caught between the throttle valve (1) and the housing.

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</u> : <u>Special Repair Requirement</u>".



## 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

>> INSPECTION END

#### [VQ37VHR]

#### < DTC/CIRCUIT DIAGNOSIS >

## P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

#### 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 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:000000010839751

INFOID:000000010839750

## 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-447, "DTC Logic"</u> or <u>EC-452, "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	Harness or connectors     (Thattle control mater circuit is even or shorted)
P2101	Electric throttle control performance (bank 1)	operate properly.	<ul><li>(Throttle control motor circuit is open or shorted)</li><li>Electric throttle control actuator</li></ul>
DTC CO	NFIRMATION PRO	CEDURE	
1.PREC	ONDITIONING		
before cc 1. Turn 2. Turn 3. Turn TESTING Before p	ignition switch OFF a ignition switch OFF a ignition switch ON. ignition switch OFF a CONDITION:	t. nd wait at least 10 seconds. nd wait at least 10 seconds.	d, always perform the following procedure attery voltage is more than 11 V when
•	>> GO TO 2.		
		IATION PROCEDURE	
2. Start	engine and let it idle ck DTC.	id wait at least 2 seconds. for 5 seconds.	
<u>Is DTC d</u>	etected?		
	>> Go to <u>EC-441, "Di</u> >> INSPECTION ENI		
Diagno	sis Procedure		INFOID:000000010839752
<b>1.</b> CHEC	K GROUND CONNE	CTION	
2. Cheo	ignition switch OFF. ck ground connection pection result normal	M95. Refer to Ground Inspection in <u>?</u>	GI-47. "Circuit Inspection".
-	>> GO TO 2.		
-	>> Repair or replace	ground connection. ROL MOTOR RELAY INPUT SIGN	

## EC-441

[VQ37VHR]

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## < DTC/CIRCUIT DIAGNOSIS >

1		EC	CM	Condition		Voltage (V)			
DTC	+	+ –							
	Connector	Terminal	Connector Terminal						
P1233	P1233 F102		M107			OFF	Approx. 0		
1 1200				- M107	M107	128	Ignition switch	ON	Battery voltage
P2101					120	Ignition switch	OFF	Approx. 0	
12101	1 101	3				ON	Battery voltage		

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 3.

## $\mathbf{3.}$ Check throttle control motor relay power supply circuit

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Disconnect IPDM E/R harness connector E7.

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

IPD	M E/R	E	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E7	70	F101	25	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

**4.**DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E3, F1

Harness connectors F104, F105

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

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

#### 5.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

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

DTC	IPDM	E/R	ECM		Continuity	
DIC	Connector	Terminal	Connector	Terminal	Continuity	
P1233	F7	54	F102	52	Existed	
P2101		54	F101	3	Existed	

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

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

**6.**DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E3, F1

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

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

#### EC-442

[VQ37VHR]

7.CHECK FUSE	Δ
<ol> <li>Disconnect 15 A fuse (No. 51) from IPDM E/R.</li> <li>Check 15 A fuse for blown.</li> </ol>	/ \
Is the inspection result normal?	EC
YES >> GO TO 8. NO >> Replace 15A fuse.	
8. CHECK INTERMITTENT INCIDENT	С
Refer to GI-44, "Intermittent Incident".	
Is the inspection result normal?	D
YES >> Replace IPDM E/R. NO >> Repair or replace harness or connectors.	
9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT	Е
1. Turn ignition switch OFF.	
<ol> <li>Disconnect electric throttle control actuator harness connector.</li> <li>Disconnect ECM harness connector.</li> </ol>	_
4. Check the continuity between electric throttle control actuator harness connector and ECM harness con-	Г
nector.	

DTC	Electr	Electric throttle control actuator		ECM		Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity	
			5	F102	49	Existed	
D1222	P1233 2 F27	E27			50	Not existed	
F 1233		6	F IUZ	49	Not existed		
			0		50	Existed	
		1 F6	I	4		2	Existed
P2101	4			E101	4	Not existed	
P2101	1		F101	2	Not existed		
			2		4	Existed	
5. Als	Also check harness for short to ground and short to power.						

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

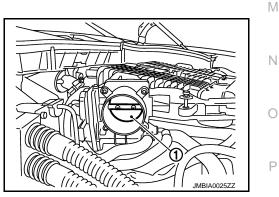
1. Remove the intake air duct.

2. Check if foreign matter is caught between the throttle valve (1) and the housing.

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <u>EC-20</u>, <u>"THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"</u>.



## 11. CHECK THROTTLE CONTROL MOTOR

Refer to EC-444, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 13. L

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

12. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace harness or connectors.

 $13. {\tt replace electric throttle control actuator}$ 

Replace malfunction electric throttle control actuator. Refer to EM-34, "Exploded View".

#### >> INSPECTION END

#### Component Inspection

INFOID:000000010839753

## 1. CHECK THROTTLE CONTROL MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- 3. Check resistance between electric throttle control actuator terminals as per the following.

Electric th	rottle control actuator	Resistance (Ω)
Bank	Terminals	(12) (12) (12)
1	1 and 2	Approx. 1 - 15 [at 25°C (77°F)]
2	5 and 6	Applox. 1 = 10 [a(20.0)(77.1)]

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-34, "Exploded View".

>> INSPECTION END

## 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:000000010839755

#### 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)
	FIRMATION PROC	EDURE	
	NDITIONING	has been previously conducted, alwa	avs perform the following procedure
before cond	ducting the next test.	I wait at least 10 seconds.	ays periorin the following procedure
2. Turn ig	nition switch ON.		
3. Turn ig	inition switch OFF and	I wait at least 10 seconds.	
_	> GO TO 2.		
	RM DTC CONFIRMA		
	ngine and let it idle for	wait at least 2 seconds. 5 seconds.	
s DTC det			
	> Go to <u>EC-445, "Diag</u> INSPECTION END	nosis Procedure".	
-	s Procedure		INF0ID:000000010839756
І.снеск	GROUND CONNECT	ΓΙΟΝ	
	nition switch OFF.	95. Refer to Ground Inspection in <u>GI-47</u>	"Circuit Inspection"
	ection result normal?		<u>Circuit inspection</u> .
YES >>	• GO TO 2.		
-	> Repair or replace gro		
		DL MOTOR OUTPUT SIGNAL CIRCUIT	FOR OPEN AND SHORT
	nect electric throttle c nect ECM harness co	ontrol actuator harness connector. nnector.	
	the continuity betwee	n electric throttle control actuator harne	ess connector and ECM harness con-

#### [VQ37VHR]

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DTC	Electri	c throttle cont	rol actuator	EC	Continuity		
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity	
			5		49	Existed	
P1236	2	F27	5	F102	50	Not existed	
1 1230	L	121	6	1102	49	Not existed	
				0	50	Existed	
	1	F6 -	1		2	Existed	
P2118			I	F101	4	Not existed	
F2110	1		2	1 101	2	Not existed	
			2		4	Existed	

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

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

**3.**CHECK THROTTLE CONTROL MOTOR

Refer to EC-446. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 5.

**4.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace harness or connectors.

**5.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

>> INSPECTION END

Component Inspection

INFOID:000000010839757

## 1. CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.

2. Disconnect electric throttle control actuator harness connector.

3. Check resistance between electric throttle control actuator terminals as per the following.

Electric th	rottle control actuator	Resistance ( $\Omega$ )	
Bank	Terminals	Resistance (22)	
1	1 and 2	Approx. 1 - 15 [at 25°C (77°F)]	
2	5 and 6	Approx. 1 - 15 [at 25°C (77°F)]	

## 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-34, "Exploded View".

>> INSPECTION 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. 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:000000010839759

[VQ37VHR]

INFOID:000000010839758

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition Possible cause		E
P1238 Electric throttle control actuator (bank 2)	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.			
	B)	Throttle valve opening angle in fail-safe mode is not in specified range.		F	
		C)	ECM detect the throttle valve is stuck open.	Electric throttle control actuator	
P2119 Electric throttle control actuator (bank 1)	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.		G	
	B)	Throttle valve opening angle in fail-safe mode is not in specified range.		Н	
	C)	ECM detect the throttle valve is stuck open.			

#### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

#### >> GO TO 2.

#### 2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Shift selector lever to D position (A/T) or 1st position (M/T) and wait at least 3 seconds.
- 3. Shift selector lever to P position (A/T) or Neutral position (M/T).
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON and wait at least 1 second.
- 6. Shift selector lever to D position (A/T) or 1st position (M/T) and wait at least 3 seconds.
- 7. Shift selector lever to P position (A/T) or Neutral position (M/T).
- 8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 9. Check DTC.

#### Is DTC detected?

#### YES >> Go to EC-448, "Diagnosis Procedure".

NO >> GO TO 3.

 $\mathbf{3}$ . Perform dtc confirmation procedure for malfunction c

1. Turn ignition switch ON and wait at least 1 second.

2. Shift selector lever to D position (A/T) or 1st position (M/T) and wait at least 3 seconds.

- 3. Shift selector lever to P position (A/T) or Neutral position (M/T).
- 4. Start engine and let it idle for 3 seconds.
- 5. Check DTC.
- Is DTC detected?

#### EC-447

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## P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

YES >> Go to <u>EC-448, "Diagnosis Procedure"</u>. NO >> INSPECTION END

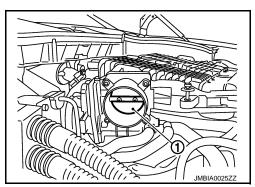
#### **Diagnosis Procedure**

 $1. {\sf check\ electric\ throttle\ control\ actuator\ visually}$ 

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <u>EC-20</u>, "<u>THROTTLE</u> <u>VALVE CLOSED POSITION LEARNING</u> : <u>Special</u> <u>Repair Requirement</u>".



## 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

>> INSPECTION END

[VQ37VHR]

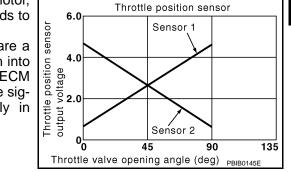
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P1239, P2135 TP SENSOR

## Description

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

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



## DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1239 or P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-393, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1239	Throttle position sensor (bank 2) circuit range/ performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1	<ul> <li>Harness or connector (TP sensor 1 and 2 circuit is open or shorted.)</li> </ul>
P2135	Throttle position sensor (bank 1) circuit range/ performance	and TP sensor 2.	Electric throttle control actuator (TP sensor 1 and 2)

#### DTC CONFIRMATION PROCEDURE

#### **1.**PRECONDITIONING

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

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-449, "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-47. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

#### EC-449

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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	Ground	Voltage (V)		
DIC	Bank	Connector	Terminal	Ciouna	voltage (v)	
P1239	2	F27	1	Ground	Approx 5	
P2135	1	F6	F6 6		Approx. 5	

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

DTC	Electri	c throttle cont	rol actuator	EC	Continuity		
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity	
P1239	2	F27	4	F101	48	Existed	
P2135	1	F6	3	FIUI	40		

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Electri	c throttle cont	rol actuator	EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P1239	2	F27	2		31	Existed
F 1239	Z		3	F101	35	
P2135	1	F6	4		30	EXISTED
P2135	1	1.0	5		34	

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

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK THROTTLE POSITION SENSOR

Refer to EC-451, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

**6.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-34, "Exploded View".

EC-450

_	> INSPECTION END						А
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>	> INSPECTION END					_	
Compon	ent Inspection					INFOID:0000000010839764	С
<b>1.</b> CHECK	THROTTLE POSITION	SENSOR					_
2. Recon	gnition switch OFF. Inect all harness connec m <u>EC-20, "THROTTLE \</u>				acial Repair Rec	nuirement"	D
4. Turn iç 5. Set se	gnition switch ON. lector lever to D (A/T) or the voltage between EC	1st (M/T) po	sition.		·	<u>quiement</u> .	E
	ECM						F
	+	_	Condi	ition	Voltage (V)		
Connector	Terminal	Terminal			0 ( )		G
		40		Fully released	More than 0.36	-	
	30 [TP sensor 1 (bank 1)]	40		Fully depressed	Less than 4.75	-	Н
	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36	-	
F101			Accelerator pedal	Fully depressed	Less than 4.75	-	
1101	34 [TP sensor 2 (bank 1)] 35 [TP sensor 2 (bank 2)]	40		Fully released	Less than 4.75	-	I
				Fully depressed	More than 0.36	-	
				Fully released	Less than 4.75	-	J
la tha in an				Fully depressed	More than 0.36		
	ection result normal? > INSPECTION END						К
	> GO TO 2.						
2.repla	CE ELECTRIC THROTT	LE CONTRO	OL ACTUATOR				
Replace m	alfunctioning electric thr	ottle control a	actuator. Refer to	EM-34, "Explor	ded View".		L
>	> INSPECTION END						M
							Ν
							0
							0
							Ρ

## P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

#### < DTC/CIRCUIT DIAGNOSIS >

## P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

#### Description

INFOID:000000010839765

[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:000000010839766

#### 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) <ul> <li>Throttle control motor relay</li> </ul>	
P2103	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	<ul> <li>Harness or connectors (Throttle control motor relay circuit is shorted)</li> <li>Throttle control motor relay</li> </ul>	

#### 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-452. "Diagnosis Procedure".

NO >> INSPECTION END

## **3.**PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

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

#### Is DTC detected?

- YES >> Go to EC-452, "Diagnosis Procedure".
- NO >> INSPECTION END

#### **Diagnosis Procedure**

#### **1.**CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

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

#### EC-452

INFOID:000000010839767

## P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

#### < DTC/CIRCUIT DIAGNOSIS >

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

IPDN	/I E/R	EC	CM	Continuity	-		
Connector	Terminal	Connector	Terminal	Continuity			
E7	70	F101	25	Existed	-		
5. Also c	heck harn	ess for sho	ort to grou	nd and sho	ort to power		
<u>Is the insp</u>	ection resu	ult normal?	<u>?</u>				
	> GO TO 3						
-	> GO TO 2						
2.DETEC	T MALFU	NCTIONIN	IG PART				
Check the • Harness • Harness • Harness	connector connector for open c	s F104, F or short be	tween EC				
		LE CONT	ROL MOT	OR RELA	Y INPUT SI	er in harness or connec GNAL CIRCUIT onnector and ECM harn	
1. Check	the contir	LE CONT	ROL MOT een IPDM	OR RELA	Y INPUT SI	GNAL CIRCUIT	
	the contir	LE CONT	ROL MOT een IPDM	OR RELA E/R sensc	Y INPUT SI	GNAL CIRCUIT	
1. Check	the contir	LE CONT nuity betwe	ROL MOT een IPDM	OR RELA E/R sensc	Y INPUT SI	GNAL CIRCUIT	
1. Check	the contir IPDN Connector	LE CONT nuity betwe	ROL MOT een IPDM E0 Connector	OR RELA E/R sensc CM Terminal	Y INPUT SI or harness c Continuity	GNAL CIRCUIT	
1. Check DTC P1290 P2100	the contir	LE CONT nuity betwe	ROL MOT een IPDM Connector F102	OR RELA E/R sensc CM Terminal 52	Y INPUT SI	GNAL CIRCUIT	
1. Check DTC P1290	the contir IPDN Connector	LE CONT nuity betwe	ROL MOT een IPDM Connector F102 F101	OR RELA E/R sensc CM Terminal 52 3	Y INPUT SI or harness c Continuity	GNAL CIRCUIT	
1. Check DTC P1290 P2100 P2103	the contin IPDN Connector E7	LE CONT nuity betwe	ROL MOT een IPDM Connector F102 F101 F101 F102	OR RELA E/R sensc CM Terminal 52 3 3 52	Y INPUT SI or harness c Continuity	GNAL CIRCUIT	
1. Check DTC P1290 P2100 P2103	the contin IPDN Connector E7 heck harne	LE CONT nuity between A E/R Terminal 54 ess for sho	ROL MOT een IPDM Connector F102 F101 F101 F102 ort to grou	OR RELA E/R sensc CM Terminal 52 3 3 52	Y INPUT SI or harness c Continuity Existed	GNAL CIRCUIT	
1.CheckDTCP1290P2100P21032.Also cIs the inspYES	the contin IPDM Connector E7 check harne ection resu	LE CONT nuity betwee 1 E/R Terminal 54 ess for she ult normal	ROL MOT een IPDM Connector F102 F101 F101 F102 ort to grou	OR RELA E/R sensc CM Terminal 52 3 3 52	Y INPUT SI or harness c Continuity Existed	GNAL CIRCUIT	
1.CheckDTCP1290P2100P21032.Also cIs the inspYES	the contin IPDM Connector E7 E7 check harne ection resu > GO TO 5 > GO TO 5	LE CONT nuity between A E/R Terminal 54 ess for she ult normal? 5. 4.	ROL MOT een IPDM Connector F102 F101 F101 F102 ort to groun	OR RELA E/R sensc CM Terminal 52 3 3 52	Y INPUT SI or harness c Continuity Existed	GNAL CIRCUIT	

Check the following.

Harness connectors E3, F1

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

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

## 5.CHECK FUSE

1.	Disconnect 15 A fuse	(No. 51) from IPDM E/R.	
----	----------------------	-------------------------	--

2. Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace 15A fuse.

**6.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connectors.

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## P1564 ASCD STEERING SWITCH

#### Description

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated. Refer to <u>EC-78, "System Description"</u> for the ASCD function.

## DTC Logic

## DTC DETECTION LOGIC

#### NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-390, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ASCD steering switch	<ul> <li>An excessively high voltage signal from the ASCD steering switch is sent to ECM.</li> <li>ECM detects that input signal from the ASCD steering switch is out of the specified range.</li> <li>ECM detects that the ASCD steering switch is stuck ON.</li> </ul>	<ul> <li>Harness or connectors (The switch circuit is open or shorted.)</li> <li>ASCD steering switch</li> <li>ECM</li> </ul>

#### 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. Check DTC.
- Is DTC detected?
- YES >> Go to EC-454, "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-47, "Circuit Inspection".

#### Is the inspection result normal?

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

2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT

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## P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

#### 1. Turn ignition switch ON.

- 2. Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with A CONSULT.
- 3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
MAIN SW	MAIN SWICH	Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
CANCEL SW	CANCEL SWIGH	Released	OFF
RESUME/ACC SW	RESUME/ACCEL-	Pressed	ON
RESUME/ACC SW	ERATE switch	Released	OFF
SET SW	SET/COAST switch	Pressed	ON
SET SW	SET/COAST SWICH	Released	OFF

#### **Without CONSULT**

1. Turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals as per the following.

	ECM			
Connector	+	-	Condition	Voltage (V)
Connector	Terminal	Terminal		
	101 (ASCD steering switch signal)	108	MAIN switch: Pressed	Approx. 0
			CANCEL switch: Pressed	Approx. 1
M107			SET/COAST switch: Pressed	Approx. 2
			RESUME/ACCELERATE switch: Pressed	Approx. 3
			All ASCD steering switches: Released	Approx. 4

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

## ${f 3.}$ 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.

4. Check the continuity between combination switch and ECM harness connector.

Combination switch	EC	M	Continuity
Terminal	Connector	Terminal	Continuity
16	M107	108	Existed
5. Also check har	rness for s	short to gr	ound and s
Is the inspection re	sult norm	<u>al?</u>	
YES >> GO TO			
NO >> GO TC			
4.DETECT MALF	UNCTION	IING PAR	Т

Check the following.

• Combination switch (spiral cable)

Harness for open and short between ECM and combination switch

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

## EC-455

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## 5.check ascd steering switch input signal circuit for open and short

#### 1. Check the continuity between combination switch and ECM harness connector.

Combination switch	EC	Continuity	
Terminal	Connector Terminal		Continuity
13	M107	101	Existed

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.

Combination switch (spiral cable)

Harness for open and short between ECM and combination switch

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

#### 7. CHECK ASCD STEERING SWITCH

Refer to EC-456, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ASCD steering switch.

#### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

#### Component Inspection

**1.**CHECK ASCD STEERING SWITCH

- 1. Turn ignition switch OFF.
- 2. Disconnect combination switch (spiral cable) harness connector.
- 3. Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance ( $\Omega$ )	
Connector	Terminals	Condition	Resistance (22)	
		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 inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch

INFOID:000000010839771

## 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-78, "System Description"</u> 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-390, "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) (19 MPH), ON switch and the to the ECM at t	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.	<ul> <li>Harness or connectors (The stop lamp switch circuit is shorted.)</li> <li>Harness or connectors (The ASCD brake switch circuit is shorted.)</li> </ul>	G
P1572	ASCD brake switch	ASCD brake switch signal is not sent to B) ECM for extremely long time while the ve- hicle is being driven.	<ul> <li>Stop lamp switch</li> <li>ASCD brake switch</li> <li>Incorrect stop lamp switch installation</li> <li>Incorrect ASCD brake switch installation</li> <li>ECM</li> </ul>	Π

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

#### NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

#### >> GO TO 2.

#### 2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

- 1. Start engine (VDC switch OFF).
- 2. Press MAIN switch and make sure that CRUISE lamp illuminates.
- 3. Drive the vehicle for at least 5 consecutive seconds under the following conditions. CAUTION:

#### Always drive vehicle at a safe speed. NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle.

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-458, "Diagnosis Procedure".

NO >> GO TO 3.

**3.**PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION: Always drive vehicle at a safe speed. NOTE:

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

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to <u>EC-458, "Diagnosis Procedure"</u>. NO >> INSPECTION END
- Diagnosis Procedure

1.CHECK OVERALL FUNCTION-I

#### With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition			
BRAKE SW1	Brake pedal (A/T models or M/T and synchrorev match mode) Brake pedal and clutch pedal (M/T models without synchrorev match mode)	Slightly depressed	OFF	
DIVARE SWI	Brake pedal (A/T models or M/T and synchrorev match mode) Brake pedal or clutch pedal (M/T models without synchrorev match mode)	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 (ASCD brake switch signal)	128	Brake pedal (A/T models or M/T and synchrorev match mode) Brake pedal and clutch pedal (M/T models without synchrorev match mode)	Slightly depressed	Approx. 0
101107			Brake pedal (A/T models or M/T and synchrorev match mode) Brake pedal or clutch pedal (M/T mod- els without synchrorev match mode)	Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO-1 >> A/T models or M/T and synchrorev match mode: GO TO 3.

NO-2 >> M/T models without synchrorev match mode: GO TO 8.

#### EC-458

INFOID:000000010839774

#### < DTC/CIRCUIT DIAGNOSIS >

2. CHECK OVERALL FUNCTION-II

#### With CONSULT

Select "BRAKE SW2" and check indication under the following conditions.

Monitor item	C	Indication	
BRAKE SW2	Brako podal	Slightly depressed	ON
BRARE SWZ	Brake pedal	Fully released	OFF

#### **Without CONSULT**

Check the voltage between ECM harness connector terminals as per the following.

		ECM					
Connector		+		-	c	Condition	Voltage (V)
Connector	-	Ferminal		Terminal	Brake pedal Slightly depressed Battery voltage		
M107		122		128	Brake nedal	Slightly depressed	Battery voltage
iiiioi	(Stop lan	np switch sig	gnal)	120	Brano podar	Fully released	Approx. 0
NO >>	GO TO 2 GO TO 2	21. 16.		WER SUP	PLY CIRCUI	г	
2. Discon 3. Turn ig	nition swi	D brake s tch ON.		ness conne orake switc		nnector and grou	nd.
ASCD bra Connector	Terminal	- Ground	Voltage	)			
E109	1	Ground	Battery vol	tage			
NO >>	• GO TO 4 • GO TO 4	5. 4.					
4.DETEC <sup>-</sup> Check the f		NCTIONII	NG PART				
<ul><li>Fuse bloc</li><li>10 A fuse</li></ul>	ck (J/B) co e (No. 3)			SCD brake	switch and fu	ISE	
	•	•		•	in harness or		
<b>J.</b> CHECK	ASCD BI	RAKE SW	ITCH INP	UT SIGNA	L CIRCUIT F	OR OPEN AND	SHORT
	nition swi	tch OFF.	connecto				
2. Discon	the contir	nuity betw	een ASCI	D brake sw	itch harness	connector and EC	CM harness connector.
2. Discon		-	een ASCI	D brake sw	itch harness -	connector and EC	CM harness connector.

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.

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< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 6.

#### 6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ECM and ASCD brake switch

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

**7.**CHECK ASCD BRAKE SWITCH

Refer to EC-462. "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace ASCD brake switch.

8.CHECK ASCD BRAKE SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.

4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD brake switch		Ground	Condition		Voltage (V)	
Connector	Terminal	Ciouna	Condition		voltage (v)	
E109	1	Ground	Brake pedal	Slightly depressed	Approx. 0	
L109	I	Giounu	Diake peual	Fully released	Battery voltage	

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 9.

#### 9.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect clutch pedal position switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between clutch pedal position switch harness connector and ground.

Clutch pedal p	osition switch	Ground	Voltage
Connector	Terminal	Ground Voltage	
E108	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Fuse block (J/B) connector E103

- 10 A fuse (No. 3)
- Harness for open or short between clutch pedal position switch and fuse

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

## **11.**CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.

2. Check the continuity between clutch pedal position switch harness connector and ASCD brake switch harness connector.

#### EC-460

#### < DTC/CIRCUIT DIAGNOSIS >

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						^
Clutch pedal	position switch	ASCD bra	ke switch	Continuity		A
Connector	Terminal	Connector	Terminal			
E108	2	E109	1	Existed		EC
3. Also che	eck harness fo	or short to g	ground an	d short to p	ower.	
•	tion result no	rmal?				
	GO TO 12.	dina di ta a la a m				С
	• •		-		power in harness or connectors.	
	CLUTCH PE					- D
			ction (Clut	ch Pedal P	<u>osition Switch)"</u> .	D
	tion result no	rmal?				
-	GO TO 21. Replace clutc	h nedal no	sition swit	ch		Е
	•	• •			RCUIT FOR OPEN AND SHORT-II	
				SIGNAL CI	COILFOR OPEN AND SHORT-II	
	ition switch O ect ECM harr		ctor			F
				e switch har	ness connector and ECM harness connector.	
	<b>,</b>					G
ASCD brake	switch	ECM	Cant	in tite		
Connector	Terminal Conn	ector Term	Cont	inuity		
E109	2 M1	07 120	6 Exis	sted		Н
4. Also che	ck harness fo	or short to g	round an	d short to p	ower.	
Is the inspec	tion result no	rmal?				1
	GO TO 15.					1
	GO TO 14.					
14.DETEC	T MALFUNC	TIONING F	PART			J
Check the fo						-
	onnectors E10 or open or sho		ECM and		ke switch	К
			Low and			T.
>>	Repair open o	circuit. shor	t to aroun	d or short to	power in harness or connectors.	
	ASCD BRA		-			L
	462, "Compo			D Broko S	witch)"	-
	tion result no			JD DIAKE S	<u>witch)</u> .	в. Л
	GO TO 21.					Μ
	Replace ASC	D brake sw	itch.			
16.снеск		SWITCH	POWER	SUPPLY CI	RCUIT	Ν
	ition switch O					-
2. Disconn	ect stop lamp	switch har				
3. Check th	ne voltage bet	tween stop	lamp swit	tch harness	connector and ground.	0
Stop lamp	Gro	und Vol	tage			Р
Connector	Terminal					
E110		-	voltage			
	tion result no	rmal?				
	GO TO 18. GO TO 17.					
	001017.					

17. DETECT MALFUNCTIONING PART

#### < DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between stop lamp switch and battery

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

18.check stop lamp switch input signal circuit for open and short

1. Disconnect ECM harness connector.

2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lam	p switch	ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
E110	2	M107	122	Existed	

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

Is the inspection result normal?

YES >> GO TO 20.

NO >> GO TO 19.

**19.** DETECT MALFUNCTIONING PART

Check the following.

• Fuse block (J/B) connectors E103, M2

• Harness for open or short between ECM and stop lamp switch

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

#### 20. CHECK STOP LAMP SWITCH

Refer to EC-463. "Component Inspection (Stop Lamp Switch)"

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace stop lamp switch.

21. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

#### Component Inspection (ASCD Brake Switch)

INFOID:000000010839775

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	Condition	
1 and 2	Brake pedal	Fully released	Existed
	Diake pedai	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-9. "Inspection and Adjustment".

2. Check the continuity between ASCD brake switch terminals under the following conditions.

## EC-462

#### < DTC/CIRCUIT DIAGNOSIS >

Terminals	C	ondition	Continuity	
1 and 2	Brake pedal	Fully released	Existed	
		Slightly depressed	Not existed	
YES > NO >	•	ON END SCD brake switc		
Compon	ent inspe	ction (Clutch	Pedal Positio	INFOID:000000010839776
1.снеск	CLUTCH P	EDAL POSITION	N SWITCH-I	
2. Discor		pedal position sw		nector. witch terminals under the following conditions.
Terminals		Condition	Continuity	_
4		Fully released	Existed	_
1 and 2	Clutch peda	Fully depressed	Not existed	—
s the insp	ection result	normal?	1	_
	> INSPECTI	ON END		
~	> GO TO 2.			
	CLUTCH P	EDAL POSITION	N SWITCH-II	
				r to <u>CL-8, "Inspection and Adjustment"</u> . switch terminals under the following conditions.
	Fully released Existed	_		
1 and 2	Clutch peda	Fully depressed	Not existed	—
YES > NO >	•			INF0/D:000000010839777
	-	IP SWITCH-I	- /	
	gnition switcl			
		mp switch harne	ss connector.	
				inals under the following conditions.
_				
Terminals	C	ondition	Continuity	
1 and 2	Brake pedal	Fully released	Not existed	
		Slightly depressed	Existed	
	ection result			
YES >	> INSPECTI			
YES >	> INSPECTI > GO TO 2.			

1. Adjust stop lamp switch installation. Refer to <u>BR-9, "Inspection and Adjustment"</u>.

2. Check the continuity between stop lamp switch terminals under the following conditions.

#### < DTC/CIRCUIT DIAGNOSIS >

Terminals	С	Continuity	
1 and 2	Brako podal	Fully released	Not existed
i anu z	nd 2 Brake pedal	Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch.

#### P1574 ASCD VEHICLE SPEED SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

## P1574 ASCD VEHICLE SPEED SENSOR

## Description

The ECM receives two vehicle speed signals via the CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to <u>EC-78</u>, "System Description" for ASCD functions.

## DTC Logic

DTC DETECTION LOGIC NOTE:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC U1XXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-368, "M/T MODELS : DTC Logic".
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-390, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-392, "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.	<ul> <li>Harness or connectors (The CAN communication line is open or shorted.)</li> <li>Combination meter</li> <li>ABS actuator and electric unit (control unit)</li> <li>Wheel sensor</li> <li>TCM</li> <li>ECM</li> </ul>	ŀ

## 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

 Start engine (VDC switch OFF).
 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.
 Check DTC. Is DTC detected?

YES >> Go to <u>EC-465, "Diagnosis Procedure"</u>. NO >> INSPECTION END

#### Diagnosis Procedure

1. СНЕСК DTC WITH TCM	
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Check DTC with TCM. Refer to TM-203, "Diagnosis Description".

Is the inspection result normal?

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## P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

2.check dtc with "abs actuator and electric unit (control unit)"

Refer to BRC-23, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3. CHECK DTC WITH COMBINATION METER

Refer to MWI-34, "CONSULT Function (METER/M&A)".

>> INSPECTION END

## 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	<ul> <li>VVEL control module calculation function is malfunctioning.</li> <li>VVEL EEP-ROM system is malfunc- tioning.</li> </ul>	VVEL control module	G	
DTC CONFIRMATION PROCEDURE					

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

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

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

2. Turn ignition switch ON.

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

**TESTING CONDITION:** 

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

>> GO TO 2.

## **2.** PERFORM DTC CONFIRMATION PROCEDURE

Turn ignition switch ON and wait at least 1 second.
 Check DTC.
 <u>Is DTC detected?</u>
 YES >> Go to <u>EC-467, "Diagnosis Procedure"</u>.
 NO >> INSPECTION END
 Diagnosis Procedure

## 1.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-467. "DTC Logic"</u>.

#### Is the DTC P1606 displayed again?

- YES >> GO TO 2.
- NO >> INSPECTION END
- **2.**REPLACE VVEL CONTROL MODULE
- 1. Replace VVEL control module.

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## P1606 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

2. Go to <u>EC-18</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> INSPECTION END

# 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 CONF	<b>FIRMATION PROCEDURE</b>		
1.PRECON	DITIONING		
before cond 1. Turn igr 2. Turn igr 3. Turn igr <b>TESTING C</b>	ucting the next test. hition switch OFF and wait at l hition switch ON. hition switch OFF and wait at l <b>ONDITION:</b>		
>>	GO TO 2.		
2.PERFOR	M DTC CONFIRMATION PR	OCEDURE	
1. Start en 2. Check [	gine and let it idle for at least DTC.	1 second.	
	<u>cted?</u> Go to <u>EC-469, "Diagnosis Pre</u> INSPECTION END	ocedure".	
Diagnosis	s Procedure		INFOID:000000010839786
1.PERFOR	M DTC CONFIRMATION PR	OCEDURE	
1. Turn igr 2. Erase D	nition switch ON.		
	DTC Confirmation Procedure	Э.	
	-469, "DTC Logic".		
	P1607 displayed again?		
-	GO TO 2. INSPECTION END		
•	E VVEL CONTROL MODULE	-	
		-	

1. Replace VVEL control module.

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# P1607 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

>> INSPECTION END

# P1608 VVEL SENSOR POWER SUPPLY

# DTC Logic

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DTC DE	TECTION LOGIC				
DTC No.	Trouble diagnosis name		DTC detecting condi	tion	Possible cause
P1608	VVEL sensor power supply circuit		ntrol module detects source for sensor is gh.		<ul> <li>Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.)</li> <li>VVEL control shaft position sensor</li> <li>VVEL control module</li> </ul>
	NFIRMATION PROCEDUR	E			
1.PREC	ONDITIONING				
before co 1. Turn 2. Turn 3. Turn <b>TESTING</b>	ignition switch OFF and wait a ignition switch OFF and wait a ignition switch OFF and wait a <b>CONDITION:</b> erforming the following proc	at least 1 at least 1	0 seconds. 0 seconds.		s perform the following procedure
~	>> GO TO 2.				
	ORM DTC CONFIRMATION P				
	ignition switch ON and wait at k DTC.	least 1 s	second.		
	<u>etected?</u> >> Go to <u>EC-471, "Diagnosis F</u> >> INSPECTION END	Procedur	<u>e"</u> .		
Diagnos	sis Procedure				INFOID:000000010839788
1.снес	K GROUND CONNECTION				
2. Chec	ignition switch OFF. k ground connection M95. Ref pection result normal?	fer to Gr	ound Inspection	in <u>GI-47, "</u>	Circuit Inspection".
YES >	>> GO TO 2. >> Repair or replace ground co				
	K VVEL CONTROL SHAFT P				
2. Turn	onnect VVEL control shaft posi ignition switch ON. k the voltage between VVEL c				s connector and ground.
	VVEL control shaft position sensor		Ground	Voltage	

VVEL	VVEL control shaft position sensor			Voltage (V)	
Bank	Connector	Terminal	Ground	voltage (v)	
1	F46	3			
I	140	6	Ground	Approx. 5	
2	F47	3	Ground		
2	147	6			

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3. Ρ

# P1608 VVEL SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

# **3.**CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

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

VVEL co	ontrol shaft position	on sensor	VVEL con	Continuity	
Bank	Connector	Terminal	Connector	Terminal	Continuity
1	F46	3		9	
I	140	6	E15	22	Existed
2	E47	3		7	EXISTED
2	F47 -	6		20	

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

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

# **4.**DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F1, E3
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

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

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

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

**6.**REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module.
- Go to <u>EC-18</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE) : Special Repair Requirement".

#### >> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace.

**8.**REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-91, "Exploded View".

>> INSPECTION 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

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# DTC DETECTION LOGIC

DTC No.	Trouble diag	nosis name	DT	C detecting condition	Possible cause
P1805	Brake switch	I		a signal is not sent to ECM for ex- me while the vehicle is being driv-	<ul> <li>Harness or connectors (Stop lamp switch circuit is open or short- ed.)</li> <li>Stop lamp switch</li> </ul>
DTC CON	FIRMATIO	N PROC	EDURE		
1.PERFO	RM DTC CO	ONFIRMA	TION PROCE	DURE	
<ol> <li>Fully de</li> <li>Erase t</li> <li>Check</li> <li><u>Is 1st trip D</u></li> <li>YES &gt;&gt;</li> </ol>	he DTC 1st trip DTC <u>TC detecte</u> Go to <u>EC-</u>	orake ped ). <u>d?</u> 173, "Diag	al for at least		
	INSPECTI				
Diagnosi	s Proced	ule			INFOID:000000010839791
1.снеск	STOP LAM	P SWITC	HCIRCUIT		
	nition switch				
2. Check	the stop lan	np when a	pressing an	d releasing the brake peda	Ι.
Brake	pedal	St	op lamp		
Fully r	eleased	Not	illuminated		
Slightly o	lepressed	IIIu	uminated		
	ection result	normal?			
	GO TO 4. GO TO 2.				
~				UPPLY CIRCUIT	
			harness con		
				itch harness connector and	ground.
Stop lam	-	Ground	Voltage		
Connector	Terminal	0			
E110			attery voltage		
-	ction result GO TO 4.	<u>nomal?</u>			
	GO TO 3.				
3.DETEC	Γ MALFUNG	CTIONING	G PART		
Check the f					
	k (J/B) coni	nector E1	03		

• Fuse block (J/B) connector E103

• 10 A fuse (No. 7)

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# 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 lam	p switch	EC	Continuity	
Connector	Terminal	Connector	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-474, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace stop lamp switch.

**I**.CHECK INTERMITTENT INCIDENT

Refer to GI-44, "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	С	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
	Diake pedai	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-9</u>, "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
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed
	ection result		
YES > NO >	> INSPECT > Replace s	top lamp switch.	
	,		

#### < 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

In the sensor is capable of precise measurement  $\chi = 1$ , but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide  $\lambda$  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.	<ul> <li>A/F sensor 1 (bank 1)</li> <li>A/F sensor 1 heater</li> <li>Heated oxygen sensor 2 (bank 1)</li> </ul>
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.	<ul> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> <li>Exhaust gas leaks</li> </ul>
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.	<ul> <li>A/F sensor 1 (bank 2)</li> <li>A/F sensor 1 heater</li> <li>Heated oxygen sensor 2 (bank 2)</li> </ul>
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.	<ul> <li>Fuel pressure</li> <li>Fuel injector</li> <li>Intake air leaks</li> <li>Exhaust gas leaks</li> </ul>

# 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.

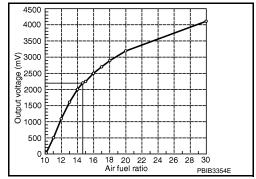
#### TESTING CONDITION:

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

EC-476

# Protector Holder

Zirconia element



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2015 370Z

INFOID:000000010839793

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<pre></pre>	
>> GO TO 2.	
2.PERFORM DTC CONFIRMATION PROCEDURE	ŀ
1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE	_
<u>CLEAR : Special Repair Requirement</u> . 2. Turn ignition switch OFF and wait at least 10 seconds.	E
3. Turn ignition switch ON.	
<ol> <li>Turn ignition switch OFF and wait at least 10 seconds.</li> <li>Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.</li> </ol>	(
6. Let engine idle for 1 minute.	
<ol> <li>Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.</li> <li>Check 1st trip DTC.</li> </ol>	-
Is 1st trip DTC detected?	
YES >> Go to <u>EC-477, "Diagnosis Procedure"</u> . NO >> INSPECTION END	
	E
Diagnosis Procedure	
1. CHECK GROUND CONNECTION	F
1. Turn ignition switch OFF.	
<ol> <li>Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>. <u>Is the inspection result normal?</u></li> </ol>	(
YES >> GO TO 2.	
NO >> Repair or replace ground connection.	ŀ
2.RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2	
Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to <u>EM-39, "Removal and Installa-</u> tion".	
>> GO TO 3.	
3. CHECK FOR EXHAUST GAS LEAK	
<ol> <li>Start engine and run it at idle.</li> <li>Listen for an exhaust gas leak before the three way catalyst 2.</li> </ol>	
Is exhaust gas detected?	ŀ
YES >> Repair or replace. NO >> GO TO 4.	
4. CHECK FOR INTAKE AIR LEAK	l
1. Start engine and run it at idle.	
2. Listen for an intake air leak after the mass air flow sensor.	N
<u>Is intake air leak detected?</u> YES >> Repair or replace.	
YES >> Repair or replace. NO >> GO TO 5.	ľ
5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE	
1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE	(
<u>CLEAR : Special Repair Requirement</u> . 2. Run engine for at least 10 minutes at idle speed.	
Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?	
<ul> <li>YES &gt;&gt; Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-273, "Diagnosis Procedure"</u> or <u>EC-277, "Diagnosis Procedure"</u>.</li> <li>NO &gt;&gt; GO TO 6.</li> </ul>	F
NO >> GO TO 6. 6.CHECK HARNESS CONNECTOR	
1. Turn ignition switch OFF.	
<ol> <li>Disconnect A/F sensor 1 harness connector.</li> <li>Check harness connector for water.</li> </ol>	

Check harness connector for water.

3.

#### < 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 1			Voltage
DIC	Bank	Connector	Terminal	Ground	voltage
P2096 P2097	1	F61	4	Ground	Battery voltage
P2098 P2099	2	F62	4	Ground	Dattery Voltage

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

**8.**DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E3, F1
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

# $9. {\sf CHECK} \ {\sf A/F} \ {\sf SENSOR} \ 1 \ {\sf INPUT} \ {\sf SIGNAL} \ {\sf CIRCUIT} \ {\sf FOR} \ {\sf OPEN} \ {\sf AND} \ {\sf SHORT}$

- 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
P2096	1	F61	1		57	
P2097	1	101	2	F102	61	Existed
P2098	2	E62	1	1102	65	LAISIEU
P2099	2	F62	2		66	

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

DTC		A/F sensor	Ground	Continuity		
	Bank	Connector	Terminal	Giouna	Continuity	
P2096	1	F61	1		Not existed	
P2097	1	101	2	Ground		
P2098	2	0 500	1	Giouna		
P2099	2	F62	2			

# < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

										А
DTC		ECM	<b>-</b> · ·	Ground	Continuity					A
	Bank	Connector	Terminal							
P2096 P2097	1		57							EC
F2097		F102	61	Ground	Not existed					
P2098	2		65							
P2099			66							С
5. Also c	heck h	arness for	short to po	ower.						
Is the insp			<u>nal?</u>							D
	> GO 1			(					_	D
	-			-	or short to p	ower in n	harness or	connector	S.	
10.сне	CK A/F	SENSOR	1 HEATER	२						E
Refer to E	<u>C-190,</u>	"Compone	ent Inspect	<u>ion"</u> .						
Is the insp	ection	result norm	<u>nal?</u>							
	> GO 1									F
	> GO 1									
11.снес	CK HEA	ATED OXY	GEN SEN	SOR 2						G
Refer to E	<u>C-249,</u>	"Compone	ent Inspect	ion".						G
Is the insp	ection	result norm	<u>nal?</u>							
	> GO 1			_	_	_				Н
			•		gen sensor 2	2.				
12.CHE	CK INT	ERMITTE	NT INCIDE	ENT						
Perform <u>G</u>	I-44, "I	ntermittent	Incident".							
Is the insp	ection	result norm	<u>nal?</u>							
-	> GO 1									1
		air or replac								0
<b>13.</b> REPL	ACE A	AIR FUEL I	RATIO (A/I	F) SENSO	R 1					
Replace ai	ir fuel r	atio (A/F) s	sensor 1.							K
CAUTION	•	/=						. (h 0 F		
					ropped from a new one.	n a neigr	nt of mor	e than 0.5	m (19.7 in)	onto a
					exhaust sy	stem th	reads us	ing Oxyge	en Sensor	Thread
				ol (J-4389	7-18 or J-4	3897-12)	] and ap	proved Ar	nti-seize Lu	Ibricant
•		ervice too	l).							N
Do you ha										IV
	> GO 1 > GO 1									
				ATA						Ν
14.CON		VF ADJUS	SIMENI D	AIA						
With CO										
		switch ON		L B 2" in "F	DATA MONIT		do with CC			C
					ISULT scree			JNSULI.		
ls "0.000" (										_
		ECTION E	END							P
NO >	> GO T	TO 15.								
15.CLEA	R THE	E MIXTURI	E RATIO S	ELF-LEA	RNING VALU	UE				
Clear the CLEAR : S					efer to EC-24	<u>4, "MIXT</u>	URE RA	TIO SELF-	LEARNING	VALUE
Do you ha		-	quirement							

#### () With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
- 3. Make sure that "0.000" is displayed on CONSULT screen.

>> INSPECTION END

# P2122, P2123 APP SENSOR

# Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.

# DTC Logic

# DTC DETECTION LOGIC

#### NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-393, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P2122	Accelerator pedal posi- tion sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	<ul> <li>Harness or connectors (APP sensor 1 circuit is open or shorted.)</li> </ul>	
P2123	Accelerator pedal posi- tion sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	<ul> <li>Accelerator pedal position sensor (APP sensor 1)</li> </ul>	

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

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

#### **TESTING CONDITION:**

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

#### >> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- Check DTC. 2.

#### Is DTC detected?

YES >> Go to EC-481, "Diagnosis Procedure". >> INSPECTION END NO

# Diagnosis Procedure

1.CHECK GROUND CONNECTION

Turn ignition switch OFF. 1.

Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection". 2.

EC-481

Is the inspection result normal?

INFOID:0000000010839796

INFOID:000000010839797

PBIB1741E

E

А

L

M

Ν

# P2122, P2123 APP SENSOR

< 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	sensor	Ground	Voltage (V)	
Connector	Terminal	Ciouna	voltage (v)	
E112	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 s	ensor	EC	CM	Continuity
Connector Terminal		Connector Termina		Continuity
E112	E112 4		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.

#### ${f 6}.$ CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP s	ensor	EC	Continuity	
Connector	Connector Terminal		Connector Terminal	
E112	E112 3		97	Existed

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

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7. 7.DETECT MALFUNCTIONING PART

# P2122, P2123 APP SENSOR

			22, P2123 A	PP SENSOR	K	[VQ37VHR]	
	RCUIT DIAGNOS	515 >					
<ul><li>Check the</li><li>Harness</li></ul>	connectors M6, E	E106					А
	for open or short		CM and accelerat	or pedal position	n sensor		
		ouit chort to		to now or in horn			
-	Kepair open cir KAPP SENSOR	cuit, snort to	ground or short	to power in nam	less or connectors.		EC
		unt la ana actio	~ "				
	C-483, "Compone ection result norm		<u></u> .				С
YES >	-> GO TO 10.	<u></u>					
•	> GO TO 9.						D
	CE ACCELERAT						
Replace a	ccelerator pedal a	assembly. Re	efer to <u>ACC-4, "E</u>	xploded View".			Е
>	> INSPECTION E	ND					
	CK INTERMITTEI		IT				_
	I-44, "Intermittent						F
>	> INSPECTION E	ND					G
Compor	nent Inspection	n				INFOID:000000010839799	
	<b>KACCELERATOR</b>		SITION SENSO	R			Н
	gnition switch OFI						
2. Recor	nnect all harness of	connectors o	lisconnected.				Ι
	gnition switch ON < the voltage ECM		nnector terminals	s as per the follo	wina.		
	<u>j</u>						.1
	ECM		_				
Connector	+	-	Con	dition	Voltage (V)		
	Terminal	Terminal		Fully released	0.45 - 1.0		K
	97 (APP sensor 1)	100		Fully depressed	4.2 - 4.8		
M107			Accelerator pedal	Fully released	0.22 - 0.50		L
	98 (APP sensor 2)	104		Fully depressed	2.1 - 2.5		
	ection result norm				·		M
	INSPECTION E GO TO 2.	ND					
•	CE ACCELERAT	OR PEDAI	ASSEMBLY				N
	ccelerator pedal a			xploded View"			
Nopiace a			Dioi to <u>AUU-4, L</u>				~
>	> INSPECTION E	ND					0
							Ρ

# P2127, P2128 APP SENSOR

# Description

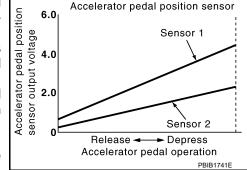
The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.

# DTC Logic

#### DTC DETECTION LOGIC



INFOID:000000010839801

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127	Accelerator pedal posi- tion sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	Harness or connectors     (APP sensor 2 circuit is open or shorted.)     [CKP sensor (POS) circuit is shorted.]     (EVAP
P2128	Accelerator pedal posi- tion sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	<ul> <li>(EVAP control system pressure sensor circuit is shorted.)</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>Accelerator pedal position sensor (APP sensor 2)</li> <li>(Brake booster pressure sensor circuit is shorted)</li> <li>Crankshaft position sensor (POS)</li> <li>EVAP control system pressure sensor</li> <li>Refrigerant pressure sensor</li> <li>Brake booster pressure sensor</li> </ul>

# 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-485, "Diagnosis Procedure".
- NO >> INSPECTION END

# 

			P21	27, P2128		NSOR		
< DTC/CIF		AGNOSIS	>				[VQ37VH	R]
Diagnos	is Proce	dure					INFOID:0000000108	
1.снеск	GROUN		CTION					A
	•	onnection		er to Ground In	spection in	<u>GI-47, "Circuit</u>	t Inspection".	EC
NO >	> GO TO 2 > Repair o	r replace (	-					С
2.CHECK	APP SEN	ISOR 2 P	OWER SL	IPPLY CIRCU	IT-I			
2. Turn iç	gnition swi	tch ON.						D
								E
	sensor	Ground	Voltage	PPLY CIRCUIT-I         in (APP) sensor harness connector.         sor harness connector and ground.         (V)         .5         (V)         .5         PPLY CIRCUIT-II         ensor harness connector and ECM harness con         Continuity         Existed         M and accelerator pedal position sensor         CIRCUIT-III         ort to ground, between the following terminals.         Sensor         Connector         Terminal				
Connector E112	Terminal 6	Ground	Approx	5				F
Is the insp			Approx	5				1
YES > NO >	> GO TO 7 > GO TO 3	7. 3.			и <b>т</b> и			G
	gnition swi		JWER SU	IPPLY CIRCU	-			— н
2. Discor	nect ECN	l harness			connector	and ECM harr	ness connector.	
APP s	sensor	EC	CM	Oraștinuitu				I
Connector	Terminal	Connector	Terminal	Continuity				
E112	6	M107	103	Existed				J
	<u>ection rest</u> > GO TO १ > GO TO 4	5.	2					K
4.DETEC	T MALFU	NCTIONIN	IG PART					
Check the • Harness • Harness	connector			M and acceler	ator pedal p	oosition senso	r	L
>	> Repair o	pen circui	t.					Μ
5.CHECK	K SENSOR	POWER	SUPPLY	CIRCUIT-III				L *
Check har	ness for sł	nort to pov	ver and sh	ort to ground,	between the	e following ter	minals.	— N
EC	CM			Sensor				0
Connector	Terminal		Name		Connector	Terminal		0
F101	45	Brake boos	ster pressure	esensor	E48	1		
	46	CKP sense	or (POS)		F2	1		Р

Is the inspection result normal?

74

103

107

Gear lever position sensor

Refrigerant pressure sensor

EVAP control system pressure sensor

APP sensor

F102

M107

F57

E112

B30

E172

3

6

3

3

- YES >> GO TO 6.
- NO >> Repair short to ground or short to power in harness or connectors.

# **6.**CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-309, "Component Inspection".)
- Gear lever position sensor (Refer to EC-399, "Component Inspection".)
- Brake booster pressure sensor (Refer to <u>EC-386, "Component Inspection"</u>.)
- EVAP control system pressure sensor (Refer to EC-343. "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-527, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace malfunctioning component.

**I**.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

APP sensor		EC	CM	Continuity
Connector Terminal		Connector	Terminal	Continuity
E112	2	M107	104	Existed

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

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

**8.**DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M6, E106

Harness for open or short between ECM and accelerator pedal position sensor

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

# 9.CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP sensor		EC	CM	Continuity
Connector	Connector Terminal		Terminal	Continuity
E112	E112 1		98	Existed

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

Is the inspection result normal?

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

**10.** DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors 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 <u>EC-487</u>, "Component Inspection". Is the inspection result normal?

# P2127, P2128 APP SENSOR

< DTC/CI	RCUIT DIAGNOS		I27, P2128 A	PP SENSO	K	[VQ37VHR]	
	>> GO TO 13. >> GO TO 12.						^
	LACE ACCELERA	TOR PEDA	L ASSEMBLY				A
-	accelerator pedal a			xploded View".			
		-					EC
	> INSPECTION E						
			IT				С
Refer to G	31-44, "Intermittent	Incident".					
>	> INSPECTION E	ND					D
Compor	nent Inspectior	า				INFOID:000000010839803	
	•			_			E
	K ACCELERATOR		SITION SENSO	R			
	gnition switch OFF			F			
3. Turn i	gnition switch ON.						
4. Checl	k the voltage ECM	harness co	nnector terminals	s as per the follo	wing.		
	ECM						G
Connector	+		Con	dition	Voltage (V)		
Connector	Terminal	Terminal					H
	97 (APP sensor 1)	97 (APP sensor 1) 100		Fully released	0.45 - 1.0		
M107	, ,		Accelerator pedal	Fully depressed	4.2 - 4.8		
	98 (APP sensor 2)	104		Fully released Fully depressed	0.22 - 0.50 2.1 - 2.5		
Is the insr	pection result norm	al?		Fully depressed	2.1 - 2.3		J
	> INSPECTION E						
	»> GO TO 2.						k
	ACE ACCELERAT						K
Replace a	accelerator pedal a	issembly. Re	efer to <u>ACC-4, "E</u>	<u>xploded View"</u> .			
	> INSPECTION E	חוא					
							$\mathbb{N}$
							N
							0
							0
							Ρ

# 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-393, "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.	<ul> <li>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.)</li> <li>Accelerator pedal position sensor (APP sensor 2) (Brake booster pressure sensor circuit is shorted)</li> <li>Crankshaft position sensor (POS)</li> <li>EVAP control system pressure sensor</li> <li>Brake booster pressure sensor</li> <li>Refrigerant pressure sensor</li> <li>Refrigerant pressure sensor</li> </ul>

# 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

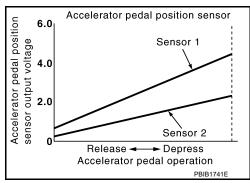
1. Start engine and let it idle for 1 second.

# 2. Check DTC.

Is DTC detected?

YES >> Go to EC-489, "Diagnosis Procedure".

NO >> INSPECTION END



INFOID:000000010839805

< DTC/CIRCUI	T DIAGNOS	IS >	P2138 A	.PP SENSOR	[VQ37VHR]
Diagnosis P					INFOID:000000010839806
1.CHECK GRO		IECTION			
	n switch OFF				
2. Check grou	ind connectio	n M95. Ref	er to Groun	d Inspection in <u>GI-47, "Circuit Inspection"</u> .	
Is the inspectior YES >> GO		<u>ai :</u>			
NO >> Rep	pair or replac	-			
2.CHECK APF	SENSOR 1	POWER SI	JPPLY CIR	CUIT	
	accelerator p n switch ON.	pedal position	on (APP) se	nsor harness connector.	
		en APP se	nsor harnes	s connector and ground.	
APP senso	Grour	d Voltage	e (V)		
Connector Te E112	rminal 5 Grour	id Appro	x 5		
Is the inspection			A. U		
YES >> GO					
NO >> GO	TO 3.				
<b>3.</b> DETECT MA	LFUNCTION	IING PART			
Check the follow	ving.				
Harness conn	ectors M6, E	106			
<b>1.</b> CHECK APF	SENSOR 2		•	short to power in harness or connectors. CUIT-I	
	n switch ON. /oltage betwe	en APP se	nsor harnes	s connector and ground.	
	5			5	
APP senso	r Grour	d Voltage	e (V)		
	rminal				
E112	6 Grour		x. 5		
<u>s the inspectior</u> YES >> GO		<u>al?</u>			
NO >> GO					
- D.CHECK APF		POWER SI	JPPLY CIR	CUIT-II	
	n switch OFF				,
2. Disconnect	ECM harnes	s connector			
3. Check the o	continuity bet	ween APP :	sensor harr	ess connector and ECM harness connector	
APP sensor		ECM			
Connector Terr		or Terminal	- Continuity		
E112	ninal Connect				
	6 M107	103	Existed		
Is the inspectior	6 M107		Existed		
YES >> GO	6 M107 n result norm TO 7.		Existed		
YES >> GO NO >> GO	6 M107 n result norm TO 7. TO 6.	al?	Existed		
YES >> GO	6 M107 n result norm TO 7. TO 6.	al?	Existed		

• Harness connectors M6, E106

Check the following.

#### < DTC/CIRCUIT DIAGNOSIS >

· Harness for open or short between ECM and accelerator pedal position sensor

#### >> Repair open circuit.

# 7. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

EC	M	Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
46	CKP sensor (POS)	F2	1	
F102	74	Gear lever position sensor	F57	3
	103	APP sensor	E112	6
M107	107	EVAP control system pressure sensor	B30	3
	107	Refrigerant pressure sensor	E172	3

Is the inspection result normal?

>> GO TO 8. YES

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 <u>EC-309, "Component Inspection"</u>.)
  Gear lever position sensor (Refer to <u>EC-399, "Component Inspection"</u>.)
- Brake booster pressure sensor (Refer to EC-386, "Component Inspection".)
- EVAP control system pressure sensor (Refer to <u>EC-343, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to EC-527, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace malfunctioning component.

# ${f 9.}$ CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F112	4	M107	100	Existed	
LIIZ	2	WITO7	104	LAISIEU	

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

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors M6, E106

· Harness for open or short between ECM and accelerator pedal position sensor

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

11. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

# EC-490

# < DTC/CIRCUIT DIAGNOSIS >

$\frac{\text{Connector}}{\text{Erritical}} \frac{\text{Connector}}{1 \text{ Imminal}} \frac{1}{\text{Fill } \frac{3}{1} \frac{1}{1} \frac{\text{Mi07}}{97} \frac{97}{98} \frac{1}{\text{Existed}}}}{\frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{98} \frac{1}{1} \frac{1}{1$	APP se	ensor	E	СМ	Continuity				
E112       1       M107       98       Existed <ul> <li>Also check harness for short to ground and short to power.</li> <li>the inspection result normal?</li> <li>YES</li> <li>SGO TO 13.</li> </ul> <li>2. DETECT MALFUNCTIONING PART</li> <li>There following.</li> <li>Harness connectors M6, E106</li> <li>Harness or open or short between ECM and accelerator pedal position sensor</li> <li>&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>CHECK APP SENSOR</li> <li>Effer to EC-491. "Component Inspection".</li> <li>a the inspection result normal?</li> <li>YES</li> <li>&gt; GO TO 14.</li> <li>4. REPLACE ACCELERATOR PEDAL ASSEMBLY</li> <li>teplace accelerator pedal assembly. Refer to ACC-4. "Exploded View".</li> <li>&gt; INSPECTION END</li> <li>5. CHECK INTERMITTENT INCIDENT</li> <li>Effer to GI-44. "Intermittent Incident".</li> <li>&gt; INSPECTION END</li> <li>COMPONENT Inspection         <ul> <li>CHECK ACCELERATOR PEDAL POSITION SENSOR</li> </ul> </li> <li>CHECK ACCELERATOR PEDAL POSITION SENSOR</li> <li>Turn ignition switch OFF.</li> <li>Reconnect all harness connectors disconnected.</li> <li>Turn ignition switch ON.</li> <li>Check the voltage ECM harness connector terminals as per the following.</li> <li>ECM         <ul> <li>Granetar Terminal             <ul> <li>Terminal</li> <li>Terminal</li> <li>Terminal</li> <li>MI07</li></ul></li></ul></li>	Connector	Terminal	Connector	Terminal	Continuity				_
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3.CHECK APP SENSOR         efer to EC-491, "Component Inspection".         the inspection result normal?         YES       >> GO TO 15.         NO       >> GO TO 15.         NO       >> GO TO 14.         4.REPLACE ACCELERATOR PEDAL ASSEMBLY         eplace accelerator pedal assembly. Refer to ACC-4. "Exploded View".         >> INSPECTION END         5.CHECK INTERMITTENT INCIDENT         efer to GI-44. "Intermittent Incident".         >> INSPECTION END         component Inspection         orgonoponent Inspection         orgonoponent Inspection         orgonoponent Inspection         orgonoponent all harness connectors disconnected.         Turn ignition switch OFF.         Reconnect all harness connectors disconnected.         Turn ignition switch ON.         Check the voltage ECM harness connector terminals as per the following.         EcM         connector         4         97 (APP sensor 1)         98 (APP sensor 2)       104		<b>Donoir</b> o	non oiroui	it abort to	around or abort	to now or in horn	ana ar anna stara		
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5.CHECK INTERMITTENT INCIDENT         efer to GI-44. "Intermittent Incident".         >> INSPECTION END         INSPECTION END         COMPONENT INSPECTION END         COMPONENT INSPECTION END         CHECK ACCELERATOR PEDAL POSITION SENSOR         - CHECK ACCELERATOR PEDAL POSITION SENSOR         Turn ignition switch OFF.         Reconnect all harness connectors disconnected.         Turn ignition switch ON.         Check the voltage ECM harness connector terminals as per the following.         Condition         Voltage (V)         Fully released 0.45 - 1.0         Fully depressed 4.2 - 4.8         Fully depressed 4.2 - 4.8         Fully released 0.22 - 0.50				-					
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Turn ignition switch OFF.         Reconnect all harness connectors disconnected.         Turn ignition switch ON.         Check the voltage ECM harness connector terminals as per the following.         ECM         Connector       Yoltage (V)         Terminal       Terminal         Yoltage (V)	.CHECK	ACCELE	RATOR P	PEDAL PO	SITION SENSO	R			
<ul> <li>Reconnect all harness connectors disconnected.</li> <li>Turn ignition switch ON.</li> <li>Check the voltage ECM harness connector terminals as per the following.</li> </ul> ECM           ECM         Voltage (V) <u>+</u>									
Check the voltage ECM harness connector terminals as per the following.         ECM         Connector       Voltage (V)         Terminal       Terminal         Terminal       Terminal         Fully released       0.45 - 1.0         Fully released       0.45 - 1.0         Fully depressed       4.2 - 4.8         Fully released       0.22 - 0.50	Reconr	nect all ha	arness cor	nnectors di	sconnected.				
ECM     Voltage (V)       Connector     +     -       Terminal     Terminal     Terminal       97 (APP sensor 1)     100     Fully released     0.45 - 1.0       98 (APP sensor 2)     104     Fully released     0.22 - 0.50	Turn ig	nition swi	tch ON.	orp.co.c. oor	naatar tarminak	a an nar tha falla	wing		
+     -     Condition     Voltage (V)       Terminal     Terminal     Terminal     Fully released     0.45 - 1.0       97 (APP sensor 1)     100     Accelerator pedal     Fully released     4.2 - 4.8       98 (APP sensor 2)     104     Fully released     0.22 - 0.50	CHECK					s as per the follo	wing.		
Connector     Terminal     Terminal       97 (APP sensor 1)     100     Fully released     0.45 - 1.0       98 (APP sensor 2)     104     Fully released     0.22 - 0.50		EC	M						
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M107 Accelerator pedal Fully depressed 4.2 - 4.8 98 (APP sensor 2) 104 Fully released 0.22 - 0.50						Fully released	0.45 - 1.0		
98 (APP sensor 2) 104 Fully released 0.22 - 0.50	M407	97 (APP se	ensor 1)			Fully depressed	4.2 - 4.8		
yo (APP sensor 2) 104	M107			104	Accelerator pedal	Fully released	0.22 - 0.50		
Fully depressed 2.1 - 2.5		98 (APP se	ensor 2)	104		Fully depressed	2.1 - 2.5		
s the inspection result normal?	the inspe	ction resu	ult normal	?					

 $2. {\tt REPLACE ACCELERATOR PEDAL ASSEMBLY}$ 

Replace accelerator pedal assembly. Refer to ACC-4, "Exploded View".

>> INSPECTION END

# **P2765 INPUT SPEED SENSOR**

# Description

Input speed sensor is installed in transmission and detects transmission input shaft speed. ECM receives input speed signal and performs SynchroRev Match mode (S-MODE) control according to input speed signal.

# **DTC Logic**

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P2765 is displayed with DTC P0335, P0340 or P0345, first perform the trouble diagnosis for DTC P0335, P0340 or P0345. Refer to EC-306, "DTC Logic" or EC-310, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause			
P2765 Input speed sensor circuit		There is a difference between engine speed signal calculated by ECM and input shaft speed sensor signal.	<ul> <li>Harness or connectors (Input speed sensor circuit is open or shorted.)</li> <li>Input speed sensor</li> </ul>			
DTC CONFIRMATION PROCEDURE						
1.PREC	1.PRECONDITIONING					
	If DTC Confirmation Procedure has been previously conducted, always perform the following procedu					
before conducting the next test.						
1. Turn	1. Turn ignition switch OFF and wait at least 10 seconds.					
2. Turn	ignition switch ON.					

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

**TESTING CONDITION:** 

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

>> GO T	O 2.	
	~ ~ ~	

# 2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.

2. Drive the vehicle for at least 10 consecutive seconds under the following conditions.

Vehicle speed	More than 20 km/h (12 mph)
Shift lever	Except neutral position
Clutch pedal	Fully released
CAUTION: Always drive 3. Check DTC.	e vehicle at a safe speed

YES >> Go to EC-494, "Diagnosis Procedure".

>> INSPECTION END NO

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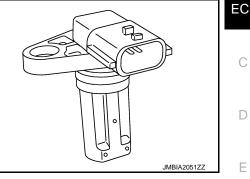
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# **P2765 INPUT SPEED SENSOR**

# < DTC/CIRCUIT DIAGNOSIS >

# Diagnosis Procedure

INFOID:000000010839810

#### **1.**CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-47, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK INPUT SPEED SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect input speed sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between input speed sensor harness connector and ground.

Input spe	ed sensor	Ground	Voltage (V)
Connector	Connector Terminal		voltage (v)
F58	1	Ground	Battery voltage

Is the inspection result normal?

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

**3.** DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F103, M116

Harness for open or short between input speed sensor and IPDM E/R

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

# ${f 4.}$ CHECK INPUT SPEED SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

Input spe	Input speed sensor		ECM		
Connector	Terminal	Connector	Terminal	Continuity	
F58	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.

 ${f b.}$ CHECK INPUT SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between input speed sensor harness connector and ECM harness connector.

Input speed sensor		E	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F58	3	F102	75	Existed	

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

Is the inspection result normal?

YES >> GO TO 6.

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

**Ó.**CHECK INPUT SPEED SENSOR

# **P2765 INPUT SPEED SENSOR**

	P2765 INPUT SPEED S	ENSOR	
< DTC/CIRCUIT DIAG	NOSIS >	[VQ37VHR]	
Refer to EC-495, "Comp	onent Inspection".		
Is the inspection result n	<u>ormal?</u>		А
YES >> GO TO 7. NO >> Replace inp	ut speed sensor.	-	
7.CHECK INTERMITTE	•		EC
Refer to <u>GI-44, "Intermiti</u>			
	<u>entinoident</u> .		C
>> INSPECTIO	N END		C
Component Inspec	tion	INFOID:000000010839811	D
<b>1.</b> CHECK INPUT SPEE	ED SENSOR-I		
1. Turn ignition switch			Е
<ol> <li>Disconnect input spectrum</li> <li>Remove the sensor.</li> </ol>	eed sensor harness connector. Refer to <u>TM-36, "Exploded View"</u> .		
4. Visually check the s			
Is the inspection result n	ormal?	$\mathbf{\overline{o}}$	F
YES >> GO TO 2.	ut an and concer	~	
NO >> Replace inp	ut speed sensor.	2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	G
			Н
		JMBIA2060ZZ	
2. CHECK INPUT SPEE	-D SENSOR-II	- JMBIA206022	
	en input speed sensor terminals as per th	e following items	
			J
Terminals (Polarity)	Resistance		
1 (+) - 2 (-)			1.4
1 (+) - 3 (-)	Except 0 or $\infty \Omega$ [at 25°C (77°F)]		Κ
2 (+) - 3 (-)			
Is the inspection result n			L
YES >> INSPECTIO NO >> Replace inp	N END ut speed sensor.		
	ut speed sensol.		M
			IVI
			Ν
			0
			0
			Ρ

# 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-78, "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 (A/T or M/T models and synchrorev match mode) Brake pedal and clutch pedal (M/T models without synchror- ev match mode)	Slightly depressed	OFF
DIVINE OW I	Brake pedal (A/T or M/T models and synchrorev match mode) Brake pedal or clutch pedal (M/T models without synchrorev match mode)	Fully released	ON

# **Without CONSULT**

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 (A/T or M/T models and synchrorev match mode) Brake pedal and clutch pedal (M/T mod- els without synchrorev match mode)	Slightly depressed	Approx. 0
WI 107	(ASCD brake switch signal)	120	Brake pedal (A/T or M/T models and synchrorev match mode) Brake pedal or clutch pedal (M/T models without synchrorev match mode)	Fully released	Battery voltage

# Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-496, "Diagnosis Procedure".

# Diagnosis Procedure

# **1.**INSPECTION START

Check which type of transmission the vehicle is equipped with.

# Which type of transmission?

A/T models or M/T models and synchrorev match mode>>GO TO 2. M/T models without synchrorev match mode>>GO TO 7.

# 2. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.

# EC-496

INFOID:000000010839814

INFOID:000000010839812

4. Check the voltage between ASCD brake switch harness connector and ground.         ASCD brake switch E109       1       Ground Ground Battery voltage         Is the inspection result normal?       YES       > GO TO 4.         NO       >> GO TO 3.       3.         3.DETECT MALFUNCTIONING PART       Check the following.       Check the following.         - Fuse block (J/B) connector E103       10 A fuse (No. 3)         Harness for open or short between ASCD brake switch and fuse       >> Repair open circuit or short to ground in harness or connectors.         4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT       Turn ignition switch OFF.         2. Disconnect ECM harness connector.       S. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         XCDD brake switch to ground and short to power.       Is the inspection result normal?         YES       >> GO TO 6.         NO       > GO TO 5.         5.DETECT MALFUNCTIONING PART         Check the following.         • Harness connectors E106, M6         • Harness or open or short between ECM and ASCD brake switch         >> Repair open circuit, short to ground or short to power in harness or connectors.         6.CHECK ASCD BRAKE SWITCH         Refer to EC-439. "Component Inspection (ASCD brake switch)"         Is the inspection result normal? <th>COTC/CIRCUIT DIAGNOSI</th> <th>ASCD BRAI</th> <th>[VQ37VHR]</th>	COTC/CIRCUIT DIAGNOSI	ASCD BRAI	[VQ37VHR]
Connector       Terminal       Ground       Voltage         E109       1       Ground       Battery voltage         Is the inspection result normal?       YES       >> GO TO 4.         NO       >> GO TO 3.       S.DETECT MALFUNCTIONING PART         Check the following.       •       •         Fuse block (JB) 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. <b>4</b> . CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         1. Turn ignition switch OFF.       .       Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         ASCD brake switch       ECM       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.         5.DETECT MALFUNCTIONING PART       .       .       .       .       .         Check the following.       .       .       .       .       .       .       .         YES	4. Check the voltage betwee	en ASCD brake switch ha	rness connector and ground.
Connector       Terminal       Ground       Voltage         E109       1       Ground       Battery voltage         Sthe inspection result normal?       YES       >> GO TO 4.         NO       >> GO TO 4.       >>         DETECT MALFUNCTIONING PART	ASCD broke ewitch		
E109       1       Ground       Battery voltage         sthe inspection result normal?         YES       >> GO TO 4.         NO       >> GO TO 3.         3. DETECT MALFUNCTIONING PART         Check the following.         Fuse block (J/B) connector E103         10 A fuse (Mo. 3)         Harness for open or short between ASCD brake switch and fuse         >> Repair open circuit or short to ground in harness or connectors.         4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         I. Turn ignition switch OFF.         Disconnect ECM harness connector.         2. Obtack exwitch       ECM         Connector       Terminal         Connector       Terminal         Connector       Terminal         Connector       Terminal         Connector Terminal       Continuity         YES       > GO TO 6.         NO       >> GO TO 5.         D.DETECT MALFUNCTIONING PART         Check the following.         Harness for open or short between ECM and ASCD brake switch         >> Repair open circuit, short to ground or short to power.         S.D.DETECT MALFUNCTIONING PART         Check the following.         Harness for open or short between ECM and ASCD brake switch </th <th>Ground</th> <th>Voltage</th> <th></th>	Ground	Voltage	
ste inspection result normal?         YES       >> GO TO 4.         NO       >>> GO TO 3.         3.DETECT MALFUNCTIONING PART         Check the following.         • Fuse block (J/B) connector E103         • 10 A fuse (No. 3)         • Harness for open or short between ASCD brake switch and fuse         >> Repair open circuit or short to ground in harness or connectors.         4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         1. Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         ASCD brake switch       ECM         Connector       Terminal         YES       > GO TO 6.         NO       >> GO TO 5.         D.ETECT MALFUNCTIONING PART         Check the following.         • Harness for open or short between ECM and ASCD brake switch		Battery voltage	
YES ⇒> GO TO 4. NO ⇒> GO TO 3. 3. DETECT MALFUNCTIONING PART Check the following. Fuse block (J/B) connector E103 10 A fuse (No. 3) Harness for open or short between ASCD brake switch and fuse >> Repair open circuit or short to ground in harness or connectors. 4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch OFF. 2. Disconnect ECM harness connector. 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector. 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector. 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector. 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector. 4. Also check harness for short to ground and short to power. 5. the inspection result normal? YES ⇒ GO TO 6. NO ⇒ GO TO 5. 5. DETECT MALFUNCTIONING PART Check the following. 4. 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-499. "Component Inspection (ASCD Brake Switch)" 5. the inspection result normal? YES ⇒ GO TO 15. NO ⇒> Replace ASCD brake switch. 7. CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 4. Disconnect ASCD brake switch. 7. CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 5. Disconnect ASCD brake switch. 7. CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 5. Disconnect ASCD brake switch harness connector.			
3. DETECT MALFUNCTIONING PART         Check the following.         Fuse block (J/B) connector E103         10 A fuse (No. 3)         Harress for open or short between ASCD brake switch and fuse         >> Repair open circuit or short to ground in harness or connectors.         4.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         1. Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         ASCD brake switch       ECM         Connector       Terminal         Connector       Terminal         Connector       Terminal         Connector Terminal       Continuity         E109       2       M107         2       M107       126         Existed       4. Also check harness for short to ground and short to power.         Is the inspection result normal?       YES         YES       > GO TO 5.         5.DETECT MALFUNCTIONING PART       Solution between ECM and ASCD brake switch         >> Repair open circuit, short to ground or short to power in harness or connectors.         6.CHECK ASCD BRAKE SWITCH       Solution (ASCD Brake Switch)         >> Repair open circuit, short to ground or short to power in harness or connectors.	YES >> GO TO 4.	_	
Check the following.         Fuse block (J/B) connector E103         10 A fuse (No. 3)         Harness for open or short between ASCD brake switch and fuse         >> Repair open circuit or short to ground in harness or connectors.         4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         1. Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         ASCD brake switch       ECM         Connector       Terminal         Connector       Terminal      <	•	_	
<ul> <li>Fuse block (J/B) connector E103</li> <li>10 A fuse (No. 3)</li> <li>Harness for open or short between ASCD brake switch and fuse</li> <li>&gt;&gt; Repair open circuit or short to ground in harness or connectors.</li> <li>4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT</li> <li>Turn ignition switch OFF.</li> <li>Disconnect ECM harness connector.</li> <li>Check the continuity between ASCD brake switch harness connector and ECM harness connector.</li> <li>ACD brake switch ECM Continuity</li> <li>Connector Terminal Connector Terminal Continuity</li> <li>E109 2 M107 126 Existed</li> <li>A. Also check harness for short to ground and short to power.</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 6.</li> <li>DETECT MALFUNCTIONING PART</li> <li>Check the following.</li> <li>Harness for open or short between ECM and ASCD brake switch</li> <li>&gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>6. CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH</li> <li>It the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH</li> <li>It the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH CONTEXT</li> <li>It the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH CONTEXT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH COULT</li> <li>1. Turn ignition switch OFF.</li> <li>3. Disconnect ASCD brake switch harness connector.</li> </ul>		NG PART	
<ul> <li>10 A fuse (No. 3)</li> <li>Harness for open or short between ASCD brake switch and fuse</li> <li>&gt;&gt; Repair open circuit or short to ground in harness or connectors.</li> <li>4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ECM harness connector.</li> <li>3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.</li> <li>ASCD brake switch ECM Connector Terminal Continuity</li> <li><u>a SCD brake switch Connector Terminal Continuity</u></li> <li><u>a ASCD brake switch Connector Terminal Continuity</u></li> <li><u>a ASCD brake switch short to ground and short to power.</u></li> <li><u>b the inspection result normal?</u></li> <li>YES &gt;&gt; GO TO 6.</li> <li>NO &gt;&gt; GO TO 5.</li> <li>5. DETECT MALFUNCTIONING PART</li> <li>Check the following.</li> <li>Harness for open or short between ECM and ASCD brake switch</li> <li>&gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>6. CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH CRUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch.</li> </ul>		E103	
>> Repair open circuit or short to ground in harness or connectors.           4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT           1. Turn ignition switch OFF.           2. Disconnect ECM harness connector.           3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.           ASCD brake switch         ECM           Connector         Terminal           E109         2           M107         126           Existed           4. Also check harness for short to ground and short to power.           Is the inspection result normal?           YES         > G0 T0 6.           NO         >> G0 T0 5.           5.DETECT MALFUNCTIONING PART           Check the following.           • Harness for open or short between ECM and ASCD brake switch           >> Repair open circuit, short to ground or short to power in harness or connectors.           6.CHECK ASCD BRAKE SWITCH           Refer to EC-499. "Component Inspection (ASCD Brake Switch)"           Is the inspection result normal?           YES         > G0 T0 15.           NO         >> Replace ASCD brake switch. <b>Z</b> .CHECK ASCD BRAKE SWITCH           IS the inspection result normal?           YES         > G0 T0 15.           NO         >> Replace ASCD	10 A fuse (No. 3)		
4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         1. Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         ASCD brake switch ECM continuity <u>Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Connector Terminal Context Continuity         4. Also check harness for short to ground and short to power.         Is the inspection result normal?         YES       &gt; GO TO 6.         NO       &gt;&gt; GO TO 5.         5. DETECT MALFUNCTIONING PART         Check the following.         • Harness for open or short between ECM and ASCD brake switch         &gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.         6. CHECK ASCD BRAKE SWITCH         Refer to EC-499. "Component Inspection (ASCD Brake Switch)"         Is the inspection result normal?         YES       &gt;&gt; GO TO 15.         NO       &gt;&gt; Replaice ASCD brake switch.         7. CHECK ASCD BRAKE SWITCH         Refer to EC-499. "Component Inspection (ASCD Brake Switch)"         Is the inspection result normal?         YES       &gt;&gt; GO TO 15.         NO       &gt;&gt; Replace ASCD brake switch.         7. CHECK ASCD BRAKE SWITCH CIRCU</u>	Harness for open or short b	etween ASCD brake swite	ch and fuse
4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT         1. Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector. <u>ASCD brake switch ECM continuity</u> <u>Connector Terminal Connector Terminal Connector Terminal Continuity</u> <u>E109 2 M107 126 Existed</u> 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 to ground or short to power in harness or connectors.          6.CHECK ASCD BRAKE SWITCH         Refer to EC-499. "Component Inspection (ASCD brake switch)"          Is the inspection result normal?          YES >> GO TO 15.          NO >> Replair open circuit, short to ground or short to power in harness or connectors.          6.CHECK ASCD BRAKE SWITCH         Refer to EC-499. "Component Inspection (ASCD Brake Switch)"          Is the inspection result normal?          YES >> GO TO 15.          NO >> Replace ASCD brake switch.          7.CHECK ASCD BRAKE SWITCH CIRCUIT         1. Turn ignition switch OFF.	>> Penair onon oirou	it or short to around in he	rness or connectors
1. Turn ignition switch OFF.         2. Disconnect ECM harness connector.         3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.         ASCD brake switch       ECM         Connector       Terminal         Etos       SO TO 5.         5.DETECT MALFUNCTIONING PART         Check the following.       •         • Harness for open or short between ECM and ASCD brake switch         >> Repair open circuit, short to ground or short to power in harness or connectors.         6.CHECK ASCD BRAKE SWITCH	· · ·	•	
<ol> <li>Disconnect ECM harness connector.</li> <li>Check the continuity between ASCD brake switch harness connector and ECM harness connector.</li> <li>ASCD brake switch ECM Continuity</li> <li>Connector Terminal Connector Terminal</li> <li>Continuity</li> <li>Connector Terminal Connector Terminal</li> <li>Existed</li> <li>Also check harness for short to ground and short to power.</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 6.</li> <li>NO &gt;&gt; GO TO 5.</li> <li>DETECT MALFUNCTIONING PART</li> <li>Check the following.</li> <li>Harness connectors E106, M6</li> <li>Harness for open or short between ECM and ASCD brake switch</li> <li>&gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 5.</li> <li>CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>Turn ignition switch OFF.</li> <li>Disconnect ASCD brake switch harness connector.</li> </ol>			
<ul> <li>3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.</li> </ul> ASCD brake switch ECM Continuity Connector Terminal Connect ASCD brake switch Terminal Connect ASCD Brake SWITCH CIRCUIT 1. Turn ignition switch OFF. 2. Disconnect ASCD brake switch harness connector.		connector.	
Connector         Terminal         Connector         Terminal         Continuity           E109         2         M107         126         Existed           4.         Also check harness for short to ground and short to power.         Is the inspection result normal?           YES         >> GO TO 6.         NO         >> GO TO 5.           5.DETECT MALFUNCTIONING PART         Check the following.         Iteration           • Harness connectors E106, M6         •         Harness for open or short between ECM and ASCD brake switch           >> Repair open circuit, short to ground or short to power in harness or connectors.         6.CHECK ASCD BRAKE SWITCH           Refer to EC-499, "Component Inspection (ASCD Brake Switch)"         Is the inspection result normal?           YES         >> GO TO 15.         NO           NO         >> Replace ASCD brake switch.         7.CHECK ASCD BRAKE SWITCH CIRCUIT           1.         Turn ignition switch OFF.         2. Disconnect ASCD brake switch harness connector.	<ol><li>Check the continuity betw</li></ol>	een ASCD brake switch	harness connector and ECM harness connector.
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           YES         >> GO TO 6.         NO         >> GO TO 5.           5.DETECT MALFUNCTIONING PART         Connector sectors E106, M6         Iteration           • Harness connectors E106, M6         •         Harness for open or short between ECM and ASCD brake switch           >> Repair open circuit, short to ground or short to power in harness or connectors.         6.CHECK ASCD BRAKE SWITCH           Refer to EC-499, "Component Inspection (ASCD Brake Switch)"         Is the inspection result normal?           YES         >> GO TO 15.           NO         >> Replace ASCD brake switch.           7.CHECK ASCD BRAKE SWITCH CIRCUIT           1. Turn ignition switch OFF.           2. Disconnect ASCD brake switch harness connector.			
E109       2       M107       126       Existed         4. Also check harness for short to ground and short to power.         Is the inspection result normal?         YES       >> GO TO 6.         NO       >> GO TO 5.         5.DETECT MALFUNCTIONING PART         Check the following.         • Harness connectors E106, M6         • Harness for open or short between ECM and ASCD brake switch         >> Repair open circuit, short to ground or short to power in harness or connectors.         6.CHECK ASCD BRAKE SWITCH         Refer to EC-499. "Component Inspection (ASCD Brake Switch)"         Is the inspection result normal?         YES       >> GO TO 15.         NO       >> Replace ASCD brake switch.         7.CHECK ASCD BRAKE SWITCH CIRCUIT         1. Turn ignition switch OFF.         2. Disconnect ASCD brake switch harness connector.		Continuity	
<ul> <li>A. Also check harness for short to ground and short to power.</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 6.</li> <li>NO &gt;&gt; GO TO 5.</li> <li>5.DETECT MALFUNCTIONING PART</li> <li>Check the following.</li> <li>Harness connectors E106, M6</li> <li>Harness for open or short between ECM and ASCD brake switch</li> <li>&gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>6.CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7.CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch harness connector.</li> </ul>			
Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART Check the following. • Harness connectors E106, M6 • Harness for open or short between ECM and ASCD brake switch >> Repair open circuit, short to ground or short to power in harness or connectors. 6.CHECK ASCD BRAKE SWITCH Refer to EC-499. "Component Inspection (ASCD Brake Switch)" Is the inspection result normal? YES >> GO TO 15. NO >> Replace ASCD brake switch. 7.CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 2. Disconnect ASCD brake switch harness connector.			2 power
<ul> <li>YES &gt;&gt; GO TO 6.</li> <li>NO &gt;&gt; GO TO 5.</li> <li>5.DETECT MALFUNCTIONING PART</li> <li>Check the following.</li> <li>Harness connectors E106, M6</li> <li>Harness for open or short between ECM and ASCD brake switch</li> <li>&gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>6.CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7.CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch harness connector.</li> </ul>		-	
<ul> <li>5. DETECT MALFUNCTIONING PART</li> <li>Check the following.</li> <li>Harness connectors E106, M6</li> <li>Harness for open or short between ECM and ASCD brake switch</li> <li>&gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>6. CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499, "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7. CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch harness connector.</li> </ul>	YES >> GO TO 6.		
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.  CHECK ASCD BRAKE SWITCH  Refer to EC-499. "Component Inspection (ASCD Brake Switch)" Is the inspection result normal?  YES >> GO TO 15. NO >> Replace ASCD brake switch.  CHECK ASCD BRAKE SWITCH CIRCUIT  Turn ignition switch OFF.  Disconnect ASCD brake switch harness connector.			
<ul> <li>Harness connectors E106, M6</li> <li>Harness for open or short between ECM and ASCD brake switch &gt;&gt; Repair open circuit, short to ground or short to power in harness or connectors. </li> <li>CHECK ASCD BRAKE SWITCH Refer to EC-499, "Component Inspection (ASCD Brake Switch)" Is the inspection result normal? YES &gt;&gt; GO TO 15. NO &gt;&gt; Replace ASCD brake switch. 7.CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 2. Disconnect ASCD brake switch harness connector.</li></ul>	D.DETECT MALFUNCTION	NG PART	
<ul> <li>Harness for open or short between ECM and ASCD brake switch &gt; Repair open circuit, short to ground or short to power in harness or connectors. </li> <li>CHECK ASCD BRAKE SWITCH Refer to EC-499, "Component Inspection (ASCD Brake Switch)" Is the inspection result normal? YES &gt;&gt; GO TO 15. NO &gt;&gt; Replace ASCD brake switch. CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 2. Disconnect ASCD brake switch harness connector.</li></ul>		10	
<ul> <li>&gt; Repair open circuit, short to ground or short to power in harness or connectors.</li> <li>6.CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7.CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch harness connector.</li> </ul>			orake switch
<ul> <li>6.CHECK ASCD BRAKE SWITCH</li> <li>Refer to EC-499. "Component Inspection (ASCD Brake Switch)"</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 15.</li> <li>NO &gt;&gt; Replace ASCD brake switch.</li> <li>7.CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch harness connector.</li> </ul>	·····		
Refer to EC-499. "Component Inspection (ASCD Brake Switch)"         Is the inspection result normal?         YES       >> GO TO 15.         NO       >> Replace ASCD brake switch.         7.CHECK ASCD BRAKE SWITCH CIRCUIT         1.       Turn ignition switch OFF.         2.       Disconnect ASCD brake switch harness connector.	>> Repair open circu	it, short to ground or sho	rt to power in harness or connectors.
Is the inspection result normal?         YES       >> GO TO 15.         NO       >> Replace ASCD brake switch.         7.CHECK ASCD BRAKE SWITCH CIRCUIT         1. Turn ignition switch OFF.         2. Disconnect ASCD brake switch harness connector.	${\mathfrak S}.$ CHECK ASCD BRAKE SV	/ITCH	
YES >> GO TO 15. NO >> Replace ASCD brake switch. 7.CHECK ASCD BRAKE SWITCH CIRCUIT 1. Turn ignition switch OFF. 2. Disconnect ASCD brake switch harness connector.	Refer to <u>EC-499, "Componen</u>	t Inspection (ASCD Brake	Switch)"
NO       >> Replace ASCD brake switch.         7.CHECK ASCD BRAKE SWITCH CIRCUIT         1. Turn ignition switch OFF.         2. Disconnect ASCD brake switch harness connector.		<u>l?</u>	
<ul> <li>7.CHECK ASCD BRAKE SWITCH CIRCUIT</li> <li>1. Turn ignition switch OFF.</li> <li>2. Disconnect ASCD brake switch harness connector.</li> </ul>		raka switch	
<ol> <li>Turn ignition switch OFF.</li> <li>Disconnect ASCD brake switch harness connector.</li> </ol>	_		
2. Disconnect ASCD brake switch harness connector.			
		switch harness connector	
	3. Turn ignition switch ON.		
4. Check the voltage between ASCD brake switch harness connector and ground.	<ol> <li>Check the voltage between the vol</li></ol>	en ASCD brake switch ha	rness connector and ground.
	ASCD broke ewitet		
ASCD brake switch Connector Terminal Ground Condition Voltage (V)	Ground	Condition	Voltage (V)

	ASCD bra	ike switch	Ground	Condition		Voltage (V)
	Connector	Terminal	Ciouna			voltage (v)
	E109	1	Ground	Brake pedal	Slightly depressed	Approx. 0
_	L109	Ι	Giouna	Diake pedai	Fully released	Battery voltage

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 12.

NO >> GO TO 8.

8.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect clutch pedal position switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between clutch pedal position switch harness connector and ground.

Clutch pedal p	osition switch	Ground	Voltage
Connector	Connector Terminal		voltage
E108	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

**9.** DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between clutch pedal position switch and fuse

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

# 10. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between clutch position switch harness connector and ASCD brake switch harness connector.

Clutch pedal position switch		ASCD bra	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
E108	2	E109	1	Existed	

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

Is the inspection result normal?

YES >> GO TO 11.

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

11. CHECK CLUTCH PEDAL POSITION SWITCH

Refer to EC-499, "Component Inspection (Clutch Pedal Position Switch)".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace clutch pedal position switch.

12. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

ASCD brake switch		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 14.

				AKE SWITCH	
	RCUIT DIAG	GNOSIS >		[VC	Q37VHR]
NO >	> GO TO 13	3.			
13.dete	ECT MALFU	INCTIONING PAR	RT		
Check the					
<ul> <li>Harness</li> </ul>	connectors				
<ul> <li>Harness</li> </ul>	for open or	short between E	CM and ASCE	brake switch	
	Deneinen	an ainarit abantta			
		en circuit, snort to RAKE SWITCH	o grouna or sn	ort to power in harness or connectors.	
		nponent Inspectio	on (ASCD Bra	<u>ke Switch)"</u> .	
	<u>ection result</u> > GO TO 15				
		SCD brake switc	:h.		
·	•	ITTENT INCIDE			
		nittent Incident".			
>	> INSPECT	ION END			
Compor	ent Inspe	ection (ASCD	Brake Swit	tch)	
			Diake Own		0:0000000010839815
<b>1.</b> CHECk	ASCD BRA	AKE SWITCH-I			
1. Turn i	gnition switc	h OFF.			
2. Disco	nect ASCD	brake switch har			
<ol><li>Check</li></ol>	the continu	$A \leq C$			
		ity between ASC	D brake switci	n terminals under the following conditions.	
				n terminals under the following conditions.	
Terminals		Condition	Continuity	n terminals under the following conditions.	
		Condition Fully released	Continuity Existed	n terminals under the following conditions.	
Terminals 1 and 2	C Brake pedal	Condition Fully released Slightly depressed	Continuity	n terminals under the following conditions.	
Terminals 1 and 2 Is the insp	C	Condition Fully released Slightly depressed	Continuity Existed	n terminals under the following conditions.	
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Terminals 1 and 2 1 s the insp YES > NO > 2.CHECH 1. Adjust	C Brake pedal ection result > INSPECT > GO TO 2. CASCD BRA ASCD brak the continu	Condition Fully released Slightly depressed IN END AKE SWITCH-II AKE SWITCH-II Se switch installati ity between ASC	Continuity Existed Not existed ion. Refer to <u>B</u> D brake switcl Continuity	R-9. "Inspection and Adjustment".	
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Terminals 1 and 2 s the insp YES > NO > 2.CHECP 1. Adjust 2. Check Terminals 1 and 2 s the insp YES > NO > Compor 1.CHECP	C Brake pedal ection result > INSPECT > GO TO 2. (ASCD BRA (ASCD brak (ASCD BRA) (ASCD brak (ASCD brak (ASCD brak (ASCD brak)) (ASCD brak (ASCD brak)) (ASCD brak (ASCD brak)) (ASCD Brak) (ASCD brak)) (ASCD Brak) (ASCD Brak) (ASCD Brak)) (ASCD Brak) (ASCD Brak)) (ASCD	Condition Fully released Slightly depressed Control Control Control Condition Fully released Slightly depressed Condition Fully released Slightly depressed Control	Continuity Existed Not existed ion. Refer to E D brake switcl Continuity Existed Not existed Not existed	R-9. "Inspection and Adjustment". In terminals under the following conditions.	0:000000010839816

#### < DTC/CIRCUIT DIAGNOSIS >

Terminals	Condition		Continuity
1 and 2	and 2 Clutch pedal	Fully released	Existed
i anu z	Ciuton pedai	Fully depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

**2.**CHECK CLUTCH PEDAL POSITION SWITCH-II

- 1. Adjust clutch pedal position switch installation. Refer to CL-8, "Inspection and Adjustment".
- 2. Check the continuity between clutch pedal position switch terminals under the following conditions.

Terminals	Condition		Condition Continu		Continuity
1 and 2	and 2 Clutch pedal	Fully released	Existed		
1 and 2	Ciulon pedai	Fully depressed	Not existed		

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace clutch pedal position switch.

# ASCD INDICATOR

# < DTC/CIRCUIT DIAGNOSIS >

# ASCD INDICATOR

# Description

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.

CRUISE lamp illuminates when MAIN switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.

SET lamp illuminates when the following conditions are met.

- CRUISE lamp is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET lamp remains lit during ASCD control.

Refer to EC-78, "System Description" for the ASCD function.

# Component Function Check

# **1.**CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR CONDITION SPECIFICATION · MAIN switch: Pressed at the **CRUISE LAMP** · Ignition switch: ON  $\mathsf{ON} \to \mathsf{OFF}$ 1st time  $\rightarrow$ at the 2nd time · MAIN switch: ON · ASCD: Operating ON Н · When vehicle speed is be-SET LAMP tween 40 km/h (25 MPH) and · ASCD: Not operating OFF 144 km/h (89 MPH) Is the inspection result normal? YES >> INSPECTION END >> Go to EC-501, "Diagnosis Procedure". NO Diagnosis Procedure INFOID:000000010839819 1.CHECK DTC Κ Check that DTC UXXXX is not displayed. Is the inspection result normal? L YES >> GO TO 2. NO >> Perform trouble diagnosis for DTC UXXXX. 2.CHECK DTC WITH COMBINATION METER M Refer to MWI-34, "CONSULT Function (METER/M&A)". Is the inspection result normal? YES Ν >> GO TO 3. NO >> Repair or replace.  ${
m 3.}$  CHECK INTERMITTENT INCIDENT Refer to GI-44. "Intermittent Incident". Is the inspection result normal? YES >> Replace combination meter. Ρ >> Repair or replace. NO

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# COOLING FAN

# Description

#### 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:000000010839821

# **1.**CHECK COOLING FAN FUNCTION

# (I) With CONSULT

#### 1. Turn ignition switch ON.

- 2. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that cooling fan speed varies according to the percentage.

#### **Without CONSULT**

- 1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to <u>PCS-10, "Diagnosis</u> <u>Description"</u>.
- 2. Make sure that cooling fan operates.

#### Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-502, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:000000010839822

# 1. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module harness connector and ground.

Cooling fan c	ontrol module	Ground	Voltage	
Connector	Connector Terminal		voltage	
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		Cround	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.

# EC-502

# **COOLING FAN**

# < DTC/CIRCUIT DIAGNOSIS >

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			ess connecto en IPDM E/R		nnector and ground.	
		,				EC
IPDM	E/R	Cround	Continuity			LU
Connector	Terminal	Ground	Continuity			
E5	12	Ground	Existed			С
E6	41	Ground	Existed			
3. Also ch	neck harn	ess for sho	ort to power.			D
Is the inspe			) -			
	> GO TO -		or short to po	wor in har	ness or connectors.	
4	•	•	NTROL SIGN			E
					1	
			ess connecto		onnector and cooling fan control module harness con-	F
nector.						
IPDM	E/R	Cooling far	n control module	Continuity		G
Connector	Terminal	Connector	- Terminal			
E9	97	E37	2	Existed		Н
			ort to ground a	nd short to	power.	
Is the inspe			-			
	> GO TO : > Repair c		short to arou	ind or shor	to power in harness or connectors.	
_	•	•	•		UT SIGNAL CIRCUIT	
			nectors discor			J
			itrol module ha		nectors.	
3. Turn ig	nition swi	itch ON.				
4. Check	the voltag	ge betweer	n cooling fan c	ontrol mod	ule harness connector and ground.	K
Cooling fan	control mor					
Connector	Termin	Ground	d Voltage			L
	4					
	6	Ground	d Battery volta	ge		
Is the inspe	_	ult normal?	)			Μ
•	> GO TO (		-			
			n control mod	ule.		Ν
<b>6.</b> CHECK	COOLIN	G FAN MC	TORS -1 AND	D -2		
Refer to EC	C-504, "C	omponent	Inspection (Co	oling Fan	Motor)".	
Is the inspe	ection res	ult normal?	<u>,</u>	•		0
	> GO TO					
_	NO >> Replace cooling fan motor.					
I.CHECK	COOLIN	G FAN CO	NTROL MOD	ULE POWI	ER SUPPLY CIRCUIT-II	
	nition swi					
2. Discon	nect cool	ing fan rela	ay.			

Disconnect cooling fan relay.
 Turn ignition switch ON.

4. Check the voltage between cooling fan relay harness connector and ground.

# EC-503

Cooling	fan relay	Ground	Voltage	
Connector	Terminal	Giouna		
F17	1	Ground	Battery voltage	
	3			

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

10A fuse (No. 42)

- IPDM E/R harness connector E7
- 50A fusible link (letter F)

• Harness for open or short between cooling fan relay and fuse

· Harness for open or short between cooling fan relay and battery

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

# $9. {\sf CHECK} \ {\sf COOLING} \ {\sf FAN} \ {\sf CONTROL} \ {\sf MODULE} \ {\sf POWER} \ {\sf SUPPLY} \ {\sf CIRCUIT-III}$

- 1. Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connector.
- 3. Check the continuity between cooling fan relay harness connector and IPDM E/R harness connector.

Cooling f	an relay	IPDN	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E17	2	E6	74	Existed

4. Check the continuity between cooling fan relay harness connector and cooling fan control module harness connector.

Cooling f	an relay	Cooling fan c	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E17	5	E37	3	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

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

**10.**CHECK COOLING FAN RELAY

Refer to EC-505, "Component Inspection (Cooling Fan Relay)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan relay.

11.CHECK INTERMITTENT INCIDENT

Perform GI-44, "Intermittent Incident".

#### Is the inspection result normal?

- YES >> Replace IPDM E/R.
- NO >> Repair or replace harness connectors.

# Component Inspection (Cooling Fan Motor)

**1.**CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.

### **COOLING FAN**

#### < DTC/CIRCUIT DIAGNOSIS >

- 2. Disconnect cooling fan control module harness connectors E301, E302.
- 3. Supply cooling fan control module terminals with battery voltage and check operation.

Coo	ling fan contro				
Motor	Connector	Terr	ninal	Operation	
WOU	Connector	(+)	(+) (-)		
1	E301	4	5	Cooling fan operates	
2	E302	6	7	<ul> <li>Cooling fan operates</li> </ul>	

#### Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace cooling fan motor.

### Component Inspection (Cooling Fan Relay)

# 1. CHECK COOLING FAN RELAY

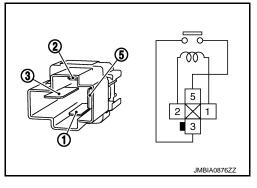
- 1. Turn ignition switch OFF.
- 2. Remove cooling fan relay.
- 3. Check the continuity between cooling fan relay terminals under the following conditions.

Terminals	Conditions	Continuity
3 and 5	12 V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan relay.



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### 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	r item Condition		Indication
	Rear window defogger switch	ON	ON
LOAD SIGNAL	Iteal window delogger switch	OFF	OFF

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-506, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

Monitor item	Co	Indication	
LOAD SIGNAL	Lighting switch	ON at 2nd position	ON
	Lighting Switch	OFF	

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to EC-506, "Diagnosis Procedure".

### 3. CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

Monitor item Condition			Indication
HEATER FAN SW	Heater fan control switch	ON	ON
HEATER FAILOW	Theater fair control switch	OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-506, "Diagnosis Procedure".

#### **Diagnosis** Procedure

#### **1.**INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>EC-506, "Compo-nent Function Check"</u>.

Which circuit is related to the incident?

Rear window defogger>>GO TO 2.

Headlamp>>GO TO 3. Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-96, "Work Flow".

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### **ELECTRICAL LOAD SIGNAL**

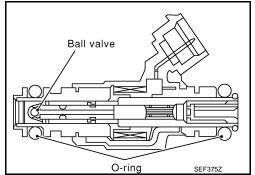
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
>> INSPECTION END	
<b>3.</b> CHECK HEADLAMP SYSTEM	А
Refer to EXL-72, "Work Flow".	
	EC
>> INSPECTION END 4.CHECK HEATER FAN CONTROL SYSTEM	
Refer to <u>HAC-5, "Work Flow"</u> .	C
Relef to <u>TRC-3, WORTHOW</u> .	
>> INSPECTION END	D
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### < 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**

INFOID:000000010839829

### **1.**INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.

NO >> Go to EC-508, "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

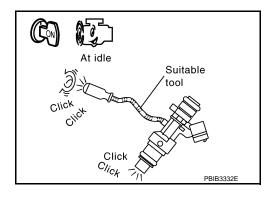
- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

#### Clicking sound should be heard.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-508, "Diagnosis Procedure".



INFOID:000000010839830

### 1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

**Diagnosis** Procedure

- 2. Disconnect fuel injector harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between fuel injector harness connector and ground.

INFOID:000000010839828

### **FUEL INJECTOR**

#### < DTC/CIRCUIT DIAGNOSIS >

	Fuelinieste				
Cylinder	Fuel injector	Terminal	Ground	Voltag	e
1	F121	1			—— I
2	F121	1	_		
3	F123	1			
4	F124	1	Ground	Battery vo	Itage
5	F125	1			
6	F126	1			
-	spection res	-	2		
	>> GO TO		<u></u>		
	>> GO TO				
2.dete	CT MALFU	JNCTIONI	NG PART		
	e following				
	s connecto		120		
	s connecto E/R harnes				
• 10 A fu	ise (No. 44)	)			
<ul> <li>Harnes</li> </ul>	ss for open	or short be	etween fu	el injector	and fuse
	>> Popoir	opop circu	it chort to	around o	r short to power in harness or connectors.
<b>^</b>	•	•		•	CIRCUIT FOR OPEN AND SHORT
			OUIPUI	SIGNAL	JIRCOIT FOR OPEN AND SHORT
	ignition sw		connecto	r	
					rness connector and ECM harness connector.
	Fuel injector	-	E	CM	Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F121	2		89	
2	F122	2		85	
3	F123	2	F102	81	Existed
4	F124	2	-	90	
5	F125	2		86	
6	F126	2		82	
			•	und and s	hort to power.
	spection res		<u>?</u>		
	>> GO TO >> GO TO				
	CT MALFU		NG PART		
	e following s connecto		107		
<ul> <li>Harnes</li> </ul>	s connecto	ors F10, F1	20		
	s for open	or short be	etween fu	el injector	and ECM
<ul> <li>Harnes</li> </ul>	•				
			it ober t	I	
_		•	it, short to	o ground o	r short to power in harness or connectors.
5.снес	CK FUEL IN	JECTOR			
5.CHEC		JECTOR	<u>Inspectic</u>		

### **FUEL INJECTOR**

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 6.

NO >> Replace malfunctioning fuel injector.

#### **6.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace IPDM E/R.

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

#### Component Inspection

## 1.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.

2. Disconnect fuel injector harness connector.

3. Check resistance between fuel injector terminals as follows.

Terminals	Resistance ( $\Omega$ )		
1 and 2	11.1 - 14.3 [at 10 - 60°C (60 - 140°F)]		

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning fuel injector.

INFOID:000000010839831

### **FUEL PUMP**

#### < DTC/CIRCUIT DIAGNOSIS > FUEL PUMP

### Description

INFOID:000000010839832

[VQ37VHR]

				EC
Sensor	Input signal to ECM	ECM Function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay ↓	С
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.	G
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.

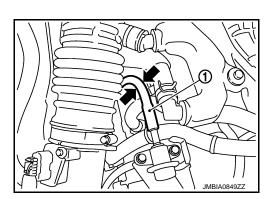
# Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

ls	<u>the</u>	inspection	result	normal?

YES >> INSPECTION END

NO >> <u>EC-511, "Diagnosis Procedure"</u>.

#### **Diagnosis** Procedure



#### INFOID:000000010839834

INFOID:000000010839833

#### 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 Terminal		Giouna	voltage	
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**

#### < DTC/CIRCUIT DIAGNOSIS >

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

IPDN	/IE/R	Ground	Voltage	
Connector Terminal		Giouna	vollage	
E7	77	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 10.

**3.**DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E3, F1

Harness connectors F104, F105

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

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

#### 4. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 4. Turn ignition switch ON.
- 5. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage	
Connector	Terminal			
B22	1	Ground	Battery voltage should exist for 1 second after ignition switch is turned ON.	

Is the inspection result normal?

YES	>> GO TO 8.
NO	>> GO TO 5.

**5.**CHECK 15 A FUSE

- 1. Turn ignition switch OFF.
- 2. Disconnect 15 A fuse (No. 41) from IPDM E/R.
- 3. Check 15 A fuse.

#### Is the inspection result normal?

YES >> GO TO 6.

6.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

#### 1. Disconnect IPDM E/R harness connector E5.

 Check the continuity between IPDM E/R harness connector and "fuel level sensor unit and fuel pump" harness connector.

IPDM	E/R	Fuel level and fue	Continuity	
Connector	Terminal	Connector	Terminal	
E5	13	B22	1	Existed

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

Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 7.

### **FUEL PUMP**

7.DETECT MALFUNCTIONING PART	
Check the following. • Harness connectors E117, B9	A
<ul> <li>IPDM E/R harness connector E5</li> <li>Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"</li> </ul>	EC
>> Repair open circuit, short to ground or short to power in harness or connectors. <b>8.</b> CHECK FUEL PUMP GROUND CIRCUIT	С
<ol> <li>Turn ignition switch OFF.</li> <li>Disconnect dropping resistor harness connector.</li> <li>Check the continuity between "fuel level sensor unit and fuel pump" harness connector and ground.</li> </ol>	D
Fuel level sensor unit and fuel pump     Ground     Continuity       Connector     Terminal	E
B22 3 Ground Existed	F
4. Also check harness for short to power.	
Is the inspection result normal?	G
YES >> GO TO 9. NO >> Repair open circuit or short to power in harness or connectors.	
9. CHECK FUEL PUMP	
Refer to EC-513, "Component Inspection".	Н
Is the inspection result normal?	
YES >> GO TO 10.	
NO >> Replace fuel pump.	
10.CHECK INTERMITTENT INCIDENT	J
Refer to <u>GI-44, "Intermittent Incident"</u> .	
<u>Is the inspection result normal?</u> YES >> Replace IPDM E/R.	К
NO >> Repair or replace harness or connectors.	N
1.CHECK FUEL PUMP	L
<ol> <li>Turn ignition switch OFF.</li> <li>Disconnect "fuel level sensor unit and fuel pump" harness connector.</li> <li>Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.</li> </ol>	Μ
	Ν
Terminals         Resistance (Ω)           1 and 3         0.2 - 5.0 [at 25°C (77°F)]	-
Is the inspection result normal?	$\sim$
YES >> INSPECTION END	0
NO >> Replace "fuel level sensor unit and fuel pump"	
	Ρ

< DTC/CIRCUIT DIAGNOSIS >

#### < DTC/CIRCUIT DIAGNOSIS >

### IGNITION SIGNAL

#### Description

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

#### **Component Function Check**

#### **1.**INSPECTION START

Turn ignition switch OFF, and restart engine.

#### Does the engine start?

YES-1 >> With CONSULT: GO TO 2.

YES-2 >> Without CONSULT: GO TO 3.

No >> Go to <u>EC-514</u>, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

#### () With CONSULT

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- 2. Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to EC-514, "Diagnosis Procedure".

 $\mathbf{3}.$  CHECK IGNITION SIGNAL FUNCTION

#### **Without CONSULT**

- 1. Let engine idle.
- 2. Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

	E	СМ			
	+	-	_	Voltage signal	
Connector	Connector Terminal		Terminal		
	11				
	12	M107	128	50mSec/div	
<b>E404</b>	15				
F101	16			÷	
	19				
	20			2V/div JMBIA0035GB	

#### NOTE:

The pulse cycle changes depending on rpm at idle.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-514, "Diagnosis Procedure".

#### Diagnosis Procedure

**1.**CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.

2. Check the voltage between ECM harness connector terminals as per the following.

INFOID:000000010839838

INFOID:000000010839836

INFOID:000000010839837

### **IGNITION SIGNAL**

#### < DTC/CIRCUIT DIAGNOSIS >

	ECM						A
	ECM +			age			
Connector	+ Terminal	 Termina		aye			
M107	125	128		voltage			EC
Is the inspe	-		-	vollage			
•	GO TO 2		-				С
		 C-173, "Dia	agnosis Pr	cedure".			0
2.снеск	IGNITION		WER SU	PLY CIRCUIT	-11		
	nition swit						D
		lenser har	ness conn	ector.			
	nition swit				n a stan and success	un al	E
4. Check	the voltag	je betweer	1 condense	r namess cor	nector and grou	na.	
Cond	lenser						
Connector	Terminal	Ground	Voltag				F
F8	1	Ground	Battery vo				
Is the inspe				aye			_
•	GO TO 5		-				G
	GO TO 3						
<b>3.</b> CHECK	IGNITION		WER SU	PLY CIRCUIT	-111		Н
	nition swit						
		/IE/R harr	iess conne	ctor.			
3. Check	the contin	uity betwe	en IPDM	R harness c	onnector and co	ndenser harness connect	or.
IPDM	E/D	Cand					
		Cond		Continuity			J
Connector E7	Terminal 53	Connector F8	Terminal 1	Existed			
					D.0.110#		
4. Also ch				d and short to	power.		K
		C-173, "Dia	_	cedure"			
	• GO TO 4			<u>locuure</u> .			L
4.DETECT		NCTIONIN	IG PART				
Check the f							
• Harness of	connector						M
<ul> <li>Harness f</li> </ul>	for open o	or short be	tween IPD	I E/R and cor	ndenser		
							Ν
_	•	•				ness or connectors.	14
<b>D.</b> CHECK	CONDEN	ISER GRO	DUND CIR		PEN AND SHOR	Т	
	nition swit						0
2. Check	the contin	uity betwe	en condei	ser harness c	onnector and gr	ound.	
Canala	ncor						Р
Conde		Ground	Continuity				P
Connector	Terminal	Orour -	Eviat				
F8	2	Ground	Existed	_			
		ess for sho	•				
Is the inspe			-				

Revision: 2014 September

>> GO TO 6.

YES

NO

EC-515

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

#### < DTC/CIRCUIT DIAGNOSIS >

#### 6.CHECK CONDENSER

Refer to EC-518. "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace condenser.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

1. Reconnect all harness connectors disconnected.

- 2. Disconnect ignition coil harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ignition coil harness connector and ground.

-				
	Ignition coi	Ground	Voltage	
Cylinder	Connector	Terminal	Ground	voltage
1	F11	3		
2	F12	3		
3	F13	3	Ground	Battery voltage
4	F14	3	Ground	Ballery vollage
5	F15	3		
6	F16	3	1	

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

**8.**DETECT MALFUNCTIONING PART

Check the following.

Harness connector F1

Harness for open or short between ignition coil and harness connector F1

#### >> Repair or replace harness or connectors.

### 9. Check ignition coil ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Check the continuity between ignition coil harness connector and ground.

	Ignition coi	Ground	Continuity	
Cylinder	Connector	Terminal	Ground	Continuity
1	F11	2		
2	F12	2	•	
3	F13	2 Ground E		Existed
4	F14	2	Ground	LAISted
5	F15	2		
6	F16	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

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

10. Check ignition coil output signal circuit for open and short

1. Disconnect ECM harness connector.

2. Check the continuity between ignition coil harness connector and ECM harness connector.

### EC-516

### **IGNITION SIGNAL**

#### < DTC/CIRCUIT DIAGNOSIS >

Ignition coil ECM		M		А				
Cylinder	Connector	Terminal	Connector	Terminal	- Continuity			
1	F11	1		20				
2	F12	1	-	16	E	С		
3	F13	1		12	-			
4	F14	1	F101	11	– Existed	С		
5	F15	1	-	15				
6	F16	1	-	19				
3. Also	check harr	ness for s	hort to grou	und and s	short to power.	D		
<u>Is the ins</u>	pection res	sult norma	<u>al?</u>					
	>> GO TO					Е		
	>> GO TO		_					
			NING PAR	Т		_		
	e following		<b>E10</b> 5			F		
	s connecto s for open		etween igr	ition coil a	and ECM			
	o .o. op o					G		
	>> Repair (	open circ	uit, short to	ground o	or short to power in harness or connectors.			
12.сн	ECK IGNIT	ION COIL		WER TR	ANSISTOR			
Refer to	EC-517, "C	omponer	nt Inspectio	n (Ignition	n Coil with Power Transistor)".	Н		
	pection res		-					
	>> GO TO							
					with power transistor.			
<b>13.</b> Сн	ECK INTEF	RMITTEN	T INCIDEN	IT				
Refer to	GI-44, "Inte	ermittent I	<u>ncident"</u> .			J		
	>> INSPEC	CTION EN	ND			Κ		
Compo	nent Ins	pection	(Ignition	Coil wi	ith Power Transistor) INFOID:000000010839839			
					NSISTOR-I			
					N3I3TOR-I			
	ignition sw onnect iani		arness cor	nector.				
					nals as per the following.	M		
Terminal	s Resistar	nce (Ω) [at 2	25°C (77°F)]	<u>.</u>		NI		
1 and 2		Except 0 o	r∞	-		Ν		
1 and 3		Except (	)					
2 and 3			-		(	0		
	pection res		al?					
	>> GO TO		tioning ign:	tion acil	with power transistor	Р		
•	NO >> Replace malfunctioning ignition coil with power transistor. 2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II							
					NOIOIUK-II			
CAUTIO	N:							

#### CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

### **IGNITION SIGNAL**

#### < DTC/CIRCUIT DIAGNOSIS >

Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
 NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 4. Start engine.
- 5. After engine stalls, crank it two or three times to release all fuel pressure.
- 6. Turn ignition switch OFF.
- 7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 8. Remove ignition coil and spark plug of the cylinder to be checked.
- 9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 10. Connect spark plug and harness connector to ignition coil.
- 11. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

#### Spark should be generated.

#### **CAUTION:**

- During the operation, always stay 50 cm (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV 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.

#### Component Inspection (Condenser)

### 1.CHECK CONDENSER

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

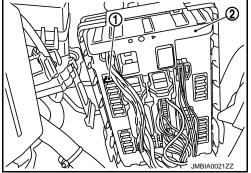
3. Check resistance between condenser terminals as per the following.

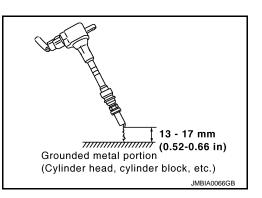
Terminals	Resistance (M $\Omega$ )
1 and 2	Above 1 [at 25°C (77°F)]

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.





INFOID:0000000010839840

#### [VQ37VHR]

### MALFUNCTION INDICATOR LAMP

#### < DTC/CIRCUIT DIAGNOSIS >

### MALFUNCTION INDICATOR LAMP

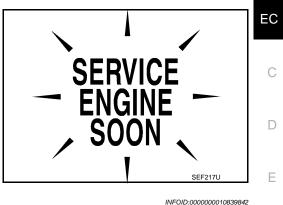
### Description

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-151, "DIAGNOSIS DESCRIPTION : Malfunc-</u> tion Indicator Lamp (MIL)".



### Component Function Check

1.CHECK MIL FUNCTION	F
<ol> <li>Turn ignition switch ON.</li> <li>Make sure that MIL illuminates.</li> <li><u>Is the inspection result normal?</u></li> <li>YES &gt;&gt; INSPECTION END</li> <li>NO &gt;&gt; Go to <u>EC-519. "Diagnosis Procedure"</u>.</li> </ol>	G
Diagnosis Procedure	3 H
1.снеск отс	
Check that DTC UXXXX is not displayed. <u>Is the inspection result normal?</u> YES >> GO TO 2. NO >> Perform trouble diagnosis for DTC UXXXX. 2.CHECK DTC WITH COMBINATION METER	J
Refer to MWI-34, "CONSULT Function (METER/M&A)".	- K
<u>Is the inspection result normal?</u> YES >> GO TO 3. NO >> Repair or replace.	L
3. CHECK INTERMITTENT INCIDENT	5.4
Refer to <u>GI-44, "Intermittent Incident"</u> .	M
<u>Is the inspection result normal?</u> YES >> Replace combination meter. NO >> Repair or replace.	Ν
	0

#### [VQ37VHR]

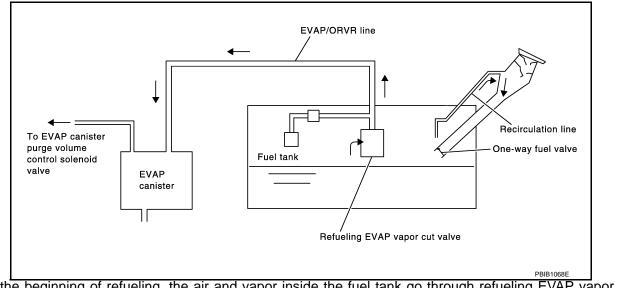
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А

#### < DTC/CIRCUIT DIAGNOSIS >

### ON BOARD REFUELING VAPOR RECOVERY (ORVR)

#### Description



From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

#### WARNING:

When conducting inspections below, be sure to observe the following:

- Put a "CAUTION: FLAMMABLE" sign in workshop.
- Never smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Always furnish the workshop with a CO<sub>2</sub> fire extinguisher.

#### **CAUTION:**

- Before removing fuel line parts, carry out the following procedures:
- Put drained fuel in an explosion-proof container and put lid on securely.
- Release fuel pressure from fuel line. Refer to EC-631, "Inspection".
- Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Never kink or twist hose and tube when they are installed.
- Never tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leaks at connections.
- Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

#### **Component Function Check**

INFOID:000000010839845

[VQ37VHR]

INFOID:000000010839844

### **1.**CHECK ORVR FUNCTION

Check whether the following symptoms are present.

- Fuel odor from EVAP canister is strong.
- Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

#### Are any symptoms present?

YES >> Go to <u>EC-520, "Diagnosis Procedure"</u>. NO >> INSPECTION END

#### Diagnosis Procedure

**1.**INSPECTION START

Check whether the following symptoms are present. A: Fuel odor from EVAP canister is strong. INFOID:000000010839846

ON BOARD REFUELING VAPOR RECOVERY (ORVR) < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]	
B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.	•
Which symptom is present?	А
A >> GO TO 2. B >> GO TO 7.	
2. CHECK EVAP CANISTER	EC
1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor	
<ul> <li>attached.</li> <li>Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.</li> </ul>	С
The weight should be less than 2.2 kg (4.9 lb). Is the inspection result normal?	D
YES >> GO TO 3.	
NO >> GO TO 4.	Е
3. CHECK IF EVAP CANISTER IS SATURATED WITH WATER	-
<ul> <li>Check if water will drain from EVAP canister (1).</li> <li>2: EVAP canister vent control valve</li> </ul>	F
Does water drain from the EVAP canister?	
YES >> GO TO 4. NO >> GO TO 6.	0
	G
	Н
PBIB2731E	
4.REPLACE EVAP CANISTER	-
Replace EVAP canister with a new one.	
>> GO TO 5.	J
5. DETECT MALFUNCTIONING PART	
Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.	K
>> Repair or replace EVAP hose. 6.CHECK REFUELING EVAP VAPOR CUT VALVE	L
Refer to <u>EC-523, "Component Inspection"</u> .	-
Is the inspection result normal?	M
YES >> INSPECTION END	
NO >> Replace refueling EVAP vapor cut valve with fuel tank. 7.CHECK EVAP CANISTER	Ν
<ol> <li>Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.</li> </ol>	$\bigcirc$
<ol><li>Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.</li></ol>	
The weight should be less than 2.2 kg (4.9 lb).	
Is the inspection result normal?	Ρ
YES >> GO TO 8. NO >> GO TO 9.	
No >> 60 10 3.	

8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

#### < DTC/CIRCUIT DIAGNOSIS >

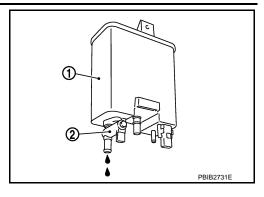
[VQ37VHR]

Check if water will drain from EVAP canister (1).

• 2: EVAP canister vent control valve

Does water drain from the EVAP canister?

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



### **9.**REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 10.

### 10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

### 11.CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace hoses and tubes.

12.CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

- YES >> GO TO 13.
- NO >> Replace filler neck tube.

13. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-523, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

**14.**CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 16.

NO >> Repair or replace one-way fuel valve with fuel tank.

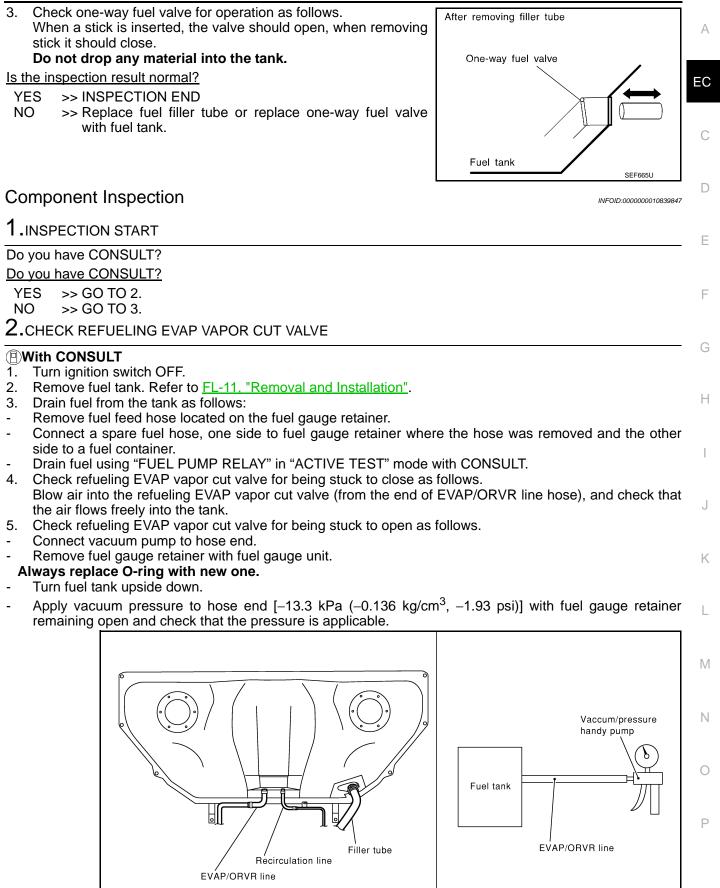
**16.**CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.

2. Remove fuel filler tube and hose.

#### < DTC/CIRCUIT DIAGNOSIS >

#### [VQ37VHR]



Is the inspection result normal? YES >> INSPECTION END PBIB1035E

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

#### NO >> Replace refueling EVAP vapor cut valve with fuel tank.

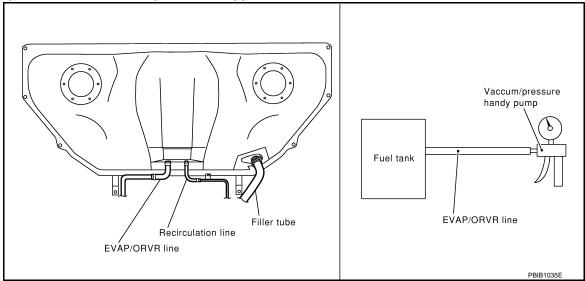
**3.**CHECK REFUELING EVAP VAPOR CUT VALVE

#### Without CONSULT

- 1. Turn ignition switch OFF.
- 2. Remove fuel tank. Refer to FL-11, "Removal and Installation".
- 3. Drain fuel from the tank as follows:
- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container.
- 4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
- Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
- 5. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

#### Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm<sup>3</sup>, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace refueling EVAP vapor cut valve with fuel tank.

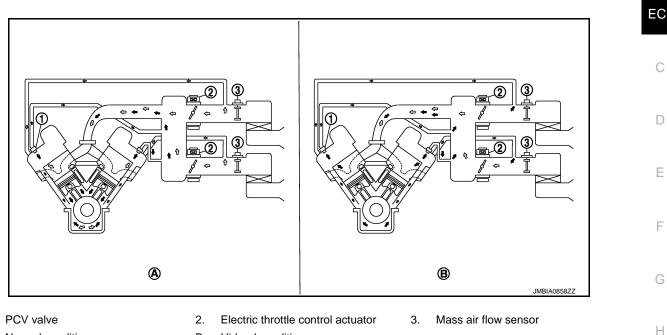
### **POSITIVE CRANKCASE VENTILATION**

#### < DTC/CIRCUIT DIAGNOSIS >

### POSITIVE CRANKCASE VENTILATION

#### Description

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Α Normal condition в Hi-load condition

🗘 : Fresh air

1

+ : Blow-by air

This system returns blow-by gas to the intake manifold.

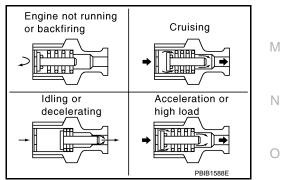
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

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

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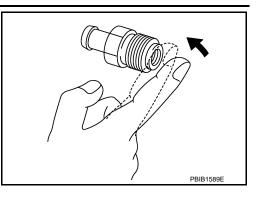
### POSITIVE CRANKCASE VENTILATION

#### < DTC/CIRCUIT DIAGNOSIS >

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace PCV valve.



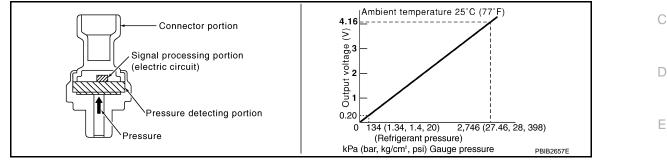
#### [VQ37VHR]

#### < DTC/CIRCUIT DIAGNOSIS >

### REFRIGERANT PRESSURE SENSOR

### Description

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



### Component Function Check

### 1.CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector terminals as per the following.

	ECM			
Connector	+	-	Voltage (V)	
	Terminal	Terminal		
M107	105 (Refrigerant pressure sensor signal)	112	1.0 - 4.0	
Is the inspe	ection result normal?			
-	INSPECTION END			
NO >>	Go to <u>EC-527</u> , "Diagnosis Proc	<u>edure"</u> .		
Diagnosi	s Procedure			

# 1.CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF.
- Turn A/C switch and blower fa
   Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in <u>GI-47, "Circuit Inspection"</u>.

#### Is the inspection result normal?

NO >> Repair or replace ground connection.

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pressure sensor		Ground	Voltage (V)	
Connector	Terminal	Cround	voltage (v)	
E172	3	Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3. INFOID:000000010839850

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### **REFRIGERANT PRESSURE SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

## 3. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E171, E177
- Harness connectors E106, M6
- Harness for open or short between ECM and refrigerant pressure sensor

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

#### 4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

Refrigerant pressure sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
E172	1	M107	112	Existed	

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

Is the inspection result normal?

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

**5.**DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E171, E177
- Harness connectors E106, M6
- 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.

#### $\mathbf{6}.$ CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
E172	2	M107	105	Existed	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

#### **7.**DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E171, E177
- Harness connectors E106, M6
- · 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-44, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.

### **REFRIGERANT PRESSURE SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

NO >> Repair or replace.

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### SHIFT POSITION INDICATOR

#### < DTC/CIRCUIT DIAGNOSIS >

### SHIFT POSITION INDICATOR

#### Description

The shift lever position is indicated by shift position indicator on combination meter. ECM receives gear position signal from gear lever position sensor and transmits the signal to combination meter via CAN communication.

### **Component Function Check**

1. CHECK SHIFT POSITION INDICATOR

1. Turn ignition switch ON.

Check that shift position indicator turns ON. 2.

Is the inspection result normal?

>> INSPECTION END YES

>> Go to EC-530, "Diagnosis Procedure". NO

**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 "COMBINATION METER"

Refer to MWI-34, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble diagnosis relevant to DTC indicated.

**3.**CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.

NO >> Repair or replace.

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#### < DTC/CIRCUIT DIAGNOSIS >

### S-MODE SWITCH

### Description

When S-MODE switch is pressed (less than 1 second), S-MODE indicator illuminates, combination meter sends S-MODE switch signal to ECM via the CAN communication, and then SynchroRev Match mode (S-MODE) is activated. When S-MODE is pressed and held (1 second or more), S-MODE indicator turns OFF and S-MODE is cancelled, and then returns to normal M/T.

### **Component Function Check**

#### 1.CHECK S-MODE SWITCH FUNCTION-I

#### NOTE:

#### If DTC UXXXX are displayed, first perform the trouble diagnosis for DTC UXXXX.

- 1. Turn ignition switch ON.
- 2. Select "M/T SYNCHRO SW" in "DATA MONITOR" mode with CONSULT.
- 3. Check "M/T SYNCHRO SW" indication under the following conditions.

Monitor iter-	0	dition	Indiantian		
Monitor item	Con		Indication		
M/T SYNCHRO SV	V S-MODE switch	Pressed Released	ON		
	F		OFF		
Is the inspection					
YES >> GO NO >> Go t		opio Dropoduro"			
•	o <u>EC-531, "Diagn</u>				
	DDE SWITCH FU				
Check the S-MC	DE indicator unde	er the following c	condition.		
	Condition		DE indicator		
S-MODE switch	Press (less than 1 se		minated		
	Press (1 second or m	ore) Not il	luminated		
Is the inspection					
	PECTION END to <u>EC-531, "Diagn</u>	ocio Procoduro"			
Diagnosis Pr	ocedure				INFOID:000000010839858
	WITH "COMBINA	TION METER"			
	. "CONSULT Fun		IO A \"		
Is the inspection			<u>IQA)</u> .		
YES >> GO					
	orm trouble diagn	osis relevant to	DTC indicated.		
<b>^</b>	DDE SWITCH PO				
	switch OFF.				
	S-MODE switch h	arness connecto	or.		
3. Turn ignition					
4. Check the v	oltage between S	-MODE switch h	arness connecto	r and ground.	
				-	
	DE switch	Ground	Voltage		
Connector	Terminal				

Is the inspection result normal?

2

YES >> GO TO 4.

M255

Battery voltage

Ground

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< DTC/CIRCUIT DIAGNOSIS >

### NO >> GO TO 3.

## 3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M98, M252
- Fuse block (J/B) connector M1
- 10 A fuse (No. 3)
- Harness for open or short between S-MODE switch and fuse

>> Repair open circuit, short to ground or short to power in harness or connectors.

### **4.**CHECK S-MODE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect combination meter harness connector.
- Check the continuity between S-MODE switch harness connector and combination meter harness connector.

S-MODE switch		Combina	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
M255	1	M53	12	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 M98, M252

· Harness for open or short between S-MODE switch and combination meter

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK S-MODE SWITCH

Refer to EC-532, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace S-MODE switch.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-44, "Intermittent Incident".

#### >> INSPECTION END

### **Component Inspection**

INFOID:000000010839859

#### **1.**CHECK S-MODE SWITCH

- 1. Turn ignition switch OFF.
- 2. Disconnect S-MODE switch harness connector.
- 3. Check the continuity between S-MODE switch terminals under the following conditions.

Terminals	Condit	Continuity	
1 and 2	S-MODE switch	Pressed	Existed
	S-IVIODE SWITCH	Released	Not Existed

Is the inspection result normal?

YES >> INSPECTION END

### **S-MODE SWITCH**

#### < DTC/CIRCUIT DIAGNOSIS >

>> Replace S-MODE switch. NO

EC-533

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# ECU DIAGNOSIS INFORMATION ECM

Reference Value

INFOID:000000010839860

[VQ37VHR]

#### 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 camshaft position sensor and other sensors related to ignition timing.

For outlines of following items, refer to <u>EC-155, "CONSULT Function"</u>.

CONSULT MONITOR ITEM

Monitor Item	C	Values/Status	
ENG SPEED	Run engine and compare CONSUL	Almost the same speed as the tachometer indication	
MAS A/F SE-B1	See EC-165, "Description".		
MAS A/F SE-B2	See EC-165, "Description".		
B/FUEL SCHDL	See EC-165, "Description".		
A/F ALPHA-B1	See EC-165, "Description".		
A/F ALPHA-B2	See EC-165, "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
HO2S2 (B1)	<ul> <li>Revving engine from idle up to 3,00 are met.</li> <li>Engine: After warming up</li> <li>After keeping engine speed betwee idle for 1 minute under no load</li> </ul>	0 - 0.3 V ←→ Approx. 0.6 - 1.0 V	
HO2S2 (B2)	<ul> <li>Revving engine from idle up to 3,00 are met.</li> <li>Engine: After warming up</li> <li>After keeping engine speed betwee idle for 1 minute under no load</li> </ul>	0 - 0.3 V ←→ Approx. 0.6 - 1.0 V	
HO2S2 MNTR (B1)	<ul> <li>Revving engine from idle up to 3,00 are met.</li> <li>Engine: After warming up</li> <li>After keeping engine speed betwee idle for 1 minute under no load</li> </ul>	LEAN ←→ RICH	
HO2S2 MNTR (B2)	<ul> <li>Revving engine from idle up to 3,00 are met.</li> <li>Engine: After warming up</li> <li>After keeping engine speed betwee idle for 1 minute under no load</li> </ul>	LEAN ←→ RICH	
VHCL SPEED SE	Turn drive wheels and compare CC tion.	Almost the same speed as speedometer indication	
BATTERY VOLT	Ignition switch: ON (Engine stopped	d)	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

#### < 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 <sup>*1</sup>	(Engine stopped)	Accelerator pedal: Fully depressed	4.3 - 4.8 V
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
P SEN 1-B1	(Engine stopped) • Selector lever: D (A/T) or 1st (M/T)	Accelerator pedal: Fully depressed	Less than 4.75 V
4	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
P SEN 2-B1* <sup>1</sup>	<ul><li>(Engine stopped)</li><li>Selector lever: D (A/T) or 1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V
UEL T/TMP SE	Ignition switch: ON		Indicates fuel tank tempera- ture
VAP SYS PRES	Ignition switch: ON		Approx. 1.8 - 4.8 V
UEL LEVEL SE	Ignition switch: ON		Depending on fuel level of fuel tank
TART SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow OI$	N	$OFF \rightarrow ON \rightarrow OFF$
	Ignition switch: ON	Accelerator pedal: Fully released	ON
LSD THL POS	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF
	• Engine: After worming we jule the	Air conditioner switch: OFF	OFF
IR COND SIG	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates.)	ON
	Engine: After warming up, idle the	Steering wheel: Not being turned	OFF
W/ST SIGNAL	engine	Steering wheel: Being turned	ON
_OAD SIGNAL • Ignitio		Rear window defogger switch: ON and/or	ON
	Ignition switch: ON	Lighting switch: 2nd position Rear window defogger switch and lighting switch: OFF	OFF
GNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$		$ON \rightarrow OFF \rightarrow ON$
	Engine: After warming up, idle the	Heater fan switch: ON	ON
EATER FAN SW	engine	Heater fan switch: OFF	OFF
		Brake pedal: Fully released	OFF
RAKE SW	Ignition switch: ON	Brake pedal: Slightly depressed	ON
	Engine: After warming up	Idle	2.0 - 3.0 msec
NJ PULSE-B1	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	1.9 - 2.9 msec
	Engine: After warming up	Idle	2.0 - 3.0 msec
NJ PULSE-B2	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	1.9 - 2.9 msec
	Engine: After warming up	Idle	7° BTDC
GN TIMING	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	25° - 45° BTDC
	Engine: After warming up	Idle	5 - 35%
CAL/LD VALUE	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,500 rpm	5 - 35%

#### < ECU DIAGNOSIS INFORMATION >

#### [VQ37VHR]

Monitor Item	C	ondition	Values/Status
	Engine: After warming up	Idle	2.0 - 6.0 g/s
MASS AIRFLOW	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,500 rpm	7.0 - 20.0 g/s
PURG VOL C/V	<ul> <li>Engine: After warming up</li> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> </ul>	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
	No load	2,000 rpm	—
INT/V SOL (B1)	<ul> <li>Engine: After warming up</li> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	Idle 2,000 rpm	0 - 2% Approx. 0 - 50%
INT/V SOL (B2)	<ul> <li>Engine: After warming up</li> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> </ul>	Idle 2,000 rpm	0 - 2% Approx. 0 - 50%
	No load		
	• 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	<ul> <li>For 1 second after turning ignition s</li> <li>Engine running or cranking</li> </ul>	ON	
	Except above		OFF
VENT CONT/V	Ignition switch: ON		OFF
THRTL RELAY	Ignition switch: ON		ON
A/F S1 HTR (B2)	Engine: After warming up, idle the e (More than 140 seconds after starti	4 - 100%	
HO2S2 HTR (B1)	<ul> <li>Engine speed: Below 3,600 rpm aft</li> <li>Engine: After warming up</li> <li>Keeping the engine speed between idle for 1 minute under no load</li> </ul>	er the following conditions are met. a 3,500 and 4,000 rpm for 1 minute and at	ON
	• Engine speed: Above 3,600 rpm	OFF	
HO2S2 HTR (B2)	<ul> <li>Engine speed: Below 3,600 rpm aft</li> <li>Engine: After warming up</li> <li>Keeping the engine speed betweer idle for 1 minute under no load</li> </ul>	er the following conditions are met. a 3,500 and 4,000 rpm for 1 minute and at	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 CC tion.	NSULT value with the speedometer indica-	Almost the same speed as the speedometer indication
IDL A/V LEARN	Engine: Running	Idle air volume learning has not been per- formed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	Ignition switch: ON	Vehicle has traveled after MIL has illumi- nated.	0 - 65,535 km (0 - 40,723 miles)
ENG OIL TEMP	Engine: After warming up		More than 70°C (158°F)
A/F S1 HTR (B1)	Engine: After warming up, idle the e (More than 140 seconds after starti	4 - 100%	
VHCL SPEED SE	Turn drive wheels and compare CC tion.	NSULT value with the speedometer indica-	Almost the same speed as the speedometer indication

Revision: 2014 September

#### < ECU DIAGNOSIS INFORMATION >

#### [VQ37VHR]

Monitor Item	Co	ondition	Values/Status	_
SET VHCL SPD	Engine: Running	ASCD: Operating	The preset vehicle speed is displayed	A
MAIN SW	Ignition switch: ON	MAIN switch: Pressed	ON	EC
		MAIN switch: Released	OFF	LO
CANCEL SW	<ul> <li>Ignition switch: ON</li> </ul>	CANCEL switch: Pressed	ON	_
ONNOLL OW		CANCEL switch: Released	OFF	С
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON	
RESOME/ACC SW		RESUME/ACCELERATE switch: Re- leased	OFF	D
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON	-
5ET 5W	Ignition switch: ON	SET/COAST switch: Released	OFF	E
BRAKE SW1		Brake pedal: Fully released	ON	-
(ASCD brake switch)	Ignition switch: ON	Brake pedal: Slightly depressed	OFF	F
BRAKE SW2		Brake pedal: Fully released	OFF	- F
(Stop lamp switch)	Ignition switch: ON	Brake pedal: Slightly depressed	ON	-
VHCL SPD CUT	Ignition switch: ON		NON	G
LO SPEED CUT	Ignition switch: ON		NON	-
AT OD MONITOR	Ignition switch: ON		OFF	
AT OD CANCEL	Ignition switch: ON		OFF	- H
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time $\rightarrow$ at the 2nd time	$ON\toOFF$	
SET LAMP	<ul> <li>MAIN switch: ON</li> <li>When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Operating ASCD: Not operating	ON OFF	
FAN DUTY	Engine: Running		0 - 100%	-
AC EVA TEMP	<ul> <li>Engine: Idle</li> <li>Both A/C switch and blower fan swi</li> </ul>	tch: ON (Compressor operates)	Changes according to in- structed value from combi- nation meter	K
AC EVA TARGET	<ul><li>Engine: Idle</li><li>Both A/C switch and blower fan swi</li></ul>	tch: ON (Compressor operates)	Changes according to in- structed value from combi- nation meter	L
A/F ADJ-B1	Engine: Running		-0.330 - 0.330	-
A/F ADJ-B2	Engine: Running		-0.330 - 0.330	M
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V	-
TP SEN 1-B2	<ul><li>(Engine stopped)</li><li>Selector lever: D (A/T) or 1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V	N
	Ignition switch: ON     (Engine standed)	Accelerator pedal: Fully released	More than 0.36 V	_
TP SEN 2-B2* <sup>1</sup>	<ul><li>(Engine stopped)</li><li>Selector lever: D (A/T) or 1st (M/T)</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V	0
P/N POSI SW	Ignition switch: ON	Selector lever: P or N (A/T), Neutral (M/T)	ON	-
		Selector lever: Except above	OFF	-
INT/A TEMP SE	Ignition switch: ON		Indicates intake air temper- ature	Р
AC PRESS SEN	<ul><li>Engine: Idle</li><li>Both A/C switch and blower fan swi</li></ul>	tch: ON (Compressor operates)	1.0 - 4.0 V	
A/F SEN1 (B2)	Engine: After warming up	Fluctuates around 2.2 V	-	
ATOM PRES SEN	This item is displayed but is not app	licable to this model.		-

#### < ECU DIAGNOSIS INFORMATION >

Monitor Item	C	Values/Status			
BRAKE BST PRES SE	This item is displayed but is not applicable to this model.				
	Engine: After warming up	Idle	–5 - 5°CA		
INT/V TIM (B1)	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	Approx. 0 - 30°CA		
	Engine: After warming up	Idle	–5 - 5°CA		
INT/V TIM (B2)	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	2,000 rpm	Approx. 0 - 30°CA		
MAP SENSOR	This item is displayed but is not applied but is not applied.	blicable to this model.			
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			
	• Ignition switch: OFF $\rightarrow$ ON	VVEL learning has not been performed yet.	YET		
VVEL LEARN	(After warming up)	VVEL learning has already been per- formed successfully.	DONE		
VVEL SEN LEARN- B1	VVEL learning has already been pe	Approx. 0.30 - 0.80 V			
VVEL SEN LEARN- B2	VVEL learning has already been pe	Approx. 0.30 - 0.80 V			
VVEL POSITION SEN-B1	<ul> <li>Engine: After warming up</li> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	Idle When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 1.40 V Approx. 0.25 - 4.75 V		
	Engine: After warming up	Idle	Approx. 0.25 - 1.40 V		
VVEL POSITION SEN-B2	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	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	<ul> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg		
VVEL TIM-B2	<ul> <li>Engine: After warming up</li> <li>Selector lever: P or N (A/T), Neutral (M/T)</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>	Idle	Approx. 0 - 20 deg		
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg		
ALT DUTY	Engine: Idle	1	0 - 80%		
ALT DUTY SIG	Power generation voltage variable	ON			
	Power generation voltage variable	OFF			
GEAR POSITION	Ignition switch: ON	Shift position: $N \rightarrow 1$ st $\rightarrow 2$ nd $\rightarrow 3$ rd $\rightarrow 4$ th $\rightarrow 5$ th $\rightarrow 6$ th $\rightarrow R$	$N \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow R$		
M/T SYN REV STAT	Ignition switch: ON	S-MODE switch: Pressed (less than 1 second)	ACTIVE		
		S-MODE switch: Pressed (1 second or more)	INACT		

#### < ECU DIAGNOSIS INFORMATION >

#### [VQ37VHR]

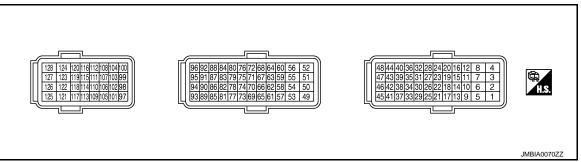
Monitor Item	C	Values/Status			
M/T SYNCHRO SW	S-MODE switch: Pressed		ON	A	
	Ignition switch: ON	S-MODE switch: Released	OFF		
	Ignition switch: ON	Clutch pedal: Fully released	ON	EC	
CPP SW		Clutch pedal: Fully depressed	OFF		
CLUTCH INTLCK SW	Ignition switch: ON	Clutch pedal: Fully released	OFF		
		Clutch pedal: Fully depressed	ON	С	
M/T N POS LEARN	Ignition switch: ON	M/T neutral position learning is success- fully complete.	DONE		
		M/T neutral position learning is not complete yet.	YET	L	
THRTL STK CNT B1	This item is displayed but is not applicable to this model.				
	• DTC P0139 self-diagnosis (delaye	INCMP			
HO2 S2 DIAG1(B1)	<ul> <li>DTC P0139 self-diagnosis (delayed response) has already been performed successfully.</li> </ul>		CMPLT	F	
	• DTC P0159 self-diagnosis (delayed response) has not been performed yet.		INCMP		
HO2 S2 DIAG2(B1)	<ul> <li>DTC P0159 self-diagnosis (delayed response) has already been performed successfully.</li> </ul>		CMPLT	(.	
	• DTC P0139 self-diagnosis (slow response) has not been performed yet.		INCMP		
HO2 S2 DIAG1(B2)	DTC P0139 self-diagnosis (slow recessfully.	CMPLT	F		
	DTC P0159 self-diagnosis (slow response) has not been performed yet.		INCMP		
HO2 S2 DIAG2(B2)	<ul> <li>DTC P0159 self-diagnosis (slow recessfully.</li> </ul>	CMPLT			
A/F SEN1	DTC P015A and P015B self-diagnosis incomplete.		INCMP		
DIAG1(B1)	DTC P015A and P015B self-diagnos	CMPLT			
A/F SEN1 DIAG1	DTC P015C and P015D self-diagnos	INCMP			
(B2)	DTC P015C and P015D self-diagnosis is complete.		CMPLT		
A/F SEN1 DIAG2(B1)	DTC P014C and P014D self-diagnosis incomplete.		INCMP	ŀ	
	DTC P014C and P014D self-diagnosis is complete.		CMPLT		
A/F SEN1	DTC P014E and P014F self-diagnosis incomplete.		INCMP		
DIAG2(B2)	DTC P014E and P014F self-diagnosis is complete.		CMPLT	L	
A/F SEN1 DIAG3(B1)	The vehicle condition is not within the diagnosis range of DTC P014C, P014D, P015A or P015B.		ABSNT		
	The vehicle condition is within the diagnosis range of DTC P014C, P014D, P015A or P015B.		PRSNT	N	
A/F SEN1 DIAG3(B2)	The vehicle condition is not within the P015C or P015D.	ABSNT	Ν		
	The vehicle condition is within the dia 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.

Ρ

### < ECU DIAGNOSIS INFORMATION >

#### **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.

	inal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
1 (O)	128 (B)	A/F sensor 1 heater (bank 1)	Output	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	2.9 - 8.8 V★ 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div
	128		Output	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div JMBIA0031GB
	(B)			<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div
3 (R)	128 (B)	Throttle control motor re- lay power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
4 (BR)	128 (B)	Throttle control motor (Close) (bank 1)	Output	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: In the middle of releasing operation</li> </ul>	0 - 14 V★ 500µSec/div 

#### < ECU DIAGNOSIS INFORMATION >

	inal No. e color)	Description		Condition	Value	A
+		Signal name	Input/ Output	Condition	(Approx.)	
5 (W)	128 (B)	A/F sensor 1 heater (bank 2)	Output	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed (More than 140 seconds after starting engine)</li> </ul>	2.9 - 8.8 V★ 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div	C D
8 (B)		ECM ground		_	_	Е
11 (GR)		Ignition signal No. 4		[Engine is running]	0 - 0.2 V★ 50mSec/div	
12 (L)		Ignition signal No. 3		<ul> <li>Warm-up condition</li> <li>Idle speed NOTE:</li> </ul>		F
15 (V)	128	Ignition signal No. 5		The pulse cycle changes depending on rpm at idle	ZV/div JMBIA0035GB	G
16 (G)	(B)	Ignition signal No. 2	Output		0.1 - 0.4 V★ 50mSec/div	Н
19 (SB)		Ignition signal No. 6		[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm		
20 (Y)		Ignition signal No. 1		• Engine speed. 2,000 tpm	ZV/div JMBIA0036GB	I
17 (P)	128 (B)	Heated oxygen sensor 2 heater (bank 1)	Output	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met</li> <li>Engine: after warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	10 V★ 50mSec/div 50mSec/div 50mSec/div 50mSec/div 50mSec/div	J K L
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)	M
				<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	BATTERY VOLTAGE (11 - 14 V)	Ν
18 (W)	128 (B)	Intake valve timing control solenoid valve (bank 1)	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000rpm</li></ul>	7 - 12 V★	O

# < ECU DIAGNOSIS INFORMATION >

	nal No. e color)	Description		Condition	Value		
+		Signal name	Input/ Output	Condition	(Approx.)		
21	EV/AP canister purge vol-		128 (B)	128 UMP canister purge vol- ume control solenoid	Output	<ul><li>[Engine is running]</li><li>Idle speed</li><li>Accelerator pedal: Not depressed even slightly, after engine starting</li></ul>	BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div ⊊ 10V/div JMBIA0039GB
(GR)	(B)	valve		<ul><li>[Engine is running]</li><li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li></ul>	BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div 50mSec/div 10V/div JMBIA0040GB		
22 (R)	128 (B)	Fuel pump relay	Output	<ul> <li>[Ignition switch: ON]</li> <li>For 1 second after turning ignition switch ON</li> <li>[Engine is running]</li> <li>[Ignition switch: ON]</li> <li>More than 1 second after turning ignition switch ON</li> </ul>	0 - 1.5 V BATTERY VOLTAGE (11 - 14 V)		
24 (P)	128 (B)	ECM relay (Self shut-off)	Output		0 - 1.5 V		
( )				<ul><li>[Ignition switch: OFF]</li><li>More than a few seconds after turning ignition switch OFF</li></ul>	BATTERY VOLTAGE (11 - 14 V)		
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		
				[Ignition switch: ON]	0 - 1.0 V		
26 (W)	128 (B)	Gear lever position sen- sor X-axis	Input	[Ignition switch: ON] • Engine stopped • Shift lever: N→1st→2nd→3rd→4th→5th→6th→R	N: 1.45 - 2.35 V 1st: 0.90 - 1.40 V 2nd: 0.90 - 1.35 V 3rd: 1.70 - 2.15 V 4th: 1.65 - 2.10 V 5th: 2.70 - 3.15 V 6th: 2.65 - 3.10 V R: 3.50 - 4.05 V		
27 (G)	128 (B)	Gear lever position sen- sor Y-axis	Input	[Ignition switch: ON] • Engine stopped • Shift lever: N→1st→2nd→3rd→4th→5th→6th→R	N: 2.15 - 3.00 V 1st: 1.10 - 1.60 V 2nd: 3.40 - 3.90 V 3rd: 1.10 - 1.65 V 4th: 3.40 - 3.90 V 5th: 1.10 - 1.60 V 6th: 3.40 - 3.90 V R: 3.40 - 3.90 V		

#### < ECU DIAGNOSIS INFORMATION >

	nal No. e color)	Description		Condition	Value	А
+		Signal name	Input/ Output	Condition	(Approx.)	
28 (BR)	128 (B)	VVEL actuator motor re- lay abort signal (VVEL control module)	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 V	EC
				<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	BATTERY VOLTAGE (11 - 14 V)	С
29 (G)	128 (B)	Intake valve timing control solenoid valve (bank 2)	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000rpm</li></ul>	7 - 12 V★	D E F
30	40	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released	More than 0.36 V	G
(Y)	(R)	(bank 1)	input	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully depressed	Less than 4.75 V	Η
31	48	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released	More than 0.36 V	
(R)	(B)	(bank 2)	input	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully depressed	Less than 4.75 V	J
33 (SB)	128 (B)	Heated oxygen sensor 2 heater (bank 2)	Output	<ul> <li>[Engine is running]</li> <li>Engine speed: Below 3,600 rpm after the following conditions are met</li> <li>Engine: after warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	10 V★ 50mSec/div = = 50mSec/div = 50mSec/div JMBIA0037GB	K L M
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)	Ν
34	40	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released	Less than 4.75 V	0
(B)	(R)	(bank 1)	mput	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully depressed	More than 0.36 V	Ρ

# < ECU DIAGNOSIS INFORMATION >

	nal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output		(Approx.)
35	48	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D (A/T) or 1st (M/T) • Accelerator pedal: Fully released	Less than 4.75 V
(W)	(B)	(bank 2)		<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	More than 0.36 V
36 (O)		Sensor ground [Brake booster pressure sensor]	_	_	_
37	128	Crankshaft position sen-	Input	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed NOTE: The pulse cycle changes depending on rpm at idle</li> </ul>	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 2V/div JMBIA0042GB
38	96	Manifold absolute pres-	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	1.2 V
(O)	(P)	sure (MAP) sensor	input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	1.5 V
39	36	Brake booster pressure	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li><li>Brake pedal: Fully released</li></ul>	1.2 V
(P)	(O)	sensor	input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li><li>Brake pedal: Fully depressed</li></ul>	3.0 V
40 (R)	_	Sensor ground [Throttle position sensor (bank 1)]	_	_	_
41 (SB)	128 (B)	Clutch pedal position switch	Input	[Ignition switch: ON] • Engine stopped • Clutch pedal: Fully released [Ignition switch: ON]	0 V
-				<ul><li>Engine stopped</li><li>Clutch pedal: Fully depressed</li></ul>	BATTERY VOLTAGE (11 - 14 V)

#### < ECU DIAGNOSIS INFORMATION >

	nal No. color)	Description		Condition	Value	A
+		Signal name	Input/ Output	Condition	(Approx.)	
42	128 (P)	Clutch interlock switch	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Clutch pedal: Fully released</li></ul>	0 V	EC
(GR)	(B)			<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Clutch pedal: Fully depressed</li></ul>	BATTERY VOLTAGE (11 - 14 V)	С
43 (G)	48 (B)	Sensor power supply [Throttle position sensor (bank 2)]		[Ignition switch: ON]	5 V	D
44 (L)	40 (R)	Sensor power supply [Throttle position sensor (bank 1)]	_	[Ignition switch: ON]	5 V	E
45 (LG)	36 (O)	Sensor power supply [Brake booster pressure sensor]	_	[Ignition switch: ON]	5 V	F
46 (R)	128 (B)	Sensor power supply [Crankshaft position sen- sor (POS)]	_	[Ignition switch: ON]	5 V	G
47 (Y)	—	Sensor ground [Crankshaft position sen- sor (POS)]	_	_	_	Н
48 (B)	_	Sensor ground [Throttle position sensor (bank 2)]	_	_	_	I
49 (GR)	128 (B)	Throttle control motor (Close) (bank 2)	Output	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: In the middle of releasing operation</li> </ul>	0 - 14 V★ 500µSec/div	J
50 (V)	128 (B)	Throttle control motor (Open) (bank 2)	Output	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: Fully depressed</li> </ul>	0 - 14 V★ 500µSec/div 500µSec/div 500µSec/div JMBIA0031GB 0 - 14 V★	L M N
				<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D (A/T) or 1st (M/T)</li> <li>Accelerator pedal: Fully released</li> </ul>	500µSec/div	O P
52 (R)	128 (B)	Throttle control motor re- lay 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)	

#### < ECU DIAGNOSIS INFORMATION >

	inal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
54 (Y)	_	Engine communication line (VVEL control mod- ule)	Input/ output	_	_
55 (LG)	_	Engine communication line (VVEL control mod- ule)	Input/ output	_	_
57 (L)	128 (B)	A/F sensor 1 (bank 1)	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	2.2 V Output voltage varies with air fuel ratio.
59	128	Camshaft position sensor	loput	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	3.0 - 5.0 V★ 20mSec/div = 
(O)	(B)	(PHASE) (bank 1)	Input	[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★ 20mSec/div € 2V/div JMBIA0046GB
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	[Ignition switch: ON]	1.8 V
63	128	Camshaft position sensor	Input	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	3.0 - 5.0 V★ 20mSec/div 
(L)	(B)	(PHASE) (bank 2)	mput	[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

# < ECU DIAGNOSIS INFORMATION >

Terminal No. (Wire color)			Condition	Value	
+		Signal name	Input/ Output	Condition	(Approx.)
65 (LG)	128 (B)	A/F sensor 1 (bank 2)	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	2.2 V Output voltage varies with air fuel ratio.
66 (V)	128 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	1.8 V
67 (P)	128 (B)	Intake air temperature sensor (bank 1)	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 (bank 1)]	_	_	_
69 (W)	128 (B)	Knock sensor (bank 2)	Input	[Engine is running] • Idle speed	2.5 V* <sup>1</sup>
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* <sup>1</sup>
74 (L)	128 (B)	Sensor power supply (Gear lever position sen- sor)	_	[Ignition switch: ON]	5 V
75	128		lanut	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	0.25 V★ 5mSec/div 2V/div JMBIA2100GB
(W)	(B)	Input speed sensor	Input	[Engine is running] • Engine speed: 2,000 rpm	0.25 V★ 5mSec/div 2V/div JMBIA2101GB
76 (W)	128 (B)	Heated oxygen sensor 2 (bank 1)	Input	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met</li> <li>Engine: after warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	0 - 1.0 V

#### < ECU DIAGNOSIS INFORMATION >

	inal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
77 (SB)	68 (LG)	Mass air flow sensor (bank 1)	Input	[Ignition switch: ON] • Engine stopped [Engine is running] • Warm-up condition • Idle speed	0.4 V 0.7 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.3 - 1.7 V
78 (G)	84 (B)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine oil temperature.
79	94	Mass air flow sensor	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0.7 - 1.2 V
(BR)	(Y)	(bank 2)	mput	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.3 - 1.7 V
80 (O)	128 (B)	Heated oxygen sensor 2 (bank 2)	Input	<ul> <li>[Engine is running]</li> <li>Revving engine from idle to 3,000 rpm quickly after the following conditions are met</li> <li>Engine: after warming up</li> <li>Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load</li> </ul>	0 - 1.0 V
81 (R)		Fuel injector No. 3			BATTERY VOLTAGE (11 - 14 V)★
82 (V) 85 (BR)	128	Fuel injector No. 6 Fuel injector No. 2		<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed NOTE: The pulse cycle changes depending on rpm at idle</li> </ul>	50mSec/div
86 (W) 89 (GR) 90 (O)	128 (B)	Fuel injector No. 5 Fuel injector No. 1 Fuel injector No. 4	Output	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div
84 (B)		Sensor ground (Heated oxygen sensor 2, Engine coolant tempera- ture sensor, Engine oil temperature sensor, Input speed sensor)			
87	96	Power steering pressure	Output	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5 V
(Y)	(P)	sensor		[Engine is running] <ul> <li>Steering wheel: Not being turned</li> </ul>	0.4 - 0.8 V

# < ECU DIAGNOSIS INFORMATION >

	nal No. color)	Description		Condition	tion Value (Approx.)	
+		Signal name	Input/ Output	Condition	(Approx.)	
88 (R)	_	Sensor ground (Gear lever position sen- sor)	_	_	_	EC
91 (SB)	95 (G)	Battery current sensor	Input	[Engine is running] • Battery: Fully charged <sup>*2</sup> • Idle speed	2.6 - 3.5 V	С
92 (G)	_	Sensor ground [Camshaft position sen- sor (PHASE) (bank 2)]	_	_	-	D
93 (P)	128 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)	E
94 (Y)	_	Sensor ground [Mass air flow sensor (bank 2)]		_	_	F
95 (G)	_	Sensor ground [Battery current sensor]		_	-	
96 (P)	_	Sensor ground [Camshaft position sen- sor (PHASE) (bank 1), Manifold absolute pres- sure (MAP) sensor, Pow- er steering pressure sensor]	_	_	_	– G H
97	100	Accelerator pedal position	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully released</li></ul>	0.45 - 1.00 V	_
(R)	(W)	sensor 1		<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully depressed</li></ul>	4.2 - 4.8 V	J
98	104	Accelerator pedal position	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully released</li></ul>	0.22 - 0.50 V	К
(P)	(GR)	sensor 2	mput	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully depressed</li></ul>	2.1 - 2.5 V	L
99 (L)	100 (W)	Sensor power supply (Accelerator pedal posi- tion sensor 1)	_	[Ignition switch: ON]	5 V	Μ
100 (W)	_	Sensor ground (Accelerator pedal posi- tion sensor 1)	_	_	_	Ν
				[Ignition switch: ON] • ASCD steering switch: OFF	4 V	0
				[Ignition switch: ON] • MAIN switch: Pressed	0 V	_ 0
101 (SB)	108 (Y)	ASCD steering switch (models with ASCD sys-	Input	[Ignition switch: ON] • CANCEL switch: Pressed	1 V	Ρ
()	× /	tem)		[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3 V	-
				[Ignition switch: ON] • SET/COAST switch: Pressed	2 V	_

#### < ECU DIAGNOSIS INFORMATION >

	inal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
102 (GR)	112 (SB)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	1.8 - 4.8 V
103 (G)	104 (GR)	Sensor power supply (Accelerator pedal posi- tion sensor 2)		[Ignition switch: ON]	5 V
104 (GR)		Sensor ground (Accelerator pedal posi- tion sensor 2)		_	-
105 (L)	112 (SB)	Refrigerant pressure sen- sor	Input	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan motor switch: ON (Compressor operates)</li> </ul>	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 (BR)	112 (SB)	Sensor power supply (EVAP control system pressure sensor, Refrig- erant pressure sensor)		[Ignition switch: ON]	5 V
108 (Y)	_	Sensor ground (ASCD steering switch)	_	_	-
109 (G)	128 (B)	PNP signal	Input	[Ignition switch: ON] • Selector lever: P or N (A/T), Neutral (M/ T)	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON] • Selector lever: Except above	0 V
110	128	Engine speed output sig-	Output	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle</li> </ul>	1 V★ 10mSec/div € 2V/div JMBIA0076GB
(R)	(B)	nal	Guipur	[Engine is running] • Engine speed is 2,000 rpm	1 V★ 10mSec/div 2V/div JMBIA0077GB
112 (SB)		Sensor ground (EVAP control system pressure sensor, Refrig- erant pressure sensor)		_	_
113 (P)	_	CAN communication line	Input/ Output	_	_
114 (L)	—	CAN communication line	Input/ Output	_	_
117 (Y)	128 (B)	Data link connector	Input/ Output	_	

#### < ECU DIAGNOSIS INFORMATION >

#### [VQ37VHR]

	nal No. e color)	Description		Condition	Value	А
+		Signal name	Input/ Output	Contaitor	(Approx.)	
121 (LG)	128 (B)	EVAP canister vent con- trol valve	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)	EC
122	128	Stop Jomp quitab	locut	[Ignition switch: OFF] • Brake pedal: Fully released	0 V	С
(P)	(B)	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)	
123 (B) 124 (B)	_	ECM ground	_	_	_	D
125 (R)	128 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)	
126	128	ASCD brake switch (mod-	locut	<ul><li>[Ignition switch: ON]</li><li>Brake pedal: Slightly depressed</li></ul>	0 V	F
(BR)	(B)	els with ASCD system)	Input	[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)	
127 (B) 128 (B)		ECM ground	_	_	_	— G

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

\*1: This may vary depending on internal resistance of the tester.

\*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

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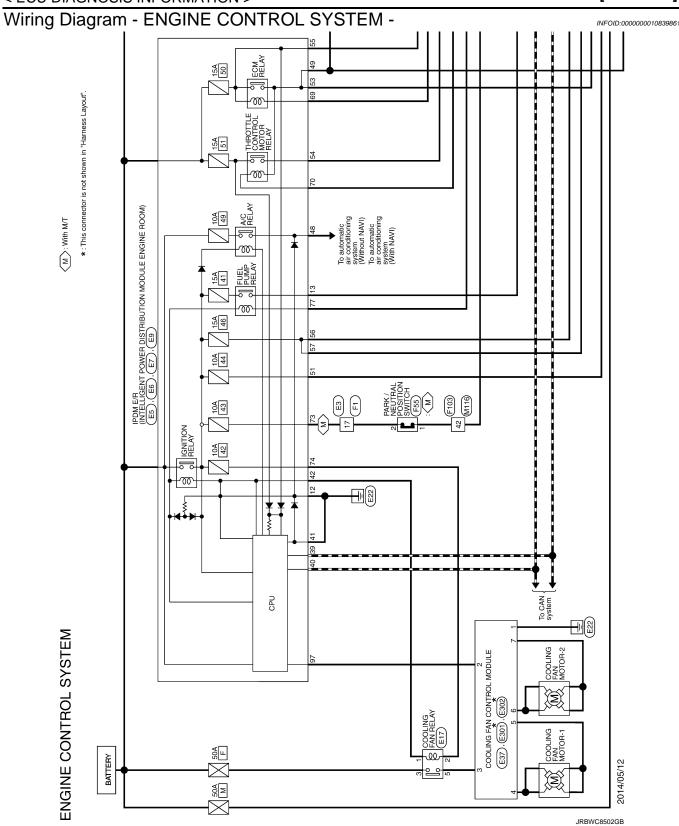
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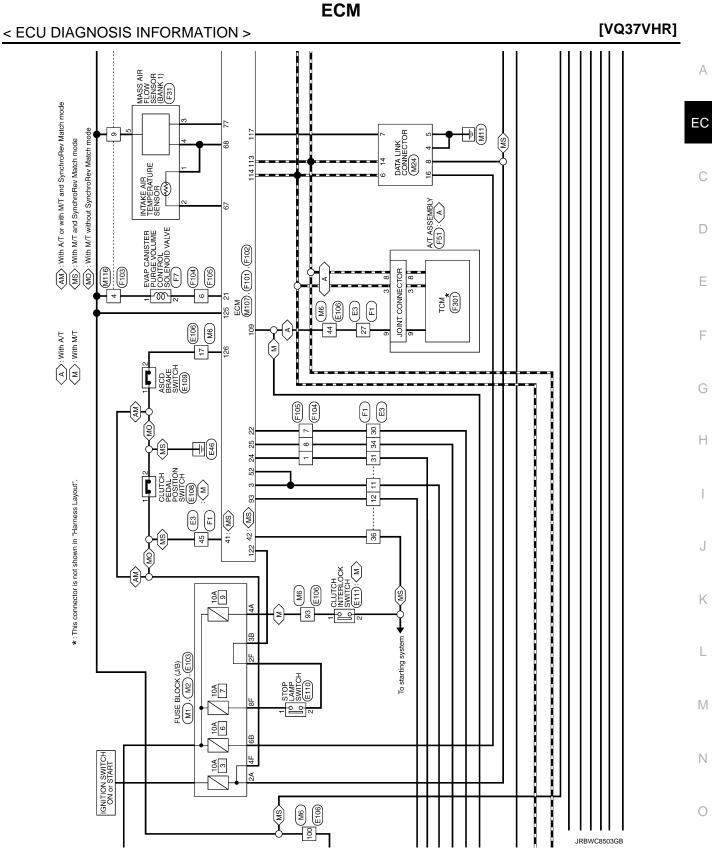
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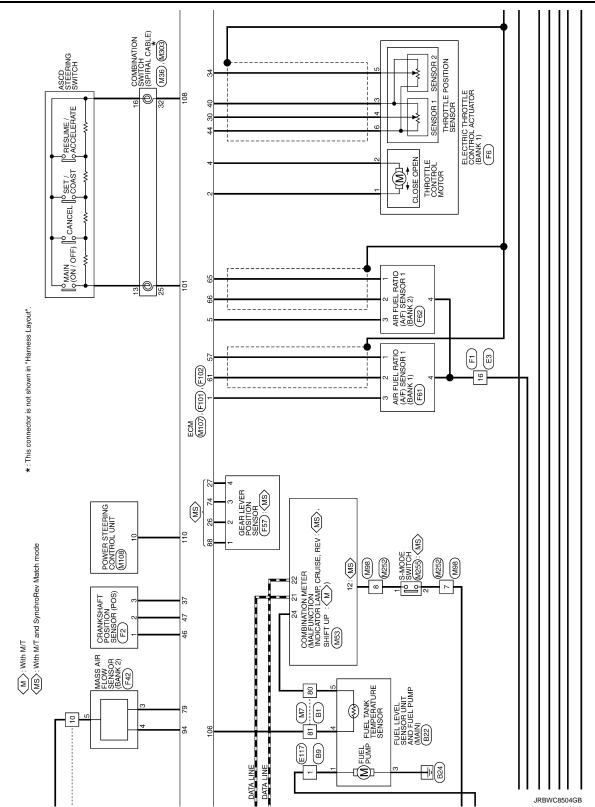
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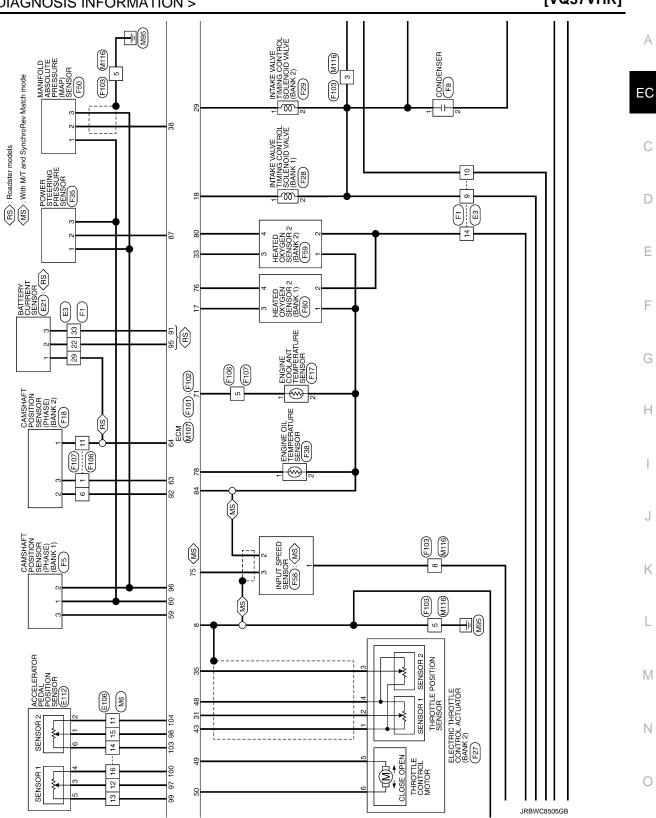
Revision: 2014 September

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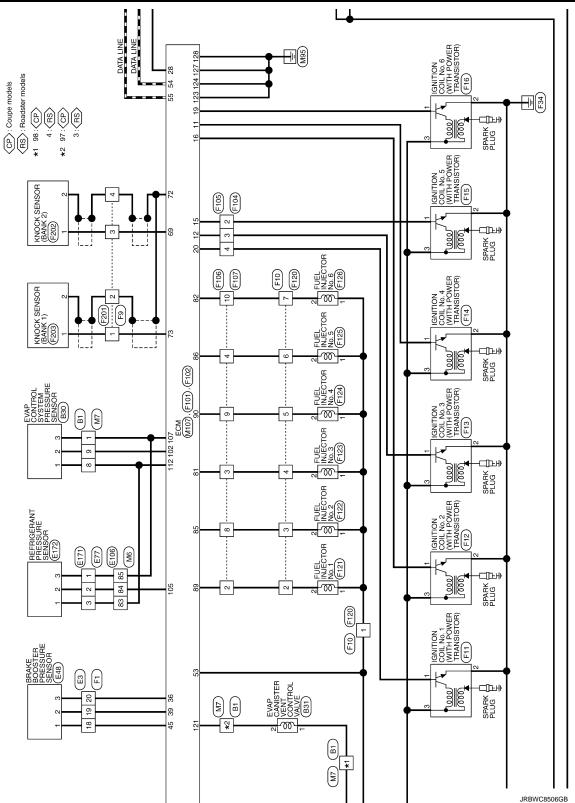
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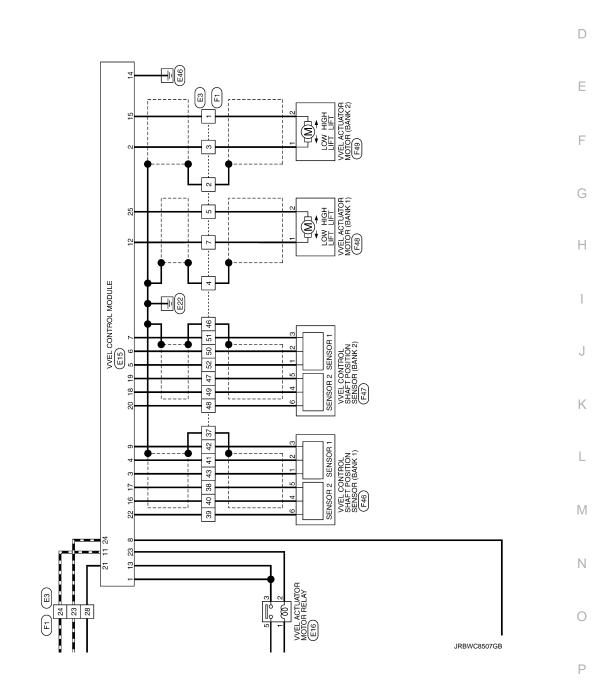
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Comediar No. B30 Comediar Name EVAF CONTROL ISYSTEM PRESSURE SENSOR Commediar Type EU3FGV-FRS	5.111	EVAP CA E02FB-F	Terminal Color Of No.     Sgnal Name (Specification)       1     Wr       2     Y
B9 wree To wree Instrem-cs 10 9 8 7 6 5	Signal Name [Specification] - [Coupe models] - [Roadster models]		Signal Name (Specification)
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Connector No. B Connector Name Connector Type T	Terminal No.         Color Of Wire           1         0         8           2         BG         3           3         Υ         6	2 ₩ m x < m 2 ₩ 5 H	
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WIFE	Signal Name (Specification)	6F 4F - 2F 1F	Signal Name (Specification)	- - - [Coupe models] - [Raadster models]
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er7 b coolinis FAN CONTROL MODULE s.ZürleGV-SNZ2	51 Signal Name (Specification)		Signal Name [Specification]	
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ENGINE CONTROL SYSTEM	Connector No. E172	Connector No. E302	20 0 -	Г
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	Connector Type 6188-0259			
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Revision: 2014 September

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ENGINE CONTROL SYSTEM Connector Name connector Name connector Type E09FGV-RR	Corrector No.     F15       Commector Name     vermon content of the source of the so	Comedar No. F17 Connector Name Evake COLANT TEMPERATURE SENSOR Connector Type EcoTGV-RS	Ormector No.         F27           Corrector Name         Littline           Corrector Type         R-HoGFB           Corrector Type         R-HoGFB           Corrector Type         R-HoGFB
Terminal Color Of Signal Name (Specification) No. Wire Signal Name (Specification) 1 L	Terminal Cabor Of Signal Name (Specification) No. Wire Signal Name (Specification) 1 V · · · · · · · · · · · · · · · · · ·	Terminal Color Of Sgnal Name [Specification] No. Wire 2 B	Terminal Color Of No. Wire Signal Name [Specification] 1 G C
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Corrector No. F59 Connector Name EEATED OXYGEN SENSOR 2 (BANK 2) Connector Type RH04MB	Terminal No.     Color of Nice     Signal Name  Specification]       1     1     0       2     1     0       3     5     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       0     0     0       1     B     -       0     0     0       0     0     0       0     0     0
Connector No. F57 Connector Name GEAR LEVER POSITION SENSOR Connector Type RHOHFB	Terminal Color Of No.     Signal Name (Specification)       0     No.     Signal Name (Specification)       1     No.     Signal Name (Specification)       2     V     Signal Name (Specification)       2     No.     Signal Name (Specification)       2     No.     F58       Corrector Name     NeUT SPEED SENSOR       Corrector Type     RenOFB       Corrector Type     RenOFB       No.     Neur Speed (Specification)       1     L       No.     Nine (Specification)       1     L       No.     Nine (Specification)
Connector No.         F51           Connector Name         AT ASSEMBLY           Connector Name         AT BO	Terminal Cabor Of No.     Signal Name (Specification)       No.     Virtie     Signal Name (Specification)       2     ER     EAVITENPOWER SUPPLY       3     L     CONTION DOWER SUPPLY       4     V     CONTION POWER SUPPLY       6     P     CONTION POWER SUPPLY       7     W     CONTION POWER SUPPLY       8     EACH     CONTION POWER SUPPLY       9     CAN-L     CAN-L       0     CONNOL     CAN-L       0     FERCIND     CAN-L       0     CONNOL     CAN-L       0     CAN-L     CAN-L
ENGINE CONTROL SYSTEM Connector Name VEL ACTUATOR MOTOR (BANK 2) Connector Name VEL ACTUATOR MOTOR (BANK 2) Connector Type X027E	Terminal     Odds: Of Wite     Signal Name (Specification)       0     U/V     Signal Name (Specification)       1     U/V     FE0       Connector Name     MAPCO.D. ABSOUTE PRESsulte (MAP) BENSION       Connector Name     MAPCO.D. ABSOUTE PRESSULTE PRESSUL

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R: SUPPLY R: SUPPLY Cound Coun	E
FIGSOR POWER SUPPLY SENSOR CROUND SENSOR CROUND SENSOR CROUND SENSOR CROUND SENSOR CROUND SENSOR CROUND SENSOR CROUND SENSOR CROUND SENSOR CROUND SUPPLY SENSOR CROUND SENSOR CROUND	F
45         LG           46         R           46         R           46         R           46         R           47         L           48         R           49         R           40         R           41         R           42         Lonedot Name           Connector Name         EOM           10         No           11         No           12         R           13         L           13         R           13         R           13         R           14         No           15         L           16         R           17         S           17         No           17	G
Characterial and a constraint of the constraint	Н
EP A28-LLH-Z FE A28-LLH-Z FE A28-LLH-Z B4(2)(3)(2)(2)(1)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)	J
Connector No.         Connector No.         F101           Connector Name         CONnector Name         ECM           Connector Name         ECM         RH0           Connector Name         ECM         No.           Connector Name         ECM         No.           Connector Name         ECM         No.           Connector Name         ECM         No.           No.         2         C         No.           1         1         R         No.           11         R         N         No.           22         R         No.         No.           23         N         N         No.           33         N         N         No.           41         R         No.         No. </td <td>K</td>	K
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Signal Name (Specification)	Μ
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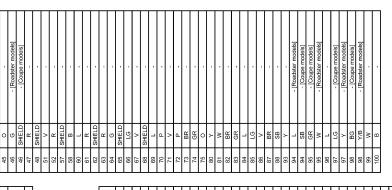
Comediar No. F122 Connector Name FuEL INJECTOR No. 2 Connector Type HS022FGY	Terminal Color OI     Signal Name (Spochration)       1     0       2     E       2     E         Connector Name     FUEL INECTOR No. 3       Connector Name     FUEL INECTOR No. 3       Connector Name     FUEL INECTOR No. 3         Mine     Signal Name (Specification)	
Comector No. F120 Comector Name WIRE TO WIRE Comector Type RH06MB	Terminal Color Ci No.     Signal Name (Specification)       1     0       2     0       3     ER       5     0       5     0       6     0       7     0       7     0       6     0       7     0       7     0       7     0       7     0       1     0       1     0       1     0       1     0       1     0       1     0       1     0       2     0       2     0	
Corrector No. F106 Corrector Name WIRE TO WIRE Corrector Type TH12PW-NH Corrector Type TH12PW-NH Corrector 109 87	Tarmman     Color     Signal Name (Specification)       1     L     Signal Name (Specification)       2     CR     Signal Name (Specification)       3     R     -       4     W     -       1     Signal Name (Specification)       1     Signal Name (Specification)	
ENGINE CONTROL SYSTEM Corrector No. F104 Connector Name Connector Type Connector Type Con	Terminal     Cold     Signal Name (Specification)       No.     Vore     Signal Name (Specification)       1     V     V       2     V     V       3     L     V       Commotor Name     Wife 10 WIRE       No     V       1     1       2     V       3     L       1     C       1     C       1     C	

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Sama Name (Specification)	Sgraf Manni Specification] Sgraf Manni Specification] IGNITON POWER SUPPLY IGNITON POWER SUPPLY CANNEL CANNEL ICNITON POWER SUPPLY IGNITON POWER SU	22414	EC
F301 TCM SP10FG			С
Connector Name Connector Name Connector Type	No.         Wire           2         4         4           2         5         6           3         7         7           7         7         1           9         7         1           9         7         1           10         W/B         9           Connector No.         2         1           Connector No.         2         1           Connector No.         2         1	Terminal         Connector         Upe           No.         No.         No.           A         V         V           A         P         P           A         Y         K           A         P         P           BA         Y         BR	D
(2)		ectification	Е
HOUCK SENSOR (BANK 2) EUZFG-RS-LGY	signal name liste	Signal Name (Specification)	F
Cormector No. F202 Connector Name (NNC Connector Type EC2F MAS	No.         Wire         Signal Mamme Ispeci           1         1         W         -           2         SHELD         -         -           Connector Num         RNOCK SENSOR (BANK 1)         -         -           Connector Num         RNOCK SENSOR (BANK 1)         -         -           Connector Num         EQ2FG-RS-LGY         -         -	1     No.     Wire       2     SHELD	G
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F126 FUEL INJECTOR No. 6 HSLOPEGY Samal Name (Scentication)		Signal Name (Specification)	I
F126 HS02FG	F201 WIRE T RS04MI		J
Comector No. Comector Name Comector Type Comector Type Comector Type Comector Type	No. Mire 1 G Connector No. Connector No.	Terminal Color of More	K
KSTEM		Specification)	L
ENGINE CONTROL SYSTEM Corrector Name PUEL INJECTOR No. 4 Corrector Type HECTOR NO. 4 Corrector Type	signal harme less F1255 HS02FGY HS02FGY	Signal Name (Specification)	Μ
Terminal Color of	No. Wire Signal Name LS 1 G Signal Name LS Connector No. F125 Connector Name FUEL INJECTOR No. 5 Connector Type HS02FGY	Terminal Color Of No. Wire 2 - S - S - S - S - S - S - S - S - S -	Ν
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Terminal No.

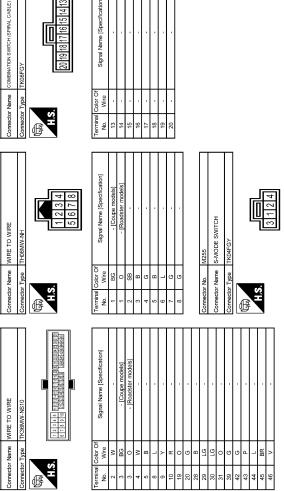
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PMP SIGNUL ENGINE SPEED OUTPUT SIGNUL CAN COMMUNICATION LINE CAN COMMUNICATION LINE ECOM GROUND ECOM GROUND	EC
	С
109         C           110         R           111	D
me [Specification] me [S	E
Meal       Meal         WIRE TO WIRE       THOBPN.M.H         THOBPN.M.H       1         Bignal Name [Specification]       5gnal Name [Specification]         Signal Name [Specification]       .         MIUT       .         ECM       .         MIUT       .         CCLEERANDE FEAL       .         MIUT       .         ACCLERANDE FEAL       .         MIUT       .         COMMARK       .         MIUT       .	F
Terminal Connector Name         Image: Second connector Name         Image: Second connector Name         Image: Name           Connector Name         Terminal Color Of         Terminal Color Of         Name         Name           Terminal Color Of         Name         Second connector Name         Name         Name           Second connector Name         E         E         E         E         E           Second connector Name         E         E         E         E         E           Non         Connector Name         E         E         E         E         E           103         GR         N         Name         E         E         E         E           103         GR         N         Name         E	G
0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     10     12       0     0     10       0     0     0       0     0     0	
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Commettor No.         M53           Commettor Name         Commettor Name           No.         1           No.         1           1         1	K
	L
SONTROL SYSTEM Mea Mea Dar Ja LINK CONNECTOR BOIGFW Signal Name [Specification] Signal Name [Specification]	Μ
BIAINE CONTROL SYSTEM       Connector Name       Connector Name     M24       Connector Name     PaTA LINK CONNECTOR       Connector Name     Connector Name       Connector Name     Signal Name	Ν

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INFOID:000000010839862

# Fail safe

## NON DTC RELATED ITEM

ctor No.

tor No.

ENGINE CONTROL SYSTEM

# [VQ37VHR]

Engine operating condition in fail-safe mode	Detected items	Remarks	Reference page	А
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.		EC
		Therefore, when electrical controlled throttle and part of ECM relat- ed diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the mal- function.	<u>EC-519</u>	С

# 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.			
P0101 P0102 P0103 P010B P010C P010D	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.			
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT 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 engine starting	80°C (176°F)		
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)		
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.			
P0122 P0123 P0222 P0223 P0227 P0228 P1239 P2132 P2133 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.			
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 3,500 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.			

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EC-573

#### < ECU DIAGNOSIS INFORMATION >

DTC No.	Detected items	Engine operating condition in fail-safe mode				
P1087 P1088	VVEL control function	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.				
P1089 P1092	VVEL control shaft position sensor	VVEL value is maintained at a fixed angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut				
P1608	VVEL control shaft position sensor	VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut				
P1090 P1093	VVEL actuator motor	VVEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut.				
		VVEL actuator motor relay is turned off, and VVEL value is become at a minimum an Engine speed will not rise more than 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 actuator	<ul> <li>(When electric throttle control actuator does not function properly due to the return sprir malfunction:)</li> <li>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.</li> </ul>				
			ng angle in fail-safe mode is not in specified range:) hrottle control actuator by regulating the throttle opening to 20			
		(When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually because of fuel cut. hicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1 more.				
P1290 P2100 P2103	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.				
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 control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.				
		Vehicle condition	Driving condition			
		When engine is idling	Normal			
		When accelerating	Poor acceleration			
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sen- sor	<ul> <li>The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.</li> <li>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.</li> <li>Therefore, the acceleration will be poor.</li> </ul>				

# DTC Inspection Priority Chart

INFOID:000000010839863

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

# < ECU DIAGNOSIS INFORMATION >

Priority	Detected items (DTC)	
1	U0101 U1001 U1003 CAN communication line	
	U1024 VVEL CAN communication line	
	P0102 P0103 P010C P010D Mass air flow sensor	
	P010A Manifold absolute pressure (MAP) sensor	
	P0111 P0112 P0113 P0127 Intake air temperature sensor	
	<ul> <li>P0116 P0117 P0118 P0125 Engine coolant temperature sensor</li> <li>P0122 P0122 P0222 P0222 P0227 P0228 P1225 P1226 P1224 P1225 P1220 P2122 P2122 P2125 Throttle position concerns</li> </ul>	
	<ul> <li>P0122 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throttle position sensor</li> <li>P0128 Thermostat function</li> </ul>	
	<ul> <li>P0126 Thermostal function</li> <li>P0181 P0182 P0183 Fuel tank temperature sensor</li> </ul>	
	<ul> <li>P0196 P0197 P0198 Engine oil temperature sensor</li> </ul>	
	P0327 P0328 P0332 P0333 Knock sensor	
	<ul> <li>P0335 Crankshaft position sensor (POS)</li> </ul>	
	P0340 P0345 Camshaft position sensor (PHASE)	
	• P0460 P0461 P0462 P0463 Fuel level sensor	
	P0500 Vehicle speed sensor	
	P0555 Brake booster pressure sensor	
	• P0605 P0607 ECM	
	P0643 Sensor power supply	
	P0705 Transmission range switch	
	P0820 Gear lever position sensor	
	<ul> <li>P0850 Park/neutral position (PNP) switch</li> </ul>	
	P1089 P1092 P1608 VVEL control shaft position sensor	
	P1606 P1607 VVEL control module	
	P1610 - P1615 NATS     P16400 P0400 P0400 Acceleration and a resition concer	
	P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor	
	P2765 Input speed sensor	

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#### < ECU DIAGNOSIS INFORMATION >

Priority	Detected items (DTC)
2	<ul> <li>P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater</li> <li>P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater</li> <li>P0075 P0081 Intake valve timing control solenoid valve</li> <li>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</li> <li>P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2</li> <li>P0441 EVAP control system purge flow monitoring</li> <li>P0443 P0444 P0445 EVAP canister purge volume control solenoid valve</li> <li>P0447 P0448 EVAP canister vent control valve</li> <li>P0447 P0448 EVAP canister vent control valve</li> <li>P0451 P0452 P0453 EVAP control system pressure sensor</li> <li>P0500 Power steering pressure sensor</li> <li>P0603 ECM power supply</li> <li>P0710 P0717 P0720 P0729 P0730 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches</li> <li>P0833 Clutch pedal position switch</li> <li>P1087 P1088 VVEL system</li> <li>P1090 P1093 VVEL actuator motor relay</li> <li>P1217 Engine over temperature (OVERHEAT)</li> <li>P1236 P2110 P1210 Thortle control function</li> <li>P1236 P2110 P1210 Thortle control motor relay</li> <li>P1236 P2110 P1210 Thortle control motor relay</li> <li>P1805 Brake switch</li> </ul>
3	<ul> <li>P0011 P0021 Intake valve timing control</li> <li>P0101 P010B Mass air flow sensor</li> <li>P0171 P0172 P0174 P0175 Fuel injection system function</li> <li>P0300 - P0306 Misfire</li> <li>P0420 P0430 Three way catalyst function</li> <li>P0456 EVAP control system (VERY SMALL LEAK)</li> <li>P0506 P0507 Idle speed control system</li> <li>P050A P050E Cold start control</li> <li>P0524 Engine oil pressure</li> <li>P100A P100B VVEL system</li> <li>P1148 P1168 Closed loop control</li> <li>P1211 TCS control unit</li> <li>P1212 TCS communication line</li> <li>P1238 P2119 Electric throttle control actuator</li> <li>P1564 ASCD steering switch</li> <li>P1572 ASCD brake switch</li> <li>P1574 ASCD vehicle speed sensor</li> </ul>

# DTC Index

INFOID:000000010839864

 $\times$ :Applicable —: Not applicable

DTC*1		Items	SRT			Permanent	Reference
CONSULT GST* <sup>2</sup>	ECM* <sup>3</sup>	(CONSULT screen terms)	code	Trip	MIL	DTC group* <sup>4</sup>	page
U0101	0101* <sup>5</sup>	CAN COMM CIRCUIT	_	1	×	В	<u>EC-178</u>
U1001	1001* <sup>5</sup>	CAN COMM CIRCUIT	_	2	_	_	<u>EC-179</u>
U1003	1003	CAN COMM CIRCUIT	—	2	—	—	<u>EC-180</u>
U1024	1024	VVEL CAN COMM CIRCUIT	_	1	×	В	<u>EC-182</u>
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	_	_	Flashing* <sup>8</sup>	_	_
P0011	0011	INT/V TIM CONT-B1	×	2	×	В	<u>EC-184</u>
P0021	0021	INT/V TIM CONT-B2	×	2	×	В	<u>EC-184</u>
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	В	<u>EC-188</u>

#### < ECU DIAGNOSIS INFORMATION >

DT	<sup>-</sup> C* <sup>1</sup>	Items	SRT			Permanent	Reference	А
CONSULT	ECM* <sup>3</sup>	(CONSULT screen terms)	code	Trip	MIL	DTC group* <sup>4</sup>	page	A
GST* <sup>2</sup>	LOW							
P0032	0032	A/F SEN1 HTR (B1)		2	×	В	<u>EC-188</u>	EC
P0037	0037	HO2S2 HTR (B1)		2	×	В	<u>EC-191</u>	
P0038	0038	HO2S2 HTR (B1)		2	×	В	<u>EC-191</u>	
P0051	0051	A/F SEN1 HTR (B2)		2	×	В	<u>EC-188</u>	С
P0052	0052	A/F SEN1 HTR (B2)		2	×	В	<u>EC-188</u>	
P0057	0057	HO2S2 HTR (B2)	—	2	×	В	<u>EC-191</u>	D
P0058	0058	HO2S2 HTR (B2)	—	2	×	В	<u>EC-191</u>	
P0075	0075	INT/V TIM V/CIR-B1		2	×	В	<u>EC-194</u>	
P0081	0081	INT/V TIM V/CIR-B2	—	2	×	В	<u>EC-194</u>	E
P0101	0101	MAF SEN/CIRCUIT-B1	—	2	×	В	<u>EC-197</u>	
P0102	0102	MAF SEN/CIRCUIT-B1	_	1	×	В	<u>EC-203</u>	F
P0103	0103	MAF SEN/CIRCUIT-B1	_	1	×	В	<u>EC-203</u>	I
P010A	010A	ABSL PRES SEN/CIRC	_	2	×	В	<u>EC-209</u>	
P010B	010B	MAF SEN/CIRCUIT-B2	_	2	×	В	<u>EC-197</u>	G
P010C	010C	MAF SEN/CIRCUIT-B2	_	1	×	В	<u>EC-203</u>	
P010D	010D	MAF SEN/CIRCUIT-B2	_	1	×	В	EC-203	
P0111	0111	IAT SENSOR 1 B1	—	2	×	А	EC-213	Н
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	В	EC-215	
P0113	0113	IAT SEN/CIRCUIT-B1	_	2	×	В	<u>EC-215</u>	
P0116	0116	ECT SEN/CIRC	_	2	×	А	<u>EC-218</u>	
P0117	0117	ECT SEN/CIRC	—	1	×	В	EC-221	
P0118	0118	ECT SEN/CIRC	_	1	×	В	<u>EC-221</u>	J
P0122	0122	TP SEN 2/CIRC-B1	_	1	×	В	<u>EC-224</u>	
P0123	0123	TP SEN 2/CIRC-B1		1	×	В	<u>EC-224</u>	K
P0125	0125	ECT SENSOR		2	×	В	<u>EC-227</u>	1.
P0127	0127	IAT SENSOR-B1		2	×	В	<u>EC-230</u>	
P0128	0128	THERMSTAT FNCTN		2	×	A	<u>EC-232</u>	L
P0130	0130	A/F SENSOR1 (B1)	—	2	×	A	<u>EC-235</u>	
P0131	0131	A/F SENSOR1 (B1)		2	×	В	EC-239	Μ
P0132	0132	A/F SENSOR1 (B1)		2	×	В	<u>EC-242</u>	IVI
P0137	0137	HO2S2 (B1)	×	2	×	A	<u>EC-245</u>	
P0138	0138	HO2S2 (B1)	×	2	×	A	EC-251	Ν
P0139	0139	HO2S2 (B1)	×	2	×	A	EC-259	
P014C	014C	A/F SENSOR1 (B1)	×	2	×	А	EC-266	
P014D	014D	A/F SENSOR1 (B1)	×	2	×	A	EC-266	0
P014E	014E	A/F SENSOR1 (B2)	×	2	×	A	EC-266	
P014F	014F	A/F SENSOR1 (B2)	×	2	×	Α	EC-266	Р
P0150	0150	A/F SENSOR1 (B2)	_	2	×	A	EC-235	-
P0151	0151	A/F SENSOR1 (B2)		2	×	В	EC-239	
P0152	0152	A/F SENSOR1 (B2)		2	×	В	EC-242	
P0157	0157	HO2S2 (B2)	×	2	×	A	EC-245	
P0158	0158	HO2S2 (B2)	×	2	×	A	EC-251	
		/		-				

#### < ECU DIAGNOSIS INFORMATION >

DT	°C*1	H	ODT			Dormonont	
CONSULT GST* <sup>2</sup>	ECM* <sup>3</sup>	ltems (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group* <sup>4</sup>	Reference page
P0159	0159	HO2S2 (B2)	×	2	×	А	<u>EC-259</u>
P015A	015A	A/F SENSOR1 (B1)	×	2	×	A	EC-266
P015B	015B	A/F SENSOR1 (B1)	×	2	×	A	EC-266
P015C	015C	A/F SENSOR1 (B2)	×	2	×	А	EC-266
P015D	015D	A/F SENSOR1 (B2)	×	2	×	А	EC-266
P0171	0171	FUEL SYS-LEAN-B1	_	2	×	В	EC-272
P0172	0172	FUEL SYS-RICH-B1	_	2	×	В	EC-276
P0174	0174	FUEL SYS-LEAN-B2	_	2	×	В	EC-272
P0175	0175	FUEL SYS-RICH-B2	_	2	×	В	EC-276
P0181	0181	FTT SENSOR	_	2	×	A and B	EC-280
P0182	0182	FTT SEN/CIRCUIT	_	2	×	В	<u>EC-284</u>
P0183	0183	FTT SEN/CIRCUIT	_	2	×	В	<u>EC-284</u>
P0196	0196	EOT SENSOR		2	×	A and B	<u>EC-287</u>
P0197	0197	EOT SEN/CIRC		2	×	В	EC-291
P0198	0198	EOT SEN/CIRC		2	×	В	EC-291
P0222	0222	TP SEN 1/CIRC-B1	_	1	×	В	EC-294
P0223	0223	TP SEN 1/CIRC-B1		1	×	В	EC-294
P0227	0227	TP SEN 2/CIRC-B2	_	1	×	В	EC-224
P0228	0228	TP SEN 2/CIRC-B2		1	×	В	EC-224
P0300	0300	MULTI CYL MISFIRE	_	2	×	В	EC-297
P0301	0301	CYL 1 MISFIRE	_	2	×	В	EC-297
P0302	0302	CYL 2 MISFIRE	_	2	×	В	EC-297
P0303	0303	CYL 3 MISFIRE	_	2	×	В	EC-297
P0304	0304	CYL 4 MISFIRE	_	2	×	В	EC-297
P0305	0305	CYL 5 MISFIRE	_	2	×	В	EC-297
P0306	0306	CYL 6 MISFIRE	_	2	×	В	EC-297
P0327	0327	KNOCK SEN/CIRC-B1	_	2	_	_	EC-303
P0328	0328	KNOCK SEN/CIRC-B1	_	2	_	_	EC-303
P0332	0332	KNOCK SEN/CIRC-B2	_	2	_	_	EC-303
P0333	0333	KNOCK SEN/CIRC-B2	_	2	_	_	EC-303
P0335	0335	CKP SEN/CIRCUIT	_	2	×	В	EC-306
P0340	0340	CMP SEN/CIRC-B1	_	2	×	В	EC-310
P0345	0345	CMP SEN/CIRC-B2	_	2	×	В	EC-310
P0420	0420	TW CATALYST SYS-B1	×	2	×	A	EC-314
P0430	0430	TW CATALYST SYS-B2	×	2	×	A	EC-314
P0441	0441	EVAP PURG FLOW/MON	×	2	×	A	EC-319
P0443	0443	PURG VOLUME CONT/V		2	×	A	EC-324
P0444	0444	PURG VOLUME CONT/V	<u> </u>	2	×	В	EC-329
P0445	0445	PURG VOLUME CONT/V	_	2	×	B	EC-329
P0447	0447	VENT CONTROL VALVE		2	×	B	EC-332
P0448	0448	VENT CONTROL VALVE		2	×	B	EC-336
P0451	0451	EVAP SYS PRES SEN		2	×	A	<u>EC-340</u>
1 0-01	0-101			-	~	~~~	<u></u>

#### < ECU DIAGNOSIS INFORMATION >

DT	<sup>-</sup> C* <sup>1</sup>	14	ODT			Permanent	Deferrere	А
CONSULT GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT screen terms)	SRT code	Trip	MIL	DTC group* <sup>4</sup>	Reference page	A
P0452	0452	EVAP SYS PRES SEN		2	×	В	<u>EC-344</u>	EC
P0453	0453	EVAP SYS PRES SEN		2	×	В	<u>EC-349</u>	
P0456	0456	EVAP VERY SML LEAK	×* <sup>7</sup>	2	×	A	<u>EC-355</u>	
P0460	0460	FUEL LEV SEN SLOSH		2	×	A	EC-361	С
P0461	0461	FUEL LEVEL SENSOR		2	×	В	EC-363	
P0462	0462	FUEL LEVL SEN/CIRC		2	×	В	<u>EC-365</u>	D
P0463	0463	FUEL LEVL SEN/CIRC		2	×	В	EC-365	
P0500	0500	VEH SPEED SEN/CIRC*6	_	2	×	В	<u>EC-368</u>	
P0506	0506	ISC SYSTEM		2	×	В	EC-371	E
P0507	0507	ISC SYSTEM		2	×	В	<u>EC-373</u>	
P050A	050A	COLD START CONTROL		2	×	A	<u>EC-375</u>	F
P050E	050E	COLD START CONTROL		2	×	А	<u>EC-375</u>	
P0524	0524	ENGINE OIL PRESSURE	_	2	×	В	EC-377	
P0550	0550	PW ST P SEN/CIRC	—	2	—	—	EC-380	G
P0555	0555	BRAKE BSTR PRES SEN/ CIRC	_	2	×	В	<u>EC-383</u>	
P0603	0603	ECM BACK UP/CIRCUIT		2	×	В	<u>EC-388</u>	Н
P0605	0605	ECM		1 or 2	$\times$ or —	В	<u>EC-390</u>	
P0607	0607	ECM	_	1 (A/T models) or 2 (M/T models)	× (A/T models) or — (M/T models)	В	<u>EC-392</u>	l
P0643	0643	SENSOR POWER/CIRC		1	×	В	EC-393	
P0705	0705	T/M RANGE SWITCH A		2	×	В	<u>TM-216</u>	
P0710	0710	FLUID TEMP SENSOR A		2	×	В	<u>TM-218</u>	K
P0717	0717	INPUT SPEED SENSOR A		2	×	В	<u>TM-221</u>	
P0720	0720	OUTPUT SPEED SENSOR*6		2	×	В	<u>TM-223</u>	L
P0729	0729	6GR INCORRECT RATIO		2	×	В	<u>TM-227</u>	
P0730	0730	INCORRECT GR RATIO		2	×	В	<u>TM-229</u>	
P0731	0731	1GR INCORRECT RATIO		2	×	В	<u>TM-231</u>	Μ
P0732	0732	2GR INCORRECT RATIO		2	×	В	<u>TM-233</u>	
P0733	0733	3GR INCORRECT RATIO	_	2	×	В	<u>TM-235</u>	Ν
P0734	0734	4GR INCORRECT RATIO	—	2	×	В	<u>TM-237</u>	
P0735	0735	5GR INCORRECT RATIO		2	×	В	<u>TM-239</u>	
P0740	0740	TORQUE CONVERTER		2	×	В	<u>TM-241</u>	0
P0744	0744	TORQUE CONVERTER		2	×	В	<u>TM-243</u>	
P0745	0745	PC SOLENOID A		2	×	В	<u>TM-245</u>	Ρ
P0750	0750	SHIFT SOLENOID A	—	2	×	В	<u>TM-246</u>	
P0775	0775	PC SOLENOID B		2	×	В	<u>TM-247</u>	
P0780	0780	SHIFT	_	1	×	В	<u>TM-248</u>	
P0795	0795	PC SOLENOID C	—	2	×	В	<u>TM-250</u>	
P0820	0820	GEAR LVR POS SEN/CIRC		1	—	—	<u>EC-396</u>	

#### < ECU DIAGNOSIS INFORMATION >

DT	°C*1	li	ODT			Permanent	D (
CONSULT GST* <sup>2</sup>	ECM* <sup>3</sup>	Items (CONSULT screen terms)	SRT code	Trip	MIL	DTC group* <sup>4</sup>	Reference page
P0830	0830	CLUTCH INTLCK SW/CIRC	_	1			EC-401
P0833	0833	CLUTCH P/P SW/CIRC		1	_	_	EC-406
P0850	0850	P-N POS SW/CIRCUIT		2	×	В	<u>EC-411</u>
P100A	100A	VVEL SYSTEM-B1		2	×	В	<u>EC-415</u>
P100B	100B	VVEL SYSTEM-B2	_	2	×	В	<u>EC-415</u>
P1087	1087	VVEL SYSTEM-B1	_	1	×	В	<u>EC-419</u>
P1088	1088	VVEL SYSTEM-B2	_	1	×	В	EC-419
P1089	1089	VVEL POS SEN/CIRC-B1	_	1	×	В	EC-420
P1090	1090	VVEL ACTR MOT-B1		1	×	В	EC-423
P1091	1091	VVEL ACTR MOT PWR		1 or 2	×	В	EC-427
P1092	1092	VVEL POS SEN/CIRC-B2		1	×	В	<u>EC-420</u>
P1093	1093	VVEL ACTR MOT-B2	_	1	×	В	EC-423
P1148	1148	CLOSED LOOP-B1		1	×	А	<u>EC-430</u>
P1168	1168	CLOSED LOOP-B2		1	×	А	<u>EC-430</u>
P1211	1211	TCS C/U FUNCTN	_	2	_		EC-431
P1212	1212	TCS/CIRC	_	2	_	_	EC-432
P1217	1217	ENG OVER TEMP	_	1	×	В	EC-433
P1225	1225	CTP LEARNING-B1	_	2	_		EC-437
P1226	1226	CTP LEARNING-B1		2			EC-439
P1233	1233	ETC FNCTN/CIRC-B2	_	1	×	В	<u>EC-441</u>
P1234	1234	CTP LEARNING-B2	_	2	_	_	EC-437
P1235	1235	CTP LEARNING-B2	_	2	_	_	EC-439
P1236	1236	ETC MOT-B2	_	1	×	В	<u>EC-445</u>
P1238	1238	ETC ACTR-B2	_	1	×	В	<u>EC-447</u>
P1239	1239	TP SENSOR-B2	_	1	×	В	EC-449
P1290	1290	ETC MOT PWR-B2	_	1	×	В	EC-452
P1564	1564	ASCD SW	_	1	_	_	<u>EC-454</u>
P1572	1572	ASCD BRAKE SW		1	_	В	<u>EC-457</u>
P1574	1574	ASCD VHL SPD SEN	_	1			EC-465
P1606	1606	VVEL CONTROL MODULE	_	1 or 2	× or —	В	<u>EC-467</u>
P1607	1607	VVEL CONTROL MODULE		1	×	В	EC-469
P1608	1608	VVEL SENSOR POWER/CIRC		1	×	В	<u>EC-471</u>
P1610	1610	LOCK MODE		2	_	_	<u>SEC-34</u>
P1611	1611	ID DISCARD IMM-ECM		2			<u>SEC-35</u>
P1612	1612	CHAIN OF ECM-IMMU	—	2	_	—	<u>SEC-37</u>
P1614	1614	CHAIN OF IMMU-KEY	_	2	_	—	<u>SEC-38</u>
P1615	1615	DIFFERENCE OF KEY		2		_	<u>SEC-41</u>
P1730	1730	INTERLOCK		2	×	В	TM-255
P1734	1734	7GR INCORRECT RATIO	_	2	×	В	<u>TM-257</u>
P1805	1805	BRAKE SW/CIRCUIT	_	2	—	—	EC-473
P2096	2096	POST CAT FUEL TRIM SYS B1	—	2	×	А	<u>EC-476</u>
P2097	2097	POST CAT FUEL TRIM SYS B1		2	×	А	<u>EC-476</u>

#### < ECU DIAGNOSIS INFORMATION >

#### [VQ37VHR]

DT	C*1	Items	SRT			Permanent	Reference	А
CONSULT GST* <sup>2</sup>	ECM* <sup>3</sup>	(CONSULT screen terms)	code	Trip	MIL	DTC group* <sup>4</sup>	page	~
P2098	2098	POST CAT FUEL TRIM SYS B2		2	×	А	<u>EC-476</u>	EC
P2099	2099	POST CAT FUEL TRIM SYS B2	—	2	×	А	<u>EC-476</u>	
P2100	2100	ETC MOT PWR-B1	—	1	×	В	<u>EC-452</u>	
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	В	<u>EC-441</u>	С
P2103	2103	ETC MOT PWR	_	1	×	В	<u>EC-452</u>	
P2118	2118	ETC MOT-B1	—	1	×	В	<u>EC-445</u>	D
P2119	2119	ETC ACTR-B1	—	1	×	В	<u>EC-447</u>	D
P2122	2122	APP SEN 1/CIRC	—	1	×	В	<u>EC-481</u>	
P2123	2123	APP SEN 1/CIRC	_	1	×	В	<u>EC-481</u>	E
P2127	2127	APP SEN 2/CIRC	—	1	×	В	<u>EC-484</u>	
P2128	2128	APP SEN 2/CIRC	—	1	×	В	<u>EC-484</u>	F
P2132	2132	TP SEN 1/CIRC-B2	_	1	×	В	EC-294	Г
P2133	2133	TP SEN 1/CIRC-B2	—	1	×	В	EC-294	
P2135	2135	TP SENSOR-B1	—	1	×	В	<u>EC-449</u>	G
P2138	2138	APP SENSOR	—	1	×	В	<u>EC-488</u>	
P2713	2713	PC SOLENOID D	_	2	×	В	<u>TM-265</u>	
P2722	2722	PC SOLENOID E	—	2	×	В	<u>TM-266</u>	H
P2731	2731	PC SOLENOID F	_	2	×	В	<u>TM-266</u>	
P2765	2765	INPUT SPEED SEN/CIRC	_	1	—	—	<u>EC-493</u>	
P2807	2807	PC SOLENOID G		2	×	В	<u>TM-268</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-33. "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 flash. For the details, refer to "How to Display SRT Status".

#### Test Value and Test Limit

The following is the information specified in Service \$06 of SAE J1979/ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.

The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

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INFOID:000000011229744

#### < ECU DIAGNOSIS INFORMATION >

Item	OBD- MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display) Unit and TID Scaling ID		Description
			P0131	83H	OBH	Minimum sensor output voltage for test cycle
			P0131	84H	0BH	Maximum sensor output voltage for test cycle
			P0130	85H	0BH	Minimum sensor output voltage for test cycle
			P0130	86H	0BH	Maximum sensor output voltage for test cycle
			P0133	87H	04H	Response rate: Response ratio (lean to rich)
			P0133	88H	04H	Response rate: Response ratio (rich to lean)
			P2A00 or P2096	89H	84H	The amount of shift in air fuel ratio (too lean)
			P2A00 or P2097	8AH	84H	The amount of shift in air fuel ratio (too rich)
			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited frequency
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)

#### < ECU DIAGNOSIS INFORMATION >

	OBD-	_		li	e and Test mit display)		А
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description	EC
			P0138	07H	0CH	Minimum sensor output voltage for test cycle	С
	02H	Heated oxygen sensor 2	P0137	08H	0CH	Maximum sensor output voltage for test cycle	
		(Bank 1)	P0138	80H	0CH	Sensor output voltage	D
			P0139	81H	0CH	Difference in sensor output voltage	-
			P0139	82H	11H	Rear O2 sensor delay response diag- nosis	E
			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	F
			P0146	80H	0CH	Sensor output voltage	-
			P0145	81H	0CH	Difference in sensor output voltage	G
			P0151	83H	0BH	Minimum sensor output voltage for test cycle	-
			P0151	84H	0BH	Maximum sensor output voltage for test cycle	Η
			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)	J
			P0153	88H	04H	Response rate: Response ratio (rich to lean)	K
			P2A03 or P2098	89H	84H	The amount of shift in air fuel ratio (too lean)	-
		Air fuel ratio (A/F) sensor 1	P2A03 or P2099	8AH	84H	The amount of shift in air fuel ratio (too rich)	L
	05H	(Bank 2)	P0150	8BH	0BH	Difference in sensor output voltage	-
			P0153	8CH	83H	Response gain at the limited frequency	M
			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	N
			P014F	8FH	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1	0
			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	P
			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
			P015D	94H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1
	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	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
		Heated oxygen sensor 2	P0157	08H	0CH	Maximum sensor output voltage for test cycle
HO2S	06H	(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
			P0163	07H	0CH	Minimum sensor output voltage for test cycle
	07H	Heated oxygen sensor 3 (Bank2) Three way catalyst function (Bank1)	P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
			P0420	80H	01H	O2 storage index
	21H		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
	22H	Three way catalyst function	P0430	82H	01H	Switching time lag engine exhaust in- dex value
	2211	(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	2411	ECP function	P0400	82H	96H	Low flow faults: Difference between max EGR temp and EGR temp under idling condition
SYSTEM	31H	EGR function	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 >

	OBD-			lii	e and Test mit display)	
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
	35H	VVT Monitor (Bank1)	P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
	0011		P100A	84H	10H	VEL slow response diagnosis
			P1090	85H	10H	VEL servo system diagnosis
			P0011	86H	9DH	VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis)
/VT			Advanced: P052A Retarded: P052B	87H	9DH	VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis)
SYSTEM			P0021	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0024	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
		VVT Monitor (Bank2)	P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
	36H		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 position check diagnosis)
	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down
	3BH	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)
EVAP			P0456	80H	05H	Leak area index (for more than 0.02 inch)
EVAP 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
30	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control valve close

#### < ECU DIAGNOSIS INFORMATION >

				lii	e and Test mit	
Item	OBD-	Self-diagnostic test item	DTC	(GST	display)	Description
	MID		-	TID	Unitand Scaling ID	
	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
			P0030	83H	0BH	A/F sensor heater circuit malfunction
	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
			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
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
	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
	47H	Heated oxygen sensor 3 heat- er (Bank 2)	P0063	80H	0CH	Converted value of heater electric cur- rent to voltage
		Secondary air system	P0411	80H	01H	Secondary air injection system incor- rect flow detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary air injection system insufficient flow
050			P2445	82H	01H	Secondary air injection system pump stuck off
SEC- OND- ARY AIR	71H		P2448	83H	01H	Secondary air injection system high airflow
			Bank1: P2440 Bank2: P2442	84H	01H	Secondary air injection system switch- ing valve stuck open
			P2440	85H	01H	Secondary air injection system switch- ing valve stuck open
			P2444	86H	01H	Secondary air injection system pump stuck on
			P0171 or P0172	80H	2FH	Long term fuel trim
	81H	Fuel injection system function (Bank 1)	P0171 or P0172	81H	24H	The number of lambda control clamped
FUEL			P117A / P219A	82H	03H	Cylinder A/F imbalance monitoring
SYSTEM			P0174 or P0175	80H	2FH	Long term fuel trim
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	81H	24H	The number of lambda control clamped
			P117B / P219B	82H	03H	Cylinder A/F imbalance monitoring

#### < ECU DIAGNOSIS INFORMATION >

#### [VQ37VHR]

				li	e and Test mit		А	
Item	OBD- MID	Self-diagnostic test item	DTC	(GST	display)	Description		
	NILD			TID	Unitand Scaling ID		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	E	
			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	0	
			P0308	87H	24H	Misfiring counter at 1000 revolution of the eighth cylinder	G	
				P0300	88H	24H	Misfiring counter at 1000 revolution of the multiple cylinders	Н
MISFIRE	A1H	Multiple gulipder miefiree	P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder		
MISFIRE	АІП	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	
				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 >

	OBD-			li	e and Test mit display)	Description	
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description	
	A2H	No. 1 cylinder misfire	P0301	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles	
			P0301	0CH	24H	Misfire counts for last/current driving cycles	
	АЗН	No. 2 cylinder misfire	P0302	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	0ВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles	
MISFIRE			P0304	0CH	24H	Misfire counts for last/current driving cycles	
MISTIRE	A6H	No. 5 cylinder misfire	P0305	0ВН	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	0BH	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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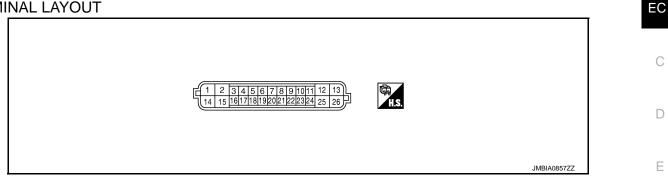
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INFOID:000000010839866

[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 (W)	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 condition • Idle speed	0 - 14 V★ 100µSec/div F SV/div JMBIA0854ZZ
(L/B)	(B/W)	(High lift) (bank 2)	Uutput	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	0 - 14 V★ 100µSec/div = = 5V/div JMBIA0855ZZ
3	4			[Engine is running] • Warm-up condition • Idle speed	Approx.0.25 - 1.40 V
3 (G)	(W)	VVEL control shaft posi- tion sensor 1 (bank 1)	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	Approx.0.25 - 4.75 V
4 (W)	_	Sensor ground [VVEL control shaft posi- tion sensor 1 (bank 1)]	_	_	_

# < ECU DIAGNOSIS INFORMATION >

Termi	nal No.	Description			Value
+		Signal name	Input/ Output	Condition	(Approx.)
5	6	VVEL control shaft posi-		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	Approx.0.25 - 1.40 V
(R)	(B)	tion sensor 1 (bank 2)	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	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 (GR)	_	Engine communication line (ECM)	Input/ Output	_	_
12 (G)	14 (B/W)	VVEL actuator motor (High lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 100µSec/div 
(5)	(0,00)			<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	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		_	-

#### < ECU DIAGNOSIS INFORMATION >

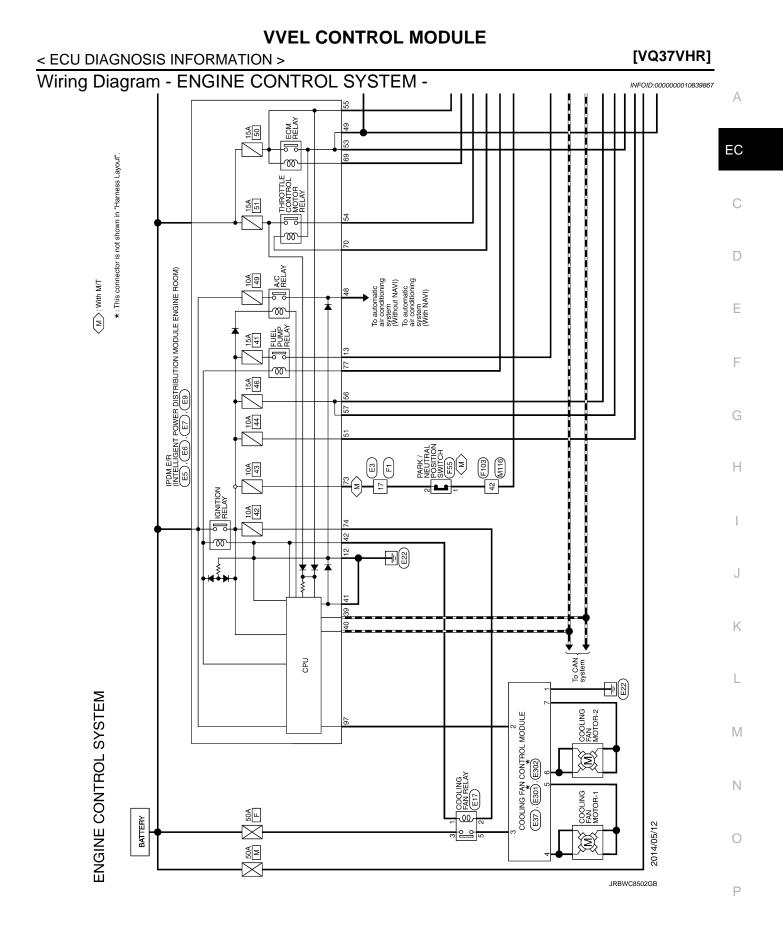
Termi	inal No.	Description			Value	
+		Signal name	Input/ Output	Condition	Value (Approx.)	
15	14	VVEL actuator motor (Low	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 100µSec/div ÷ 5V/div JMBIA0854ZZ	E
(L/Y)	(B/W)	lift) (bank 2)	Uutput	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	0 - 14 V★ 100µSec/div F 5V/div JMBIA0855ZZ	
16	17	VVEL control shaft posi-	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	3.50 - 4.75 V	
(R)	(L)	tion sensor 2 (bank 1)	mput	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	0.25 - 4.75 V	
17 (L)	_	Sensor ground [VVEL control shaft posi- tion sensor 2 (bank 1)]	—	_	_	
18 (G)	19 (W)	VVEL control shaft posi- tion sensor 2 (bank 2)	Input	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>When revving engine up to 2,000</li> </ul>	3.50 - 4.75 ∨ 0.25 - 4.75 ∨	
				rpm quickly		
19 (W)		Sensor ground [VVEL control shaft posi- tion sensor 2 (bank 2)]	_	_	_	
20 (BR)	19 (W)	Sensor power supply [VVEL control shaft posi- tion sensor 2 (bank 2)]	_	[Ignition switch: ON]	5 V	
21 (V)	14 (B/W)	VVEL actuator motor relay abort signal (ECM)	Input	[Engine is running] • Warm-up condition • Idle speed	0 V	
22 (P)	17 (L)	Sensor power supply [VVEL control shaft posi- tion sensor 2 (bank 1)]	_	[Ignition switch: ON]	5 V	
23 (Y)	14 (B/W)	VVEL control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)	
	. /			[Ignition switch: ON]	0 - 1.0 V	
24 (SB)	_	Engine communication line (ECM)	Input/ Output	_	-	

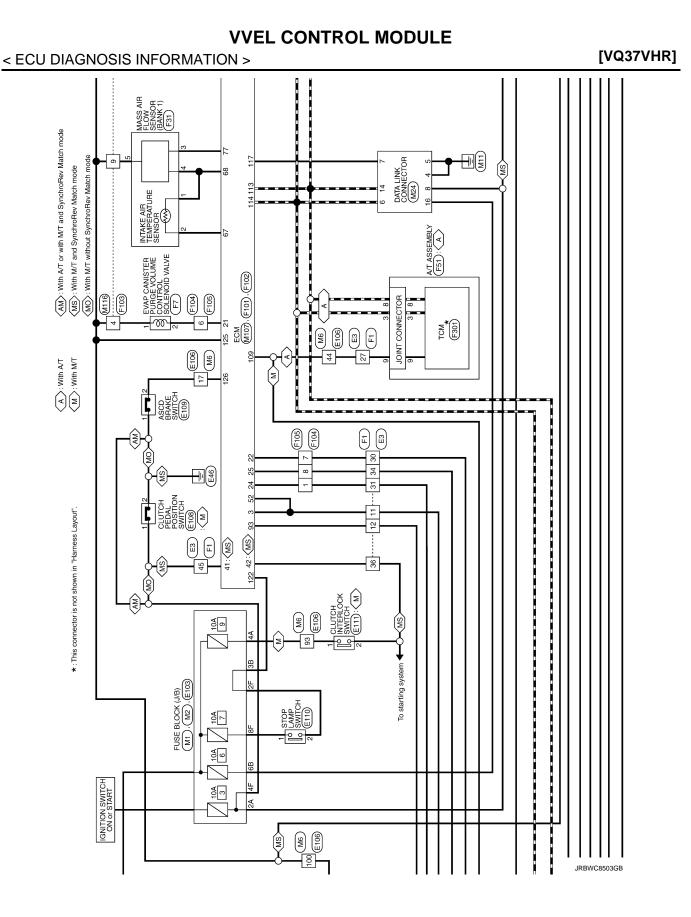
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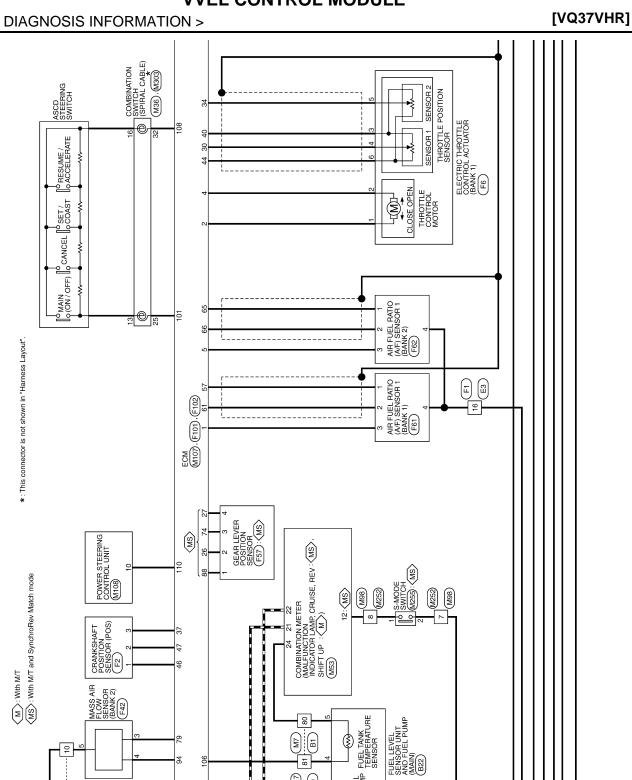
#### [VQ37VHR]

Term	inal No.	Description			Value
+		Signal name	Input/ Output	Condition	(Approx.)
25	14	VVEL control motor (Low	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 - 14 V★ 100µSec/div € 5V/div JMBIA0854ZZ
(BR)	(B/W)	lift) (bank 1)		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>When revving engine up to 2,000 rpm quickly</li></ul>	0 - 14 V★ 100µSec/div ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)







#### < ECU DIAGNOSIS INFORMATION >

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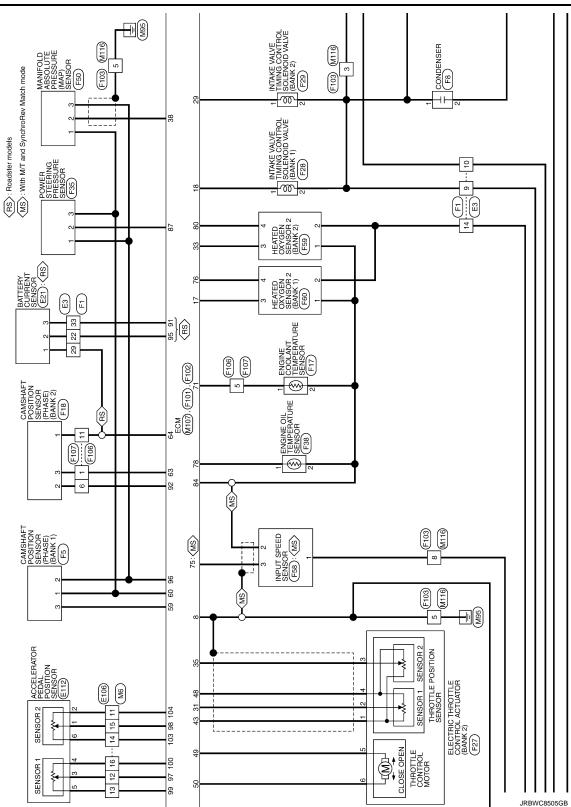
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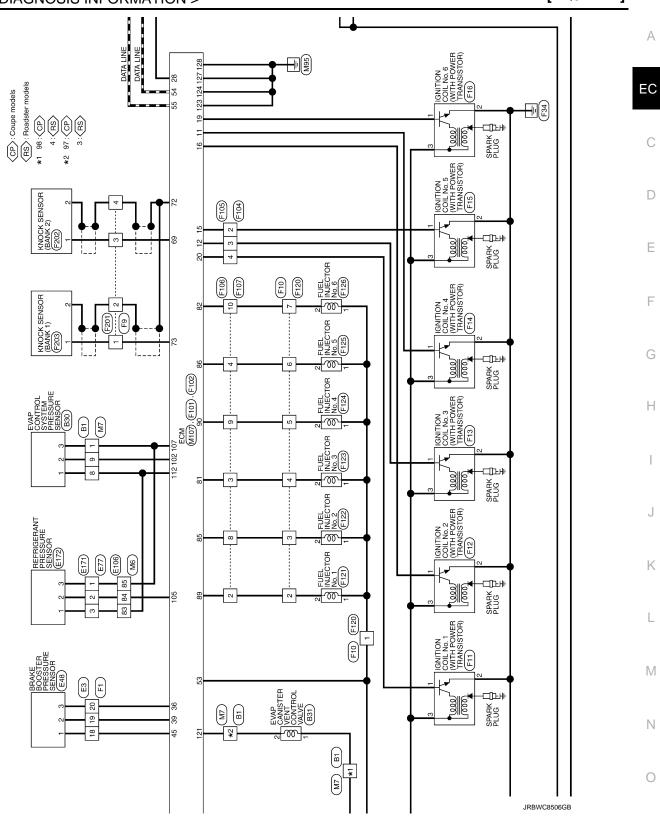
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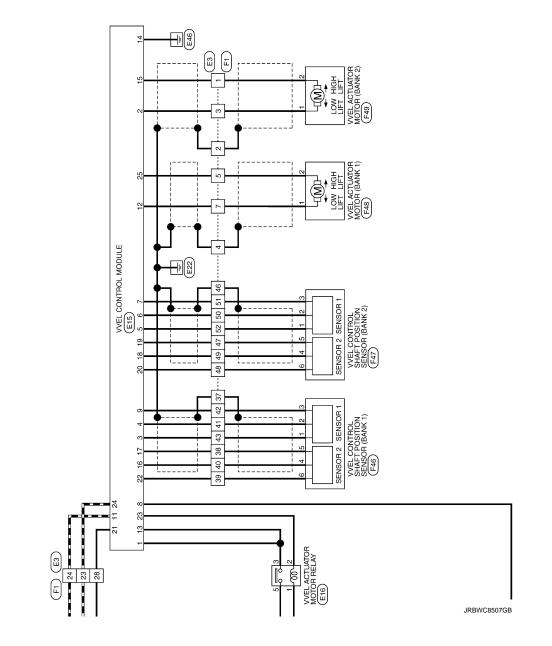
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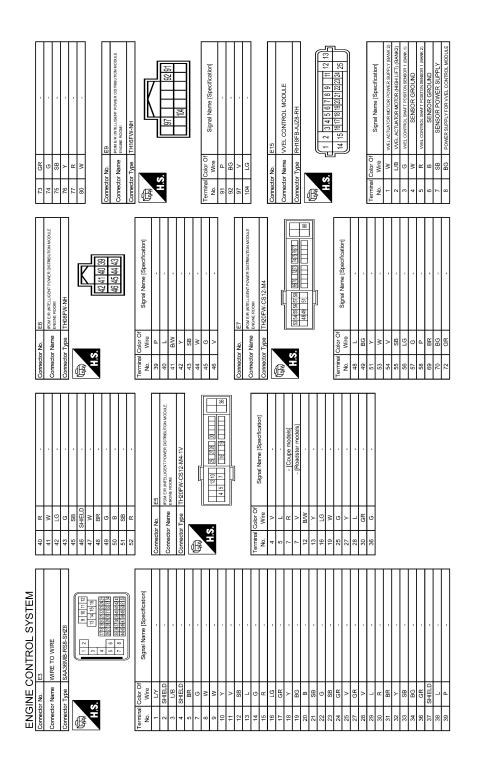
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# **VVEL CONTROL MODULE**

#### < ECU DIAGNOSIS INFORMATION >



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Comrector No. Connector Name Connector Name	D
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E17 COOLING FAN RELAY COOLING FAN RELAY 24347, 9F900 Signal Name [Specification] Signal Name [Specification] Signal Name [Specification]	I
No.         E17           Name         COULN           Name         COULN           Wire         R           Name         E21           Name         E21           Name         E21	J
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# VVEL CONTROL MODULE

#### < ECU DIAGNOSIS INFORMATION >

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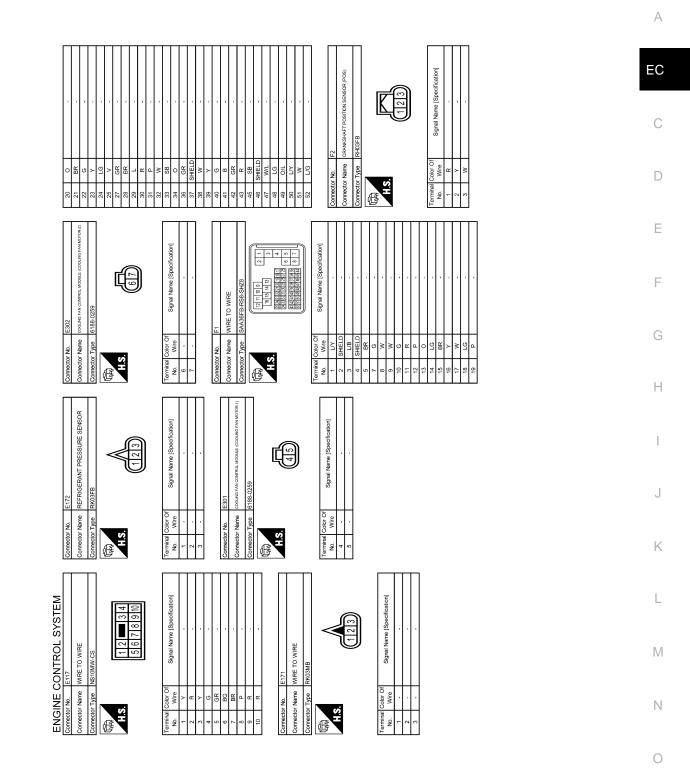
Revision: 2014 September

[VQ37VHR]

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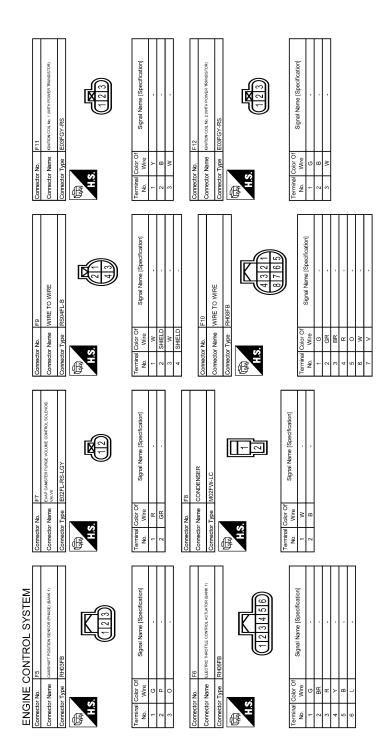
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F27     Let Cime Annual Common Activition Reverses       Let Cime Annual Common Activition Reverses     Signal Name (Specification)       Signal Name (Specification)     Signal Name (Specification)       Signal Name (Specification)     Signal Name (Specification)	С
Connector No.     Connector Name       Connector Name     E       Connector Name     V       S     N       No.     Vire	D
eeffication	E
F17     Exeme coount temperature servore       Exeme coount temperature     Signal Name [Specification]       Signal Name [Specification]     Signal Name [Specification]       Signal Name [Specification]	F
Connector No.     F17       Connector Name     Mone.con.       Connector Name     Mone.con.       Connector Type     E02FO1-KB       Mone.     F17       None.     F18       Connector Name     Mone.       None.     Sign	G
	Н
F15       common cont.lls       common cont.lls       common cont.lls       Signal Name. [Specification]       Signal Name. [Specification]       Signal Name. [Specification]       Signal Name. [Specification]	I
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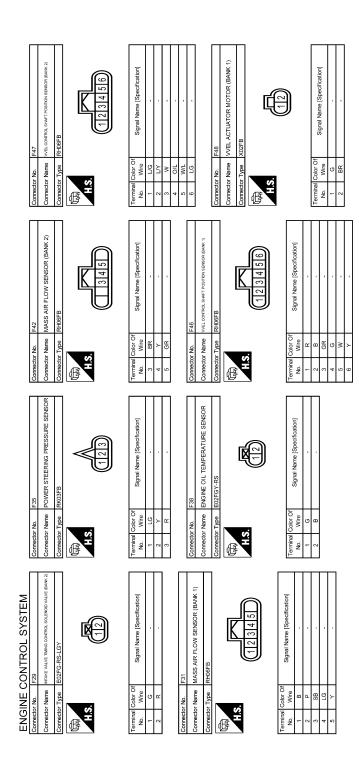
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[VQ37VHR]



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Ensor	E
F57     GEAR LEVER POSITION SENSOR       GEAR LEVER POSITION SENSOR     Bignal Name [Specification]       Signal Name [Specification]     Signal Name [Specification]	F
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F51       AT ASSEMBLY       AT ASSEMBLY       Refere DOI       Signal Name [Specification]	I
12-12-12-12-12-12-12-12-12-12-12-12-12-1	J
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ENGINE CONTROL SYSTEM       Corrector Na.     Fea       Corrector Na.     Fea       Corrector Na.     Signal Name [Specification]	Ν
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# VVEL CONTROL MODULE

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	POWER (		BATT	B SENSOR GROUND POWER SLIPPI Y FOR FCM (BACK-LIP)	╈		SENSOR GROUND		F103	Connector Name WIRE TO WIRE	e TK36FW-NS10				00 20 00 00 20 00 20 10 10 10 10 10 10 10 20 20 20 10 20 20 10 20 20 10 20 20 10 20 20 20 20 20 20 20 20 20 20 20 20 20				r Of re re		-		-				-				'	-	- -		
	++	89 GR 90 O	.,	92 83 93	╞	92 92	Н		Connector No.	Connector Nan	Connector Type		厚	SH					I erminal Color UI Nn Wire		3 W	4	е .	× ×	9 10 GR	19 O	20 Y	28 B	_	30 R		+	45 45	╞	45
SENSOR POWER SUPPLY SENSOR POWER SUPPLY	SENSOR GROUND SENSOR GROUND		F102	ECM	RH40FBR-RZ8-L-LH-Z			96 92 88 84 80 /6 /2 88 64 60 52 95 91 87 79 75 /71 67 63 59 55	74 66 54 50	[ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [		Simal Name [Snacification]		THROTTLE CONTROL MOTOR (CLOSE) (BANK 2)	THROTTLE CONTROL MOTOR (OPEN) (BANK 2)	IGNITION SWITCH	ENGINE COMMUNICATION LINE	ENGINE COMMUNICATION LINE		SENSOR POWER SUPPLY	A/F SENSOR 1 (BANK 1)	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)	SENSOR POWER SUPPLY	A/F SENSOR 1 (BANK 2) A/F SENSOR 1 (BANK 2)	INTAKE AIR TEMPERATURE SENSOR (BANK 1)	SENSOR GROUND	KNOCK SENSOR (BANK 2)	ENGINE C		KNOCK SENSOR (BANK 1)	SENSOR POWER SUPPLY	INPUT SPEED SENSOR	HEATED OXYGEN SENSOR 2 (BANK 1)	FINGINE OIL TEMPERATURE SENSOR	
ی <mark>ا</mark> ر	א ≺		Connector No.	Connector Name	Connector Type			Ś				<u> </u>	Wire	¥9 >	> @	>	>	P		0	æ	_	B S	2 >	• •	g	M	≻	SHIELD	≥		>	> 8	8 C	
45 46	47 48		Connec	Connec	Connec		ſ	-				Terminal	Ź	49	8 8	33	54	55	57	8	61	63	64	60 99	67	68	69	71	72	73	74	75	92	78	2
Connector No. F101 Connector Name ECM		ſ	48 44 40 36 28 24 20 16 12 8 4	4/14/3/3/3/2/12/1/19/15/11 3	45 41 37 33 29 25 21 17 5 1			I Color Of Signal Name [Specification] Wire	O A/F SENSOR 1 HEATER (BANK 1)	G THROTTLE CONTROL MOTOR (OPEN) (BANK 1)	R THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (BANK 1) BR THROTTLE CONTROL MOTOR (CLOSE) (BANK 1)	W A/F SENSOR 1 HEATER (BANK 2)		GR IGNITION SIGNAL NO. 4	V IGNITION SIGNAL NO. 3	G IGNITION SIGNAL NO. 2	P HEATED OXYGEN SENSOR 2 HEATER (BANK 1)	INTAKE VALY	V IGNITION SIGNAL NO. 6 V IGNITION SIGNAL NO. 6	GR EVAP CANISTER PURGE VOLUME CONTROL SOLENOD VIEVE	$\left  \right $	P ECM RELAY (SELF SHUT-OFF)		W GEAR LEVER POSITION SENSOR X-AXIS	Ť	G INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)	Y THROTTLE POSITION SENSOR 1 (BANK 1)	R THROTTLE POSITION SENSOR 1 (BANK 2)	SB HEATED OXYGEN SENSOR 2 HEATER (BANK 2)	1	THROTTLE		W CRANKSHAFT POSITION SENSOR (POS)		t
Connector No.	Connector	E	X					Terminal No.	-	~ ~	0 4	5	∞ :	11	15	16	17	18	19	21	22	24	25	Q7	28	29	30	31	33	8	35	36	37	90 90	3
Connector No. F61 Connector Name JARFUEL RATIO (AFF) SENSOR 1 (BANK 1)	RH04FDGY-P		K		(12161+)	)	-	Terminal Color Of Signal Name [Specification] No. Wire						Connector No. F62	Connector Name AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)	Connector Type RH04FDGY-P				4321				No Mire Signal Name [Specification]	- - -		- M								

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	А
ULECTOR No. 2 ULECTOR No. 2 Supral Name [Specification]	EC
	С
Connector Name Connector Name Connector Name Connector Name FUEL INU Connector FUEL IN CONNECTOR FUEL IN CONNECTOR FUEL IN CONNECTOR FUEL IN CONNECTOR FUEL IN CONNECTOR FUEL IN CONNECTOR FUEL IN CONNE	D
	E
F120       WIRE TO WIRE       HPIOBUIB       Signal Name [Specification]       Signal Name [Specification]	F
Image: Non-Structure     Image: Non-Structure     Image: Non-Structure	G
	Н
O WIRE VAH Sgnal Name [Specification] Sgnal Name [Speci	I
1106 1107 1112FV 11	J
Connector No. Connector Name Connector Name	К
	L
CONTROL SYSTEM         FIG4         WRE TO WRE         WRE TO WRE         THOBPANAH         Signal Name [Specification]         Signal Name [Specification]	$\mathbb{M}$
BIGINE CONTROL SYSTEM       Convector Name       Convector Name       Convector Name       F104       Convector Name       <	Ν
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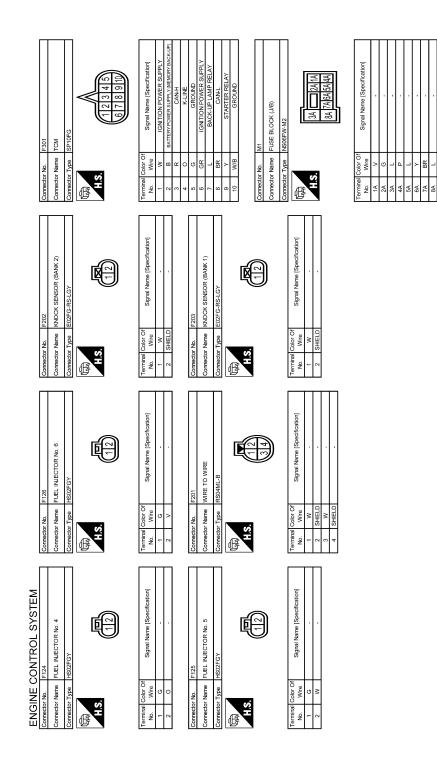
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# **VVEL CONTROL MODULE**

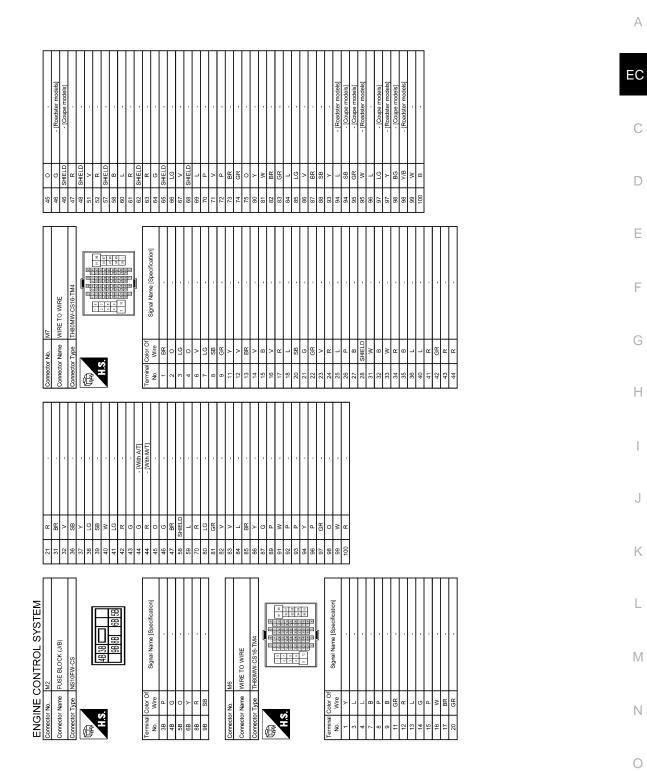
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#### **VVEL CONTROL MODULE** < ECU DIAGNOSIS INFORMATION >

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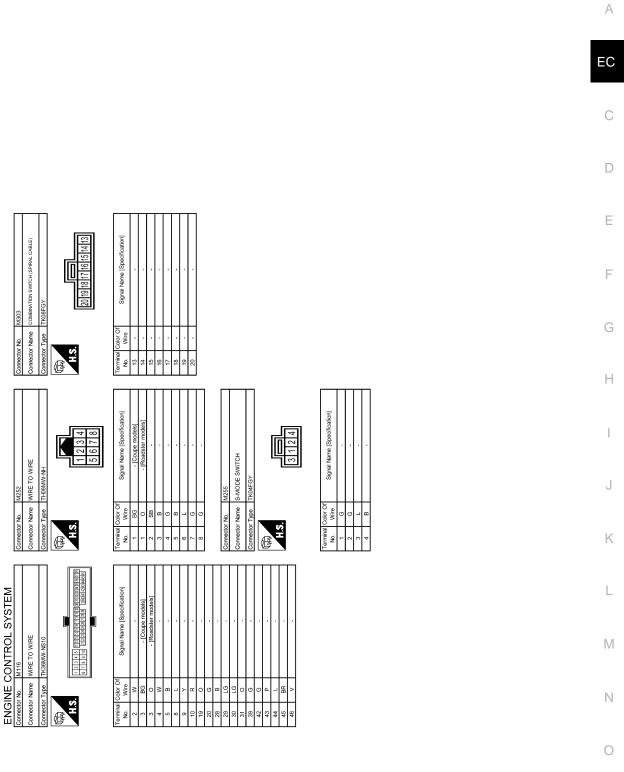
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	ENGINE CONTROL SYSTEM Connector No. [M24	Connector No.	r No. M53		Connector No.	M98	109	υ	PNP SIGNAL	
	Connector Name DATA LINK CONNECTOR	Connecto		VIBINATION METER		WIRE TO WIRE	110	<u>د</u> و	ENGINE SPEED OUTPUT SIGNAL	
		Connecto		4FW-NH		LH08EW-NH	113	ŋ 0	CAN COMMINICATION LINE	
			1		1		114		CAN COMMUNICATION LINE	
		ľ			E	ľ	117	~	DATA LINK CONNECTOR	
		Ň	Ľ		Ě		121	ГG	EVAP CANISTER VENT CONTROL VALVE	
			<u> </u>	456	6 H	1321	122	٩	STOP LAMP SWITCH	
	567		1	10 10 10 10 10 10 10		1 1 7 1	123	m	ECM GROUND	
	- > >			10 11 10 13 70 71 77		7 6	124	m	ECM GROUND	
Span kinnel [sporticului]       Timmel Good       Tim			1				125	œ (	POWER SUPPLY FOR ECM	
			. 0				126	ž	ASCU BRAKE SWITCH	
		l ermina.	Color Of	Signal Name [Specification]		Signal Name [Specification]	127		ECM GROUND	
		ġ.	Wire		+		128	8	ECM GROUND	
	- Coupe n		> (	BALLERY POWER SUPPLY	= (		Т			
	- Koadster		+	IGNITION SIGNAL	+			Γ		
	,	m	+	/EHICLE SPEED SIGNAL (2-PULSE)	+		Connect		M108	
	- -	4		HICLE SPEED SIGNAL (8-PULSE) [For Mexico]			Connect	or Name	POWER STFFRING CONTROL UNIT	
		4	Y	HICLE SPEED SKINAL (8-PULSE) [Except for Mexico]	_					
		5	+	ILLUMINATION CONTROL SIGNAL	6 L		Connect		TH12FW-NH	
		9		ROOF STATUS SIGNAL	7 B		4			
	- [Roadster	6		MMUNICATION SIGNAL (METER->TRIPLE METER)	_		E			
	- Coupe r	10	L	MMUNICATION SIGNAL (TRIPLE METER->METER)				e		
		12	ڻ ن	S-MODE SWITCH SIGNAL			É	å		
	۲ - ۲	15	-	ACC POWER SUPPLY		M107			0 0	
		16	œ	AIR BAG SIGNAL		-CM			8 10	
		17	в	GROUND		- 001				
Constructions sufficiency       Constructions       Constructions <thcon< td=""><td></td><td>18</td><td></td><td>AMBIENT SENSOR SIGNAL</td><td></td><td>RH24FGY-RZ8-R-LH-Z</td><td></td><td></td><td></td><td></td></thcon<>		18		AMBIENT SENSOR SIGNAL		RH24FGY-RZ8-R-LH-Z				
		19		AUTO AMP. CONNECTION RECOGNITION SIGNAL	l		Termina	I Color Of		
	Name COMBINATION SWITCH (SPIRAL CABLE)	20	$\vdash$	AMBIENT SENSOR GROUND	ľ		Ň	Wire	signal Name (specification)	
		21	_	CAN-H			-	ГG	EPS SOL+	
23         B         CROUND           23         B         (1)		22	٩	CANLL	<u>с</u> н	127 123 107 109 99	e	σ	IGN	
24       V       FLELLEVEL SENSOR GROUND       6       8         24       V       FLELLEVEL SENSOR GROUND       6       8         21       V       FLELLEVEL SENSOR GROUND       6       8         21       V       FLELLEVEL SENSOR GROUND       6       8         21       V       R       ACCELERATOR FEEL PROPERTIES       9       1       1         21       R       ACCELERATOR FEEL PROPERTIES       8       1		23	8	GROUND		12	2		EPS SOL-	
24/25/201         91/2013034         91/2013034         101/201303         Signal Name (Specification)         101         102         103         104         105         106         107         108         109         100         101         102         103         104 <tr< td=""><td></td><td>24</td><td>&gt;</td><td>FUEL LEVEL SENSOR GROUND</td><td></td><td>121 117 113 109</td><td>9</td><td>m</td><td>GROUND</td><td></td></tr<>		24	>	FUEL LEVEL SENSOR GROUND		121 117 113 109	9	m	GROUND	
Histolical 2012/3334         Histolical Reminal Propertion         Final Propertion         Control Propertion         Control Propertion           91         2033         Propertion         97         R         Acceleration         97         R         Acceleration         97         R         Acceleration         10							~	-	VEHICI E SPEED (2P)	
31(2)(2)(3)(3)       Terminal Color Of No.     Signal Name [Specification]       9     P     Acceleration Service 1       9     L     Signal Name [Specification]       10     W     Service Reputy 10       11     Signal Name [Specification]       12     Signal Name [Specification]       13     Signal Name [Specification]       14     Acceleration Service 100       15     Exercise Resolve Service 101       16     F     Acceleration Service 101       103     G     Evapor Action Service 101       104     C     Resolve Source Service 105       105     M     Full Final Fisher Service 105       106     M     Full Final Fisher Service 105       107     BR     SERSOR FOWER SUPPLY       108     M     Fisher Service 105       107     BR     SERSOR FOWER SUPPLY       108     M     Fisher Service ROUND	81						Ę	۰ a	ENG TACHO	
Signal Name (Specification)         Signal Name (Specification)           .	8				Torminol Color Of		<u>}</u>	-	E10 120 10	
Signal Mame (Specification) 	3				No Mire	Signal Name [Specification]				
Signal Name [Specification]					╉		1			
Signal Name (Specification)         Secientication           -					+	ACCELERATOR PEDAL POSITION SENSOR	-			
100     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       101     100       102     100	Sinnal Name IS				+	ACCELERATOR PEDAL POSITION SENSOR	77			
·         ·         ·         100         80           ·         ·         ·         101         80           ·         ·         ·         101         80           ·         ·         ·         ·         102         86           ·         ·         ·         ·         103         80           ·         ·         ·         ·         104         6         7           ·         ·         ·         ·         ·         106         8         7           ·         ·         ·         ·         ·         ·         106         8         7           ·         ·         ·         ·         ·         ·         106         8         7           ·         ·         ·         ·         ·         ·         ·         ·         107         98	a1 a				66 L	SENSOR POWER SUPPLY				
101     38       102     38       103     36       104     36       105     47       106     10       107     38	, 					SENSOR GROUND				
.         .	BS				┝	ASCD STEERING SWITCH				
100     100     100     0       110     1     1     1       110     1     1     1       110     1     1     1       110     1     1     1       110     1     1     1       110     1     1     1       110     1     1     1       110     1     1     1	M				╀	SIVES 301 ISS300 WELSAS ID0000 00/10	18			
100 100 100 100 100 100 100 100	-				+					
	-				+	SENSOR POWER SUPPLY	Т			
·	Υ -					SENSOR GROUND				
- 106 W 107 BR 108 Y					105 L	REFRIGERANT PRESSURE SENSOF	ſŕ			
107 E					┝	FUEL TANK TEMPERATURE SENSOL	α.			
5 >					┝		:			
×					+		T			
					108 Y	SENSOR GROUND	7			

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# **VVEL CONTROL MODULE**

#### < ECU DIAGNOSIS INFORMATION >



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#### < SYMPTOM DIAGNOSIS >

[VQ37VHR]

INFOID:000000010839868

# SYMPTOM DIAGNOSIS ENGINE CONTROL SYSTEM SYMPTOMS

# Symptom Table

# SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM														
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page	
Warrant	y symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	<u>EC-511</u>	
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			<u>EC-631</u>	
	Fuel injector circuit	1	1	2	3	2		2	2			2			<u>EC-508</u>	
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			<u>EC-98</u>	
Air	Positive crankcase ventilation sys- tem	3	3	4	4	4	4	4	4	4		4	1		<u>EC-525</u>	
	Incorrect idle speed adjustment							1	1	1	1		1			<u>EC-14</u>
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	<u>EC-441,</u> <u>EC-447</u>	
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			<u>EC-14</u>	
	Ignition circuit	1	1	2	2	2		2	2			2			EC-514	
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			EC-173	
Mass air	r flow sensor circuit	1			2										<u>EC-197,</u> <u>EC-203</u>	
Engine o	coolant temperature sensor circuit						3			3					<u>EC-221,</u> EC-227	
Air fuel r	ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-235, EC-239, EC-242, EC-476	
Throttle position sensor circuit							2			2					<u>EC-224,</u> <u>EC-294,</u> <u>EC-437,</u> <u>EC-439,</u> <u>EC-449</u>	
Accelera	ator pedal position sensor circuit			3	2	1									<u>EC-481,</u> <u>EC-484,</u> <u>EC-488</u>	
Knock s	ensor circuit			2								3			<u>EC-303</u>	

#### < SYMPTOM DIAGNOSIS >

#### [VQ37VHR]

	SYMPTOM										Δ				
	A)				NOI					HIGH					A
	(EXCP. HA)		SPOT		ELERAT					ATURE	NOL	N	RGE)		EC
	ESTART (E		ING/FLAT S	<b>FONATION</b>	OF POWER/POOR ACCELERATION	щ	JNG		I TO IDLE	R TEMPERATURE	CONSUMPTION	CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page	С
	O START/RESTART	STALL	HESITATION/SURGING/FLAT	SPARK KNOCK/DETONATION	F POWER/F	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	DLING VIBRATION	SLOW/NO RETURN TO IDLE	<b>OVERHEATS/WATER</b>	FUEL	OIL	Y DEAD (U		D
	HARD/NO	ENGINE STALL	HESITAT	SPARK M	LACK OF	HIGH IDI	ROUGH	1DLING	SLOW/N	OVERHE	EXCESSIVE	EXCESSIVE	BATTER		Е
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-287,</u> <u>EC-291</u>	F
Crankshaft position sensor (POS) circuit	2	2												<u>EC-306</u>	
Camshaft position sensor (PHASE) circuit	3	2												EC-310	G
Vehicle speed signal circuit		2	3		3						3			EC-368	
Power steering pressure sensor circuit		2					3	3						<u>EC-380</u>	Н
ECM	2	2	3	3	3	3	3	3	3	3	3			<u>EC-388,</u> <u>EC-390</u>	
Intake valve timing control solenoid valve cir- cuit		3	2		1	3	2	2	3		3			<u>EC-194</u>	I
Manifold absolute pressure (MAP) sensor											3			<u>EC-209</u>	
Brake booster pressure sensor											3			EC-383	J
VVEL control module	3		4	4	3									<u>EC-</u> <u>467,EC-</u> <u>469</u>	K
VVEL actuator motor	3		4	4	3									<u>EC-423</u>	
VVEL actuator motor relay	3		4	4	3									<u>EC-427</u>	
VVEL actuator shaft position sensor	3		4	4	3									<u>EC-420</u>	L
PNP signal circuit			3		3		3	3			3			<u>EC-411</u>	
Refrigerant pressure sensor circuit		2				3			3		4			<u>EC-527</u>	M
Electrical load signal circuit							3							<u>EC-506</u>	
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-5	
ABS actuator and electric unit (control unit)			4											<u>BRC-5</u>	Ν
1 - 6. The numbers refer to the order of inspecti	ion														

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

### SYSTEM — ENGINE MECHANICAL & OTHER

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#### < SYMPTOM DIAGNOSIS >

							S	(MPT)	OM								
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page		
Warranty s	ymptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA			
Fuel	Fuel tank	-													<u>FL-12</u>		
	Fuel piping Vapor lock Valve deposit	5		5	5	5		5	5			5	1		<u>FL-4</u>		
			5														
			J														
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_		
Air	Air duct														<u>EM-33</u>		
	Air cleaner														<u>EM-33</u>		
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	_	-	-	5	5		5		5	5			5			<u>EM-33</u>
	Electric throttle control actuator	5			5		5			5					EM-34		
	Air leakage from intake manifold/ Collector/Gasket														<u>EM-38</u>		
Cranking	Battery														<u>PG-106</u>		
	Generator circuit	1	1	1		1		1	1					1	<u>CHG-29,</u> <u>CHG-30</u>		
	Starter circuit	3										1			<u>STR-8</u> (M/ T) <u>STR-10</u> (A/ T)		
	Signal plate	6													<u>EM-128</u>		
	PNP signal circuit	4													<u>TM-18,</u> TM-216		
Engine	Cylinder head	5	5	5	5	5		5	5			5			<u>EM-114</u>		
	Cylinder head gasket	5	5	5	5	5			5		4	5	3				
	Cylinder block																
	Piston												4				
	Piston ring	6	6	6	6	6		6	6			6			<u>EM-128</u>		
	Connecting rod	5	0	0	0	0			0			0			<u></u>		
	Bearing																
	Crankshaft																

#### < SYMPTOM DIAGNOSIS >

#### [VQ37VHR]

							S١	/MPT	ОМ							0
		(EXCP. HA)		SPOT		LERATION					ATURE HIGH	NOI	z	(GE)		A EC
		START/RESTART (E)		HESITATION/SURGING/FLAT S	SPARK KNOCK/DETONATION	POWER/POOR ACCELERATION	W IDLE	HUNTING	TION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page	С
		HARD/NO ST/	ENGINE STALL	HESITATION/9	SPARK KNOC	LACK OF POV	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RE	OVERHEATS/	EXCESSIVE F	EXCESSIVE O	BATTERY DE/		E
Warranty s	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		_
Valve	Timing chain														<u>EM-70</u>	F
mecha- nism	Camshaft														<u>EM-101</u>	
	Intake valve timing control	5	5	5	5	5		5	5			5		-	<u>EM-70</u>	G
	Intake valve												3		<u>EM-114</u>	
	Exhaust valve															
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			<u>EX-4, EX-6</u>	Η
	Three way catalyst															
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			<u>LU-10, LU-</u> <u>13, LU-14</u>	I
	Oil level (Low)/Filthy oil														<u>LU-7</u>	
Cooling	Radiator/Hose/Radiator filler cap														<u>CO-15,</u> <u>CO-15</u>	J
	Thermostat									5	-				<u>CO-28</u>	K
	Water pump	5	5	F	5	5		5	F		4	F			<u>CO-26</u>	N
	Water gallery	Э	Э	5	Э	Э		Э	5		4	5			<u>CO-30</u>	
	Cooling fan														<u>CO-23</u>	L
	Coolant level (Low)/Contaminat- ed coolant									5					<u>CO-11</u>	
NVIS (NIS NATS)	SAN Vehicle Immobilizer System —	1	1												SEC-5	M

1 - 6: The numbers refer to the order of inspection.

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< SYMPTOM DIAGNOSIS >

# NORMAL OPERATING CONDITION

# Description

#### FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 1,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 1,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. However, if the engine speed is above 4,000 rpm, fuel will be cut off in a few seconds. Fuel cut will be operated until the engine speed reaches 1,000 rpm, then fuel cut will be cancelled. **NOTE:** 

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, <u>EC-49.</u> <u>"System Description"</u>.

#### TORQUE CUT CONTROL (AT HIGH ENGINE OIL TEMPERATURE)

ECM receives engine oil temperature signal from engine oil temperature sensor.

To avoid VVEL performance, ECM performs the engine torque cut control at high engine oil temperature. If engine oil temperature is too high, engine oil viscosity will change. As a result, engine oil pressure is decreased. This control is to control the VVEL operating angle by operating the VVEL actuator sub assembly. If this control is operated, engine performance will decrease, then maximum engine speed is reduced a little, for example.

#### NOTE:

If the engine oil temperature sensor is deteriorated, its characteristic will change.

In this case, the operating temperature for engine torque cut control might be decrease.

Perform Component Inspection of the engine oil temperature sensor to check for the deterioration. Refer to EC-290, "Component Inspection".

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# < PRECAUTION > PRECAUTION PRECAUTIONS EXCEPT FOR MEXICO

EXCEPT FOR MEXICO : Precautions 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
   H 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.

**EXCEPT FOR MEXICO : Precaution for Battery Service** 

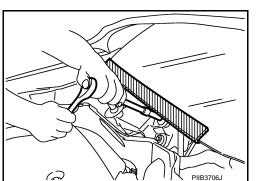
Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

EXCEPT FOR MEXICO : Precaution for Procedure without Cowl Top Cover

INFOID:000000010839872

INFOID:000000010839871

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



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< PRECAUTION >

# EXCEPT FOR MEXICO : 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.).

### EXCEPT FOR MEXICO : Precautions for Removing Battery Terminal

 When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
 NOTE:

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

• For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch. **NOTE:** 

If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
 NOTE:

The removal of 12V battery may cause a DTC detection error.

EXCEPT FOR MEXICO : On Board Diagnostic (OBD) System of Engine and A/T

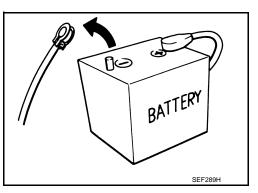
INFOID:000000010839874

INFOID:0000000011229742

The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

#### **CAUTION:**

- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to <u>PG-94, "Description"</u>.
- 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.



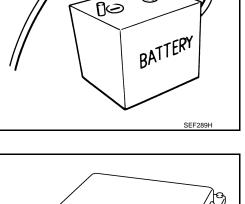
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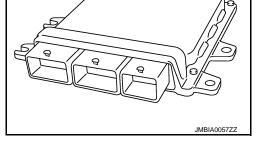
# EXCEPT FOR MEXICO : General Precautions

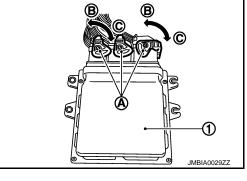
- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage 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.

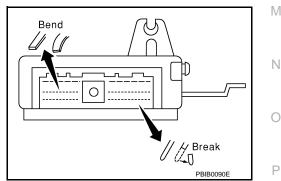
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.

- 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.

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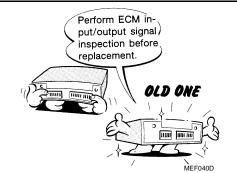
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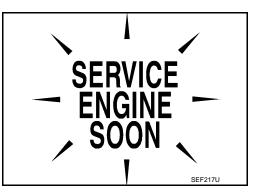
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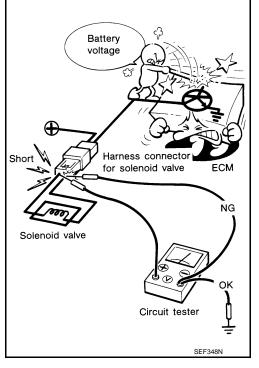
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to <u>EC-534</u>, "Reference Value".
- Handle mass air flow sensor carefully to avoid damage.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).
- 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.







- B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.
- Never operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

Never depress accelerator pedal when starting.

• Never rev up engine just prior to shutdown.

• When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.

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.

# FOR MEXICO

< PRECAUTION >

#### FOR MEXICO : Precaution for Supplemental Restraint System (SRS) "AIR BAG" and L "SEAT BELT PRE-TENSIONER" INFOID:000000010839876

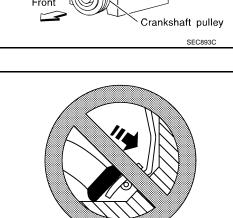
The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along M with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual. Ν

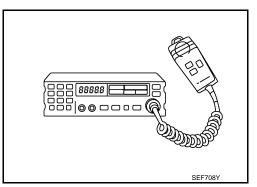
#### WARNING:

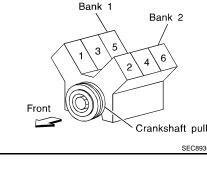
Always observe the following items for preventing accidental activation.

- 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 P 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.

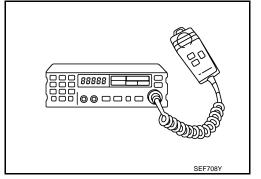
PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS WARNING:







Cylinder number and Bank layout



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#### < PRECAUTION >

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.

# FOR MEXICO : Precaution for Battery Service

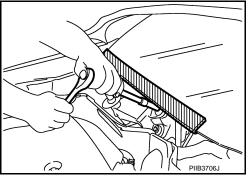
INFOID:000000010839877

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

# FOR MEXICO : Precaution for Procedure without Cowl Top Cover

INFOID:000000010839878

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



FOR MEXICO : Precautions For Xenon Headlamp Service

INFOID:000000010839879

#### 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.).

#### < PRECAUTION >

# FOR MEXICO : Precautions for Removing Battery Terminal

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• When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.

#### NOTE:

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

• For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch. **NOTE:** 

If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
 NOTE:

The removal of 12V battery may cause a DTC detection error.

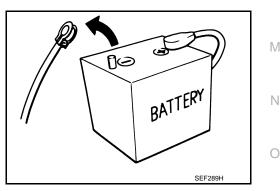
FOR MEXICO : On Board Diagnostic (OBD) System of Engine and A/T

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.

- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to <u>PG-94, "Description"</u>.
- 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.

# FOR MEXICO : 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.



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BATTERY BATTERY SEF289H

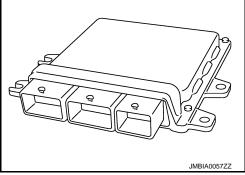
#### < PRECAUTION >

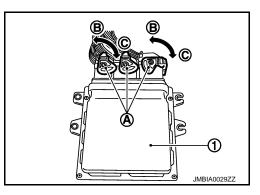
- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.

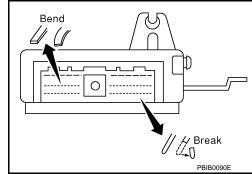
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.

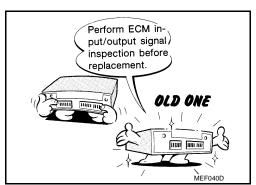
- If the battery is disconnected, the following emission-related diagnostic information will be cleared within 24 hours.
- Diagnostic trouble codes
  1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.
  - 1. ECM
  - C. Loosen

- 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>, "<u>Reference Value</u>".
- Handle mass air flow sensor carefully to avoid damage.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).











#### < PRECAUTION >

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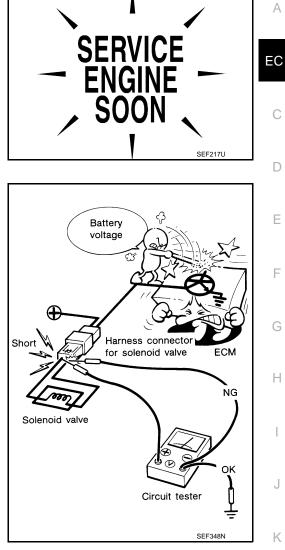
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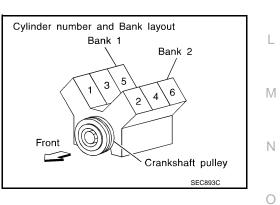
• After performing each TROUBLE DIAGNOSIS, perform DTC **Confirmation Procedure or Component Function Check.** The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.



 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.

- B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.
- Never operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



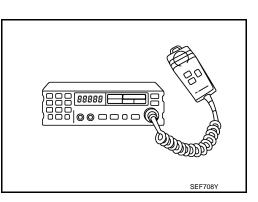
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#### < PRECAUTION >

- Never depress accelerator pedal when starting.
- Immediately after starting, never rev up engine unnecessarily.
- Never rev up engine just prior to shutdown.

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- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
- Keep the antenna as far as possible from the electronic control units.
- Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.
- Never let them run parallel for a long distance.
- Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
- Be sure to ground the radio to vehicle body.



# PREPARATION

# < PREPARATION > PREPARATION PREPARATION

# Special Service Tools

#### NOTE:

The actual shapes of Tech Mate tools may differ from those of special service tools illustrated here.

Tool number (Tech Mate No.) Tool name		Description
(J-44321) Fuel pressure gauge kit	LEC642	Checks fuel pressure
ommercial Service	e Tools	INFOID:000000010839883
Tool name (Tech Mate No.)		Description
Leak detector i.e.: (J-41416)		Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBD)	S-NT703	Applies positive pressure through EVAP service port
Fuel filler cap adapter	S-NT704	Checks fuel tank vacuum relief valve opening
i.e.: (MLR-8382)		pressure
Socket wrench	S-NT815 19 mm (0.75 in) 10 re than 10 re than 12 mm 12 mm 12 mm 12 mm 12 mm 12 mm 12 mm 13 mm 13 mm	Removes and installs engine coolant temperature sensor

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# PREPARATION

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Tool name (Tech Mate 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 <sup>TM</sup> 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

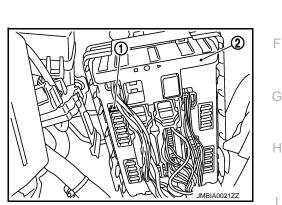
# FUEL PRESSURE RELEASE

(P) With CONSULT

- 1. Turn ignition switch ON.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.

**Without CONSULT** 

- 1. Remove fuel pump fuse (1) located in IPDM E/R (2).
- Start engine.
- 3. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- 5. Reinstall fuel pump fuse after servicing fuel system.



# FUEL PRESSURE CHECK

#### CAUTION:

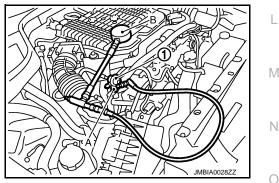
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger. NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because Z34 models do not have fuel return system.
- Use Fuel Pressure Gauge Kit (J-44321) to check fuel pressure.
- Release fuel pressure to zero. 1
- Install the inline fuel quick disconnected fitting (A) between fuel 2. 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.
- Start engine and check for fuel leakage. 5.
- 6. Read the indication of fuel pressure gauge.

### At idling : Approximately 350 kPa (3.57 kg/cm<sup>2</sup>, 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

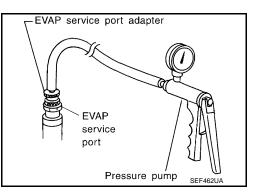
# Inspection

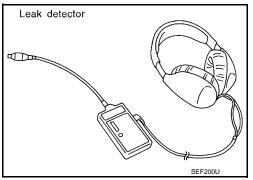
#### **CAUTION:**

- Do not use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in EVAP system.
- NOTE:
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

#### WITH CONSULT

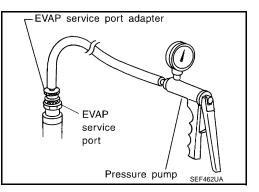
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- 3. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
- 4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 5. 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-98, "System</u> <u>Diagram"</u>.





### **WITHOUT CONSULT**

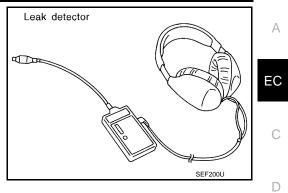
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
- To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm<sup>2</sup>, 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-98, "System</u> <u>Diagram"</u>.



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# SERVICE DATA AND SPECIFICATIONS (SDS)

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# SERVICE DATA AND SPECIFICATIONS (SDS) SERVICE DATA AND SPECIFICATIONS (SDS)

# Idle Speed

INFOID:000000010839886

[VQ37VHR]

Transmission	Condition	Specification
A/T	No load* (in P or N position)	650 ± 50 rpm
M/T	No load* (in Neutral position)	650 ± 50 rpm

\*: Under the following conditions

• A/C switch: OFF

• Electric load: OFF (Lights, heater fan & rear window defogger)

• Steering wheel: Kept in straight-ahead position

# **Ignition Timing**

INFOID:000000010839887

Transmission	Condition	Specification
A/T	No load* (in P or N position)	$10\pm5^\circ$ BTDC
M/T	No load* (in Neutral position)	$10\pm5^\circ$ BTDC

\*: Under the following conditions

• A/C switch: OFF

• Electric load: OFF (Lights, heater fan & rear window defogger)

• Steering wheel: Kept in straight-ahead position

# Calculated Load Value

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Condition	Specification (Using CONSULT or GST)
At idle	5 – 35 %
At 2,500 rpm	5 – 35 %

# Mass Air Flow Sensor

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.7 – 1.2 V*
Mass air flow (Using CONSULT or GST)	2.0 – 6.0 g/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.