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0

## **CONTENTS**

VQ37VHR	ACCELERATOR PEDAL RELEASED POSITION LEARNING20
BASIC INSPECTION9	ACCELERATOR PEDAL RELEASED POSITION
DIACNOSIS AND DEDAID WORKELOW	LEARNING : Description20
DIAGNOSIS AND REPAIR WORKFLOW 9	ACCELERATOR PEDAL RELEASED POSITION
Work Flow9 Diagnostic Work Sheet12	LEARNING: Special Repair Requirement20
•	THROTTLE VALVE CLOSED POSITION LEARN-
INSPECTION AND ADJUSTMENT14	ING20
BASIC INSPECTION14	THROTTLE VALVE CLOSED POSITION
BASIC INSPECTION : Special Repair Require-	LEARNING: Description20
ment14	THROTTLE VALVE CLOSED POSITION
110110	LEARNING : Special Repair Requirement20
ADDITIONAL SERVICE WHEN REPLACING	IDLE AIR VOLUME LEARNING21
CONTROL UNIT (ECM)17	IDLE AIR VOLUME LEARNING : Description21
ADDITIONAL SERVICE WHEN REPLACING	IDLE AIR VOLUME LEARNING : Special Repair
CONTROL UNIT (ECM) : Description17	Requirement21
ADDITIONAL SERVICE WHEN REPLACING	·
CONTROL UNIT (ECM): Special Repair Require-	VVEL CONTROL SHAFT POSITION SENSOR AD-
ment17	JUSTMENT22
ADDITIONAL SERVICE WHEN REPLACING	VVEL CONTROL SHAFT POSITION SENSOR
CONTROL UNIT (VVEL CONTROL MODULE)18	ADJUSTMENT : Description23
ADDITIONAL SERVICE WHEN REPLACING	VVEL CONTROL SHAFT POSITION SENSOR
CONTROL UNIT (VVEL CONTROL MODULE):	ADJUSTMENT : Special Repair Requirement23
Description18	MIXTURE RATIO SELF-LEARNING VALUE
ADDITIONAL SERVICE WHEN REPLACING	CLEAR24
CONTROL UNIT (VVEL CONTROL MODULE):	MIXTURE RATIO SELF-LEARNING VALUE
Special Repair Requirement18	CLEAR: Description24
·	MIXTURE RATIO SELF-LEARNING VALUE
IDLE SPEED19	CLEAR : Special Repair Requirement24
IDLE SPEED : Description19	OLEAN . Special Repair Requirement24
IDLE SPEED: Special Repair Requirement19	HOW TO SET SRT CODE26
IONITION TIMING	Description26
IGNITION TIMING	SRT Set Driving Pattern27
IGNITION TIMING: Description19	Work Procedure29
IGNITION TIMING : Special Repair Requirement19	
VIN REGISTRATION19	HOW TO ERASE PERMANENT DTC32
VIN REGISTRATION : Description19	Description32
VIN REGISTRATION : Special Repair Require-	Work Procedure (Group A)33
•	Work Procedure (Group R) 35

SYSTEM DESCRIPTION	38	System Diagram	
		System Description	126
ENGINE CONTROL SYSTEM		Component Parts Location	127
System Diagram		Component Description	134
System Description		ON DOADD DIA ONOCTIO (ODD) OVCTEM	
Component Parts Location		ON BOARD DIAGNOSTIC (OBD) SYSTEM.	
Component Description	46	Diagnosis Description	135
MULTIPORT FUEL INJECTION SYSTEM	1 40	GST (Generic Scan Tool)	135
		DIAGNOSIS SYSTEM (ECM)	126
System Diagram		DIAGNOGIO GTOTEM (LOM)	130
System Description		DIAGNOSIS DESCRIPTION	136
Component Parts Location		DIAGNOSIS DESCRIPTION: 1st Trip Detection	
Component Description	58	Logic and Two Trip Detection Logic	136
<b>ELECTRIC IGNITION SYSTEM</b>	59	DIAGNOSIS DESCRIPTION: DTC and Freeze	
System Diagram		Frame Data	136
System Description		DIAGNOSIS DESCRIPTION : Counter System	137
Component Parts Location		DIAGNOSIS DESCRIPTION: Driving Pattern	140
Component Description		DIAGNOSIS DESCRIPTION: System Readiness	
·		Test (SRT) Code	
AIR CONDITIONING CUT CONTROL	68	DIAGNOSIS DESCRIPTION : Malfunction Indica	<b>1</b> -
System Diagram		tor Lamp (MIL)	
System Description		On Board Diagnosis Function	
Component Parts Location		CONSULT Function	146
Component Description	76	DTC/CIDCUIT DIA CNOCIC	
AUTOMATIC SPEED CONTROL DEVICE	<u> </u>	DTC/CIRCUIT DIAGNOSIS	156
		TROUBLE DIAGNOSIS - SPECIFICATION	
(ASCD)		VALUE	156
System Diagram		Description	
System Description		Component Function Check	
Component Parts Location		Diagnosis Procedure	
Component Description	86	-	
CAN COMMUNICATION	87	POWER SUPPLY AND GROUND CIRCUIT.	164
System Description		Diagnosis Procedure	164
·		DOWED OUDDLY AND ODOUND OUDDLY	
COOLING FAN CONTROL		POWER SUPPLY AND GROUND CIRCUIT	
System Diagram		(VVEL CONTROL MODULE)	
System Description		Diagnosis Procedure	167
Component Parts Location		U0101 CAN COMM CIRCUIT	160
Component Description	96	Description	
EVAPORATIVE EMISSION SYSTEM	07	DTC Logic	
		Diagnosis Procedure	
System Diagram System Description		Diagnosis i rocedure	103
Component Parts Location		U1001 CAN COMM CIRCUIT	170
Component Description		Description	170
Component Description	107	DTC Logic	
<b>FUEL FILLER CAP WARNING SYSTEM</b>	108	Diagnosis Procedure	
System Diagram	108		
System Description		U1003 CAN COMM CIRCUIT	
Component Parts Location		Description	
Component Description		DTC Logic	
·		Diagnosis Procedure	171
INTAKE VALVE TIMING CONTROL		U1024 CAN COMM CIRCUIT	470
System Diagram			
System Description		Description	
Component Parts Location		DTC Logic	
Component Description	125	Diagnosis Procedure	1/3
VVEL SYSTEM	406	P0011, P0021 IVT CONTROL	175
V V LL 3131 LIVI	120	DTC Logic	

Diagnosis Procedure17	
Component Inspection17	P0117, P0118 ECT SENSOR213
P0031, P0032, P0051, P0052 A/F SENSOR 1	Description213
HEATER17	DTC Logic 213
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	
Component inspection10	Description216
P0037, P0038, P0057, P0058 HO2S2 HEAT-	DTC Logic216
ER18	2 Diagnosis Procedure217
Description	2 Component Inspection218
DTC Logic18	Special Repair Requirement218
Diagnosis Procedure18	BOARE FOT SENSOR
Component Inspection18	P0125 ECT SENSOR220
	Description
P0075, P0081 IVT CONTROL SOLENOID	DTC Logic220
VALVE18	O (   (
Description18	
DTC Logic18	
Diagnosis Procedure18	Description 223
Component Inspection18	6 DTC Logic223
DOIGH DOIGH MAE SENSOD	
P0101, P010B MAF SENSOR18	
Description	0
DTC Logic18 Diagnosis Procedure18	
	_ DTC Logic225
Component Inspection19	Diagnosis Procedure226
P0102, P0103, P010C, P010D MAF SENSOR.19	Component Inspection226
Description19	4
DTC Logic19	PU130, PU130 A/F SENSOR 1228
Diagnosis Procedure19	5 Description228
Component Inspection19	E DTC LOGIC228
	Component Function Check230
P010A MANIFOLD ABSOLUTE PRESSURE	Diagnosis Procedure230
SENSOR20	
Description20	Description232
DTC Logic20	O DTC Logic 232
Diagnosis Procedure20	U Diagnosis Procedure 233
Component Inspection20	I .
P0111 IAT SENSOR20	P0132, P0152 A/F SENSOR 1235
Description	Description235
DTC Logic	
Component Function Check	
Diagnosis Procedure	
Component Inspection	,
Component inspection20	
P0112, P0113 IAT SENSOR20	7 DTC Logic
Description20	Component Function Check239
DTC Logic20	Diagnosis Frocedure240
Diagnosis Procedure20	
Component Inspection20	
	Description 244
P0116 ECT SENSOR21	O DTC Logic 244
Description21	O Component Function Check 246
DTC Logic21	O Diagnosis Procedure 247
Component Function Check21	1 Component Inspection 249
Diagnosis Procedure21	2

P0139, P0159 HO2S2252	Description	
Description252	DTC Logic	
DTC Logic252	Diagnosis Procedure	
Component Function Check254	Component Inspection	298
Diagnosis Procedure255	DOSSE CKD SENSOD (DOS)	200
Component Inspection256	P0335 CKP SENSOR (POS)	
D044C D044D D044E D044E D04EA	Description	
P014C, P014D, P014E, P014F, P015A,	DTC Logic	
P015B, P015C, P015D A/F SENSOR 1 259	Diagnosis Procedure  Component Inspection	
DTC Logic	Component inspection	303
Diagnosis Procedure261	P0340, P0345 CMP SENSOR (PHASE)	304
P0171, P0174 FUEL INJECTION SYSTEM	Description	
FUNCTION 265	DTC Logic	
DTC Logic	Diagnosis Procedure	
Diagnosis Procedure266	Component Inspection	
Diagnosio i rosocaro200		
P0172, P0175 FUEL INJECTION SYSTEM	P0420, P0430 THREE WAY CATALYST	
FUNCTION 269	FUNCTION	
DTC Logic269	DTC Logic	
Diagnosis Procedure270	Component Function Check	
	Diagnosis Procedure	310
P0181 FTT SENSOR273	DO444 EVAD CONTDOL SYSTEM	242
Description273	P0441 EVAP CONTROL SYSTEM	
DTC Logic273	DTC Logic	
Component Function Check275	Component Function Check	
Diagnosis Procedure275	Diagnosis Procedure	315
Component Inspection276	P0443 EVAP CANISTER PURGE VOLUME	
P0182, P0183 FTT SENSOR277	CONTROL SOLENOID VALVE	318
	Description	
Description	DTC Logic	
DTC Logic	Diagnosis Procedure	
Diagnosis Procedure	Component Inspection	
Component Inspection279		02 1
P0196 EOT SENSOR280	P0444, P0445 EVAP CANISTER PURGE	
Description280	VOLUME CONTROL SOLENOID VALVE	323
DTC Logic280	Description	323
Component Function Check282	DTC Logic	323
Diagnosis Procedure283	Diagnosis Procedure	323
Component Inspection283	Component Inspection	325
D0407 D0400 FOT OFNOOD	DOA47 EVAD CANISTED VENT CONTROL	
P0197, P0198 EOT SENSOR284	P0447 EVAP CANISTER VENT CONTROL	
Description284	VALVE	
DTC Logic284	Description	
Diagnosis Procedure	DTC Logic	
Component Inspection285	Diagnosis Procedure	
P0222, P0223, P2132, P2133 TP SENSOR 287	Component Inspection	328
Description287	P0448 EVAP CANISTER VENT CONTROL	
DTC Logic287	VALVE	330
Diagnosis Procedure288	Description	
Component Inspection289	DTC Logic	
Special Repair Requirement289	Diagnosis Procedure	
oposiai respair respairement209	Component Inspection	
P0300, P0301, P0302, P0303, P0304, P0305,	Component inspection	JJZ
P0306 MISFIRE291	P0451 EVAP CONTROL SYSTEM PRES-	
DTC Logic291	SURE SENSOR	334
Diagnosis Procedure292	Description	
•	DTC Logic	
D0327 D0328 D0332 D0333 KS 207	<b>5</b>	

Component Inspection ......371

Component Inspection33	7 P0550 PSP SENSOR372
P0452 EVAP CONTROL SYSTEM PRES-	Description
SURE SENSOR33	B DTC Logic 372
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection342	
·	SOR375
P0453 EVAP CONTROL SYSTEM PRES-	Description375
SURE SENSOR34	375 DTC Logic375
Description34	
DTC Logic	Component Inspection378
Diagnosis Procedure344	POCCO FOM POWER CURRLY
Component Inspection34	P0603 ECM POWER SUPPLY380
DOLLES EVAD CONTROL OVOTEN	Description380
P0456 EVAP CONTROL SYSTEM34	D: 1 D 1
DTC Logic34	- I
Diagnosis Procedure	DUCUE FLAM 202
Component Inspection354	Description
P0460 FUEL LEVEL SENSOR35	
Description	
DTC Logic35	
Diagnosis Procedure	
Diagnosis i 1000dare	Description384
P0461 FUEL LEVEL SENSOR35	7 DTC Logic384
Description35	7 Diagnosis Procedure384
DTC Logic	
Component Function Check35	7 PU643 SENSOR POWER SUPPLY385
Diagnosis Procedure358	385 DTC Logic385
DO 100 DO 100 FUEL LEVEL OF NOOD	Diagnosis Procedure385
P0462, P0463 FUEL LEVEL SENSOR359	
Description	Description 200
DTC Logic	DTC Lorio
Diagnosis Procedure359	Component Function Check389
P0500 VSS36	
Description36	1
DTC Logic	DIANA DIAND WELL EVETEM 101
Diagnosis Procedure36	1 DTC Logic391
•	Diagnosis Procedure391
P0506 ISC SYSTEM36	Component inspection (V VEL ACTUATOR MO-
Description363	3 TOR)393
DTC Logic363	
Diagnosis Procedure363	
P0507 ISC SYSTEM36	Special Repair Requirement394
Description	
•	
DTC Logic369 Diagnosis Procedure369	•
Diagnosis Procedure	P1089, P1092 VVEL CONTROL SHAFT PO-
P050A, P050E COLD START CONTROL36	
Description	
DTC Logic36	·
Diagnosis Procedure36	
•	Special Repair Requirement
P0524 ENGINE OIL PRESSURE369	
DTC Logic369	
Diagnosis Procedure370	Description400

DTC Logic	•
Diagnosis Procedure	400 TROL ACTUATOR425
Component Inspection (VVEL ACTUATOR MO-	Description425
TOR)	402 DTC Logic 425
Component Inspection (VVEL ACTUATOR SUB	Diagnosis Procedure426
ASSEMBLY)	Special Repair Requirement426
Special Repair Requirement	403
P1091 VVEL ACTUATOR MOTOR RELAY	P1239, P2135 TP SENSOR427
	200011ptio11
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	Special Repair Requirement
P1148, P1168 CLOSED LOOP CONTROL 4  DTC Logic	· · · · · · · · · · · · · · · · · · ·
DTO Logio	
P1211 TCS CONTROL UNIT4	Description
Description	430 DTC Logic 430
DTC Logic	I Hannoele Procedille 1131
Diagnosis Procedure	
Blagitodo i robodaro illinininininininininininininininininin	
P1212 TCS COMMUNICATION LINE 4	Description
Description	409 DTC Logic
DTC Logic	Jiagnosis Procedure 432
Diagnosis Procedure	
-	D1551 D1552 DATTEDY CHIDDENT SEN
P1217 ENGINE OVER TEMPERATURE 4	410
DTC Logic	SOR435
Component Function Check	Description
Diagnosis Procedure	435
	Diagnosis Procedure 435
P1225, P1234 TP SENSOR	
Description	
DTC Logic	414 December 100
Diagnosis Procedure	414 DTC Logio
Special Repair Requirement	
D4000 D4005 TD 05N00D	Diagnosis Procedure
P1226, P1235 TP SENSOR	
Description	
DTC Logic	416 December
Diagnosis Procedure	PTC Logic
Special Repair Requirement	
04000 00404 EL EOTDIO TUDOTTI E OON	Component Function Check
P1233, P2101 ELECTRIC THROTTLE CON-	Diagnosis Procedure
TROL FUNCTION	
Description	P1564 ASCD STEERING SWITCH445
DTC Logic	418 Description 446
Diagnosis Procedure	418 DTC Logic
Component Inspection	<i>1</i> 171
Special Repair Requirement	Diagnosis Procedure
	Component Inspection447
P1236, P2118 THROTTLE CONTROL MO-	P1564 ICC STEERING SWITCH448
TOR	422 Description 448
Description	422 DTC Logic 448
DTC Logic	422 Diagnosis Procedure
Diagnosis Procedure	
Component Inspection	
Special Repair Requirement	
. , ,	DTC Logic45
	Diagnosis Procedure45
	Diagnosis i Tocedule45

P1572 ASCD BRAKE SWITCH	452	Diagnosis Procedure	488	
Description	452	Component Inspection	490	
DTC Logic		Special Repair Requirement	491	
Diagnosis Procedure				
Component Inspection (ASCD Brake Switch)		P2138 APP SENSOR		E
Component Inspection (Stop Lamp Switch)		Description		
Component inoposition (Gtop Lamp Gwiton)	100	DTC Logic	492	
P1572 ICC BRAKE SWITCH	457	Diagnosis Procedure	493	
Description		Component Inspection		
DTC Logic		Special Repair Requirement		
Diagnosis Procedure				
Component Inspection (ICC Brake Switch)		ASCD BRAKE SWITCH	497	
Component Inspection (Stop Lamp Switch)		Description	497	
Component Inspection (ICC Brake Hold Relay)		Component Function Check	497	
Component inspection (ICC Brake Hold Relay)	403	Diagnosis Procedure		
P1574 ASCD VEHICLE SPEED SENSOR	464	Component Inspection (ASCD Brake Switch)		
Description		compension inspection (1002 Branc Cinterly in		
•		ASCD INDICATOR	500	
DTC Logic		Description		
Diagnosis Procedure	404	Component Function Check		
P1574 ICC VEHICLE SPEED SENSOR	466	Diagnosis Procedure		
Description		g		
DTC Logic		COOLING FAN	501	
•		Description	501	
Diagnosis Procedure	466	Component Function Check		
P1606 VVEL CONTROL MODULE	468	Diagnosis Procedure		
Description		Component Inspection (Cooling Fan Motor)		
•		Component Inspection (Cooling Fan Relay)		
DTC Logic		Component inspection (Cooling Fair Kelay)	504	
Diagnosis Procedure	468	ELECTRICAL LOAD SIGNAL	505	
P1607 VVEL CONTROL MODULE	470	Description		
Description		Component Function Check		
•		Diagnosis Procedure		
DTC Logic		Diagnosis i rocedure	505	
Diagnosis Procedure	470	FUEL INJECTOR	507	
P1608 VVEL SENSOR POWER SUPPLY	472	Description	507	
DTC Logic		Component Function Check		
Diagnosis Procedure		Diagnosis Procedure		
Special Repair Requirement		Component Inspection		
Special Repair Requirement	4/3	Component inspection	509	
P1805 BRAKE SWITCH	475	FUEL PUMP	510	
Description		Description		
DTC Logic		Component Function Check		
Diagnosis Procedure		Diagnosis Procedure		
		Component Inspection		
Component Inspection (Stop Lamp Switch)	4/6	Oumponent inspection	012	
P2096, P2097, P2098, P2099 A/F SENSOR	1.478	ICC BRAKE SWITCH	513	
Description		Description		
DTC Logic		Component Function Check		
		Diagnosis Procedure		
Diagnosis Procedure	4/9	Component Inspection (ICC Brake Switch)		
P2122, P2123 APP SENSOR	483	Component inspection (ICC brake Switch)	315	
Description		IGNITION SIGNAL	517	
·		Description		
DTC Logic		Component Function Check		
Diagnosis Procedure				
Component Inspection		Diagnosis Procedure		
Special Repair Requirement	486	Component Inspection (Ignition Coil with Power		
D2127 D2120 ADD SENSOD	407	Transistor)		
P2127, P2128 APP SENSOR		Component Inspection (Condenser)	521	
Description		MALEUNCTION INDICATOR LAMP	EOO	
DTC Logic	487	MALFUNCTION INDICATOR LAMP	522	

Description522	2 ENGINE CONTROL SYSTEM SYMPTOMS619
Component Function Check522	
Diagnosis Procedure522	
ON BOARD REFUELING VAROR RECOV	NORMAL OPERATING CONDITION623
ON BOARD REFUELING VAPOR RECOV-	Description623
ERY (ORVR) 523	
Description523	,
Component Function Check523	
Diagnosis Procedure523	Drescution for Cumplemental Postraint System
Component Inspection520	(SRS) "AIR BAG" and "SEAT BELT PRE-TEN-
POSITIVE CRANKCASE VENTILATION 528	,
Description528	
Component Inspection	
Component inspection	On Board Diagnostic (OBD) System of Engine
REFRIGERANT PRESSURE SENSOR 530	on 2001 2 Juginous (022) 0 Juginous 2 Linguis 625
Description530	***************************************
Component Function Check530	)
Diagnosis Procedure530	
SNOW MODE SWITCH533	_
Description53	·
Component Function Check	
Diagnosis Procedure53	
Component Inspection534	•
ECU DIAGNOSIS INFORMATION539	5 FUEL PRESSURE631
	Inspection 631
ECM 53	
Reference Value538	) In an anti-su
Wiring Diagram - ENGINE CONTROL SYSTEM553	
Fail safe575	SERVILE DATA AND SEELIEILATIONS
DTC Inspection Priority Chart577	(SDS)
DTC Index579	
Test Value and Test Limit584	SERVICE DATA AND SPECIFICATIONS
VVEL CONTROL MODULE592	
Reference Value	<del>-</del>
Wiring Diagram - ENGINE CONTROL SYSTEM596	Calculated Load Value634
SYMPTOM DIAGNOSIS619	

< BASIC INSPECTION > [VQ37VHR]

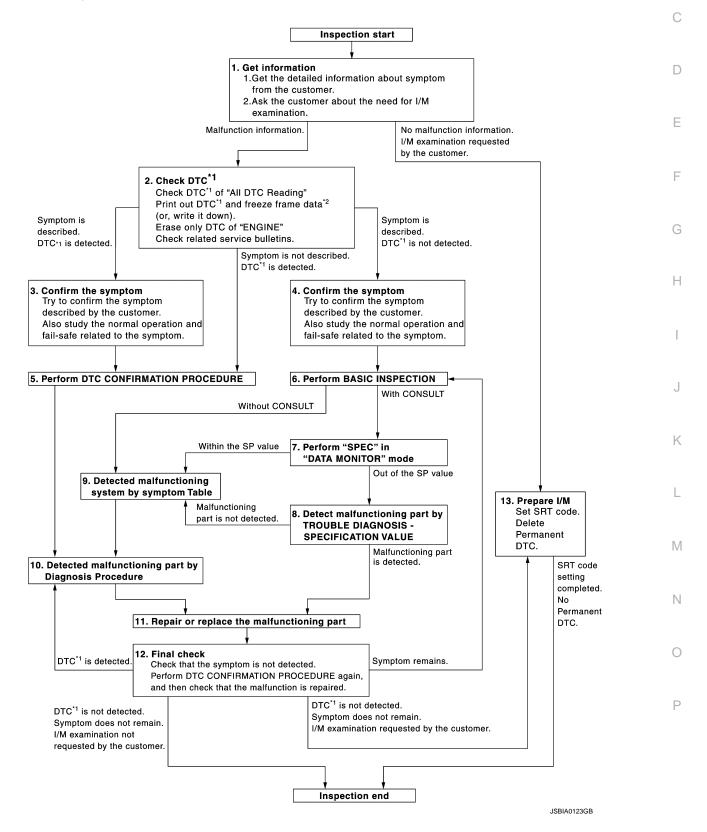
## **BASIC INSPECTION**

### DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

Α

**OVERALL SEQUENCE** 



\*1: Include 1st trip DTC.

< BASIC INSPECTION >

\*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.
- 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 <u>EC-143</u>, "On <u>Board Diagnosis Function"</u> or <u>EC-146</u>, "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-619</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-623, "Description"</u> and <u>EC-575, "Fail safe"</u>.

Diagnosis Work Sheet is useful to verify the incident.

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

>> GO TO 5.

### 4. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Also study the normal operation and fail-safe related to the symptom. Refer to <u>EC-623</u>, "<u>Description</u>" and <u>EC-575</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.

### PERFORM DTC CONFIRMATION PROCEDURE

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

If two or more DTCs are detected, refer to EC-577, "DTC Inspection Priority Chart" and determine trouble diagnosis order.

#### NOTE:

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.

If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIR-MATION PROCEDURE.

#### Is DTC detected?

#### DIAGNOSIS AND REPAIR WORKFLOW

[VQ37VHR] < BASIC INSPECTION > YES >> GO TO 10. NO >> Check according to GI-42, "Intermittent Incident". Α 6. PERFORM BASIC INSPECTION Perform EC-14, "BASIC INSPECTION: Special Repair Requirement". EC Do you have CONSULT? YES >> GO TO 7. NO >> GO TO 9. 7.PERFORM SPEC IN DATA MONITOR MODE (P)With CONSULT Make sure that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA-B1" and "A/F ALPHA-D B2" are within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode. Refer to EC-156, "Component Function Check". Is the measurement value within the SP value? Е YES >> GO TO 9. NO >> GO TO 8. F  $oldsymbol{oldsymbol{\delta}}.\mathsf{DETECT}$  MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE Detect malfunctioning part according to EC-157, "Diagnosis Procedure". Is a malfunctioning part detected? YES >> GO TO 11. NO >> GO TO 9. 9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE Н Detect malfunctioning system according to EC-619, "Symptom Table" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptoms. >> GO TO 10. 10.DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE Inspect according to Diagnosis Procedure of the system. NOTE: The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to GI-45, "Circuit Inspection". Is a malfunctioning part detected? L YES >> GO TO 11. >> Monitor input data from related sensors or check voltage of related ECM terminals using CON-NO SULT. Refer to EC-535, "Reference Value". M 11. REPAIR OR REPLACE THE MALFUNCTIONING PART Repair or replace the malfunctioning part. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replace-2. ment. Check DTC. If DTC is displayed, erase it. Refer to EC-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function". >> GO TO 12. 12.FINAL CHECK Р When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been completely repaired. When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected. Is DTC detected and does symptom remain?

Revision: 2013 March EC-11 2014 QX50

YES-1 >> DTC is detected: GO TO 10. YES-2 >> Symptom remains: GO TO 6.

#### DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION > [VQ37VHR]

NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). Refer to EC-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function".

NO-2 >> I/M examination, requested from the customer: GO TO 13.

### 13. PREPARE FOR I/M EXAMINATION

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

>> INSPECTION END.

### Diagnostic Work Sheet

INFOID:0000000009063853

#### **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.

#### **KEY POINTS**

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

SEF907L

### **DIAGNOSIS AND REPAIR WORKFLOW**

### < BASIC INSPECTION >

[VQ37VHR]

### **WORKSHEET SAMPLE**

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

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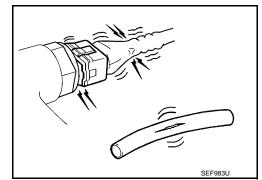
# INSPECTION AND ADJUSTMENT BASIC INSPECTION

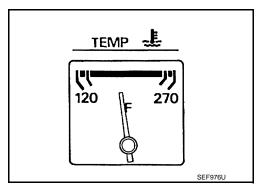
### BASIC INSPECTION: Special Repair Requirement

#### INFOID:00000000009063854

### 1. INSPECTION START

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

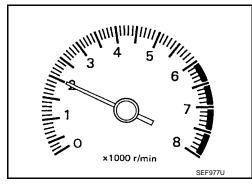




- 5. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 6. Make sure that no DTC is displayed with CONSULT or GST.

#### Are any DTCs detected?

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



### 2. REPAIR OR REPLACE

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

>> GO TO 3

### 3. CHECK IDLE SPEED

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

[VQ37VHR] < BASIC INSPECTION >

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

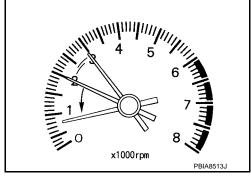
Check idle speed.

For procedure, refer to EC-19, "IDLE SPEED: Special Repair Requirement".

For specification, refer to EC-634, "Idle Speed".

#### Is the inspection result normal?

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



### f 4.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- 2. Perform EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 5.

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

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

>> GO TO 6.

#### O.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 7.

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

#### 7. CHECK IDLE SPEED AGAIN

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

For procedure, refer to EC-19, "IDLE SPEED: Special Repair Requirement".

For specification, refer to EC-634, "Idle Speed".

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 8.

### 8.DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to <u>EC-307, "Component Inspection"</u>.
- Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-303, "Component Inspection"</u>.

#### Is the inspection result normal?

YES >> GO TO 9.

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

### 9. CHECK ECM FUNCTION

- Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
- 2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to EC-17. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement".

>> GO TO 4.

### 10. CHECK IGNITION TIMING

Run engine at idle.

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**EC-15** 

Revision: 2013 March

[VQ37VHR] < BASIC INSPECTION >

Check ignition timing with a timing light.

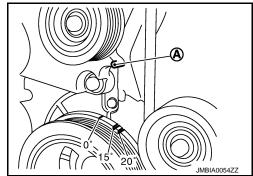
A :Timing indicator

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

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

- 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

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

For procedure, refer to EC-19, "IDLE SPEED: Special Repair Requirement".

For specification, refer to EC-634, "Idle Speed".

#### Is the inspection result normal?

>> GO TO 15. YES

NO >> GO TO 17.

## 15. CHECK IGNITION TIMING AGAIN

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

A :Timing indicator

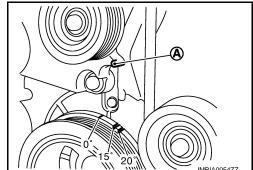
For procedure, refer to EC-19, "IGNITION TIMING: Special Repair Requirement".

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-50, "Removal and Installation".

#### Is the inspection result normal?

YES >> GO TO 17.

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

INSPECTION AND ADJUSTMENT [VQ37VHR] < BASIC INSPECTION > 17. DETECT MALFUNCTIONING PART Α Check the following. Check camshaft position sensor (PHASE) and circuit. Refer to EC-307, "Component Inspection". • Check crankshaft position sensor (POS) and circuit. Refer to EC-303, "Component Inspection". EC Is the inspection result normal? YES >> GO TO 18. >> Repair or replace. Then GO TO 4. NO 18. CHECK ECM FUNCTION Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.) D Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement". Е >> 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". >> INSPECTION END ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) Н ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Description When replacing ECM, the following procedure must be performed. (For details, refer to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement.) PROGRAMMING OPERATION NOTE: After replacing with a blank ECM, programming is required to write ECM information. Be sure to follow the procedure to perform the programming. ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement INFOID:0000000009063856 1.CHECK ECM PART NUMBER Check ECM part number to see whether it is blank ECM or not. NOTE: Part number of blank ECM is 23703 - xxxxx. Check the part number when ordering ECM or with the one included in the label on the container box. Is the ECM a blank ECM? N

YES >> GO TO 2.

NO >> GO TO 4.

#### 2.SAVE ECM PART NUMBER

Read out the part number from the old ECM and save the number, following the programming instructions. Refer to "CONSULT Operation Manual".

#### NOTE:

- The ECM part number is saved in CONSULT.
- Even when ECM part number is not saved in CONSULT, go to 3.

>> GO TO 3.

### $oldsymbol{3}.$ PERFORM ECM PROGRAMMING

**EC-17** Revision: 2013 March 2014 QX50

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< BASIC INSPECTION > [VQ37VHR]

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

During programming, maintain the following conditions:

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

>> GO TO 5.

### 4. REPLACE ECM

Replace ECM.

>> GO TO 5.

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

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

>> GO TO 6.

### 6. PERFORM VIN REGISTRATION

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

>> GO TO 7.

### 7.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

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

>> GO TO 8.

### 8.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

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

>> GO TO 9.

### 9. PERFORM IDLE AIR VOLUME LEARNING

Perform idle air volume learning. Refer to <u>EC-21</u>, "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

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

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL

1. PERFORM IDLE AIR VOLUME LEARNING

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

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>> END

IDLE SPEED

INFOID:00000000009063859

IDLE SPEED: Description

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

IDLE SPEED : Special Repair Requirement

INFOID:00000000009063860

### 1. CHECK IDLE SPEED

(P)With CONSULT

Check idle speed in "DATA MONITOR" mode with CONSULT.

∰With GST

Check idle speed with Service \$01 of GST.

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>> INSPECTION END

IGNITION TIMING

**IGNITION TIMING: Description** 

ructions in "PASIC

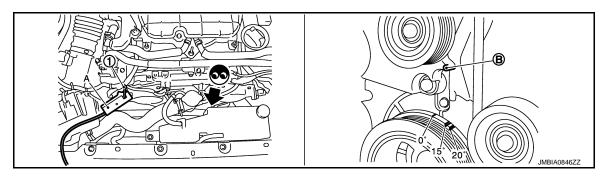
This describes how to check the ignition timing. For the actual procedure, follow the instructions in "BASIC INSPECTION".

IGNITION TIMING: Special Repair Requirement

INFOID:0000000009063862

### 1. CHECK IGNITION TIMING

Attach timing light to loop wire as shown.



- 1. Loop wire
- A. Timing light

- B. Timing indicator
- Check ignition timing.

>> INSPECTION END

VIN REGISTRATION

VIN REGISTRATION : Description

INFOID:0000000009063863

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

Revision: 2013 March **EC-19** 2014 QX50

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< BASIC INSPECTION > [VQ37VHR]

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

### VIN REGISTRATION: Special Repair Requirement

INFOID:0000000009063864

#### 1.CHECK VIN

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

>> GO TO 2.

### 2. PERFORM VIN REGISTRATION

#### (P)With CONSULT

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

>> END

### ACCELERATOR PEDAL RELEASED POSITION LEARNING

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

# ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement

### 1.START

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

>> END

### THROTTLE VALVE CLOSED POSITION LEARNING

### THROTTLE VALVE CLOSED POSITION LEARNING: Description

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:0000000009063868

INFOID:00000000009063867

### 1.START

#### (P) WITH CONSULT

- Turn ignition switch ON.
- Select "CLSD THL POS LEARN" in "WORK SUPPORT" mode.
- Follow the instructions on the CONSULT display.
- Turn ignition switch OFF and wait at least 10 seconds.
   Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

#### **(X)** WITHOUT CONSULT

1. Start the engine.

#### NOTE:

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

Revision: 2013 March **EC-20** 2014 QX50

[VQ37VHR] < BASIC INSPECTION > Warm up the engine. NOTE: Α Raise engine coolant temperature until it reaches 65°C (149°F) or more. 3. Turn ignition switch OFF and wait at least 10 seconds. Check that throttle valve moves during the above 10 seconds by confirming the operating sound. EC >> END IDLE AIR VOLUME LEARNING IDLE AIR VOLUME LEARNING: Description INFOID:0000000009063869 Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within D the specific range. It must be performed under the following conditions: Each time electric throttle control actuator or ECM is replaced. Each time VVEL actuator sub assembly or VVEL control module is replaced. Е Idle speed or ignition timing is out of specification. IDLE AIR VOLUME LEARNING: Special Repair Requirement INFOID:0000000009063870 1.PRECONDITIONING Make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment. Battery voltage: More than 12.9 V (At idle) Engine coolant temperature: 70 - 105°C (158 - 221°F) Selector lever: P or N Н Electric load switch: OFF (Air conditioner, headlamp, rear window defogger) On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not be illuminated. Steering wheel: Neutral (Straight-ahead position) Vehicle speed: Stopped Transmission: Warmed-up - With CONSULT: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V. - Without CONSULT: Drive vehicle for 10 minutes. Do you have CONSULT? YES >> GO TO 2. NO >> GO TO 3. 2.PERFORM IDLE AIR VOLUME LEARNING (P)With CONSULT M Perform Accelerator Pedal Released Position Learning, Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement". 2. Perform Throttle Valve Closed Position Learning, EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement". N Start engine and warm it up to normal operating temperature. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode. Touch "START" and wait 20 seconds. Is "CMPLT" displayed on CONSULT screen? YES >> GO TO 4. NO >> GO TO 5. 3.PERFORM IDLE AIR VOLUME LEARNING

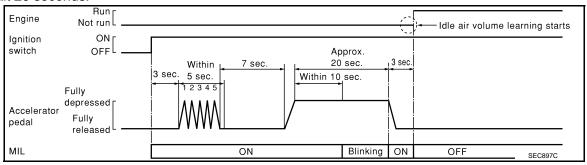
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#### NOTE:

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

**EC-21** Revision: 2013 March 2014 QX50 < BASIC INSPECTION > [VQ37VHR]

- Perform Accelerator Pedal Released Position Learning. Refer to <u>EC-20</u>. "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".
- 2. Perform Throttle Valve Closed Position Learning. <u>EC-20</u>, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 6. Repeat the following procedure quickly five times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- 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 EC-634, "Idle Speed" and EC-634, "Ignition Timing".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

### 5.DETECT MALFUNCTIONING PART-I

#### Check the following

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

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace malfunctioning part.

#### 6.DETECT MALFUNCTIONING PART-II

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

It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to EC-156, "Description".

If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:

- Engine stalls.
- Erroneous idle.

#### >> INSPECTION END

#### VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

[VQ37VHR] < BASIC INSPECTION >

### VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT: Description

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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 INFOID:0000000009063872

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

#### (P) With CONSULT

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

Voltage : 500 ± 48 mV

Tighten the VVEL control shaft position sensor mounting bolt.

: 7.0 N•m (0.71 kg-m, 62 in-lb) (0)

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

> Voltage : 500  $\pm$  48 mV

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

>> INSPECTION END

### 3.perform vvel control shaft position sensor adjustment

#### Without CONSULT

- 1. Disconnect VVEL control shaft position sensor harness connector.
- 2. Remove VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".
- Turn ignition switch ON, wait at least 5 seconds and then turn OFF.

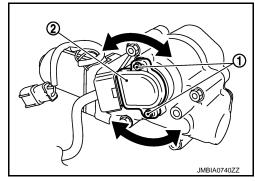
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< BASIC INSPECTION > [VQ37VHR]

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



	VVEL control module			
Bank	Connector	+	_	Voltage
Dalik	Connector	Terminal	Terminal	
1	E14	3	4	500 ± 48 mV
2	C14	5	6	300 ± 46 IIIV

Tighten the VVEL control shaft position sensor mounting bolt.

: 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
Dank	Connector	Terminal	Terminal	
1	E14	3	4	500 ± 48 mV
2	L14	5	6	300 ± 40 IIIV

#### 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 Requirement".</u>

#### >> INSPECTION END

#### MIXTURE RATIO SELF-LEARNING VALUE CLEAR

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

INFOID:0000000009063873

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:00000000009063874

### 1.START

### **With CONSULT**

- 1. Start engine and warm it up to normal operating temperature.
- Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.

< BASIC INSPECTION > [VQ37VHR]

3. Clear mixture ratio self-learning value by touching "CLEAR".

#### **With GST**

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

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Revision: 2013 March **EC-25** 2014 QX50

< BASIC INSPECTION > [VQ37VHR]

### HOW TO SET SRT CODE

### **OUTLINE**

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

#### **SRT ITEM**

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

SRT item*1 (CONSULT indication)	Performance Priority*2	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.
CATALYST	1	Three way catalyst function P0420, P043	
EVAP SYSTEM	1	EVAP control system purge flow monitoring	P0441
	1	EVAP control system	P0456
HO2S	1	Air fuel ratio (A/F) sensor 1	P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D
		Heated oxygen sensor 2	P0137, P0157
		Heated oxygen sensor 2	P0138, P0158
		Heated oxygen sensor 2	P0139, P0159
EGR/VVT SYSTEM	2	Intake value timing control function	P0011, P0021

<sup>\*1:</sup> Though displayed on the CONSULT screen, "HO2S HTR" is not SRT item.

#### 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.

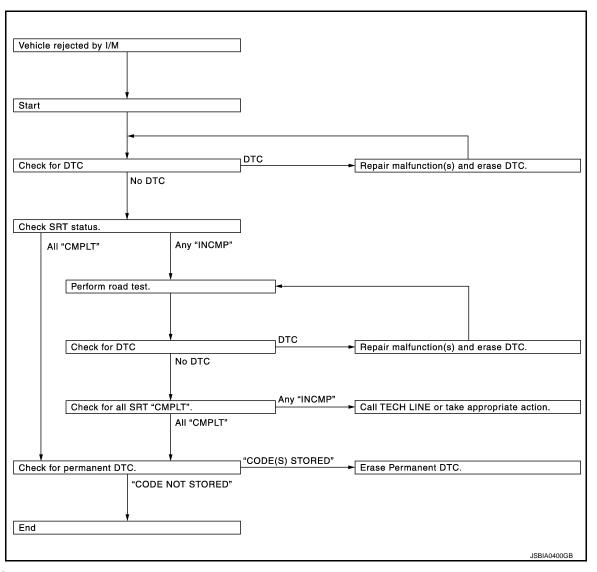
<sup>\*2:</sup> If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT.

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SRT Set Driving Pattern

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**CAUTION:** 

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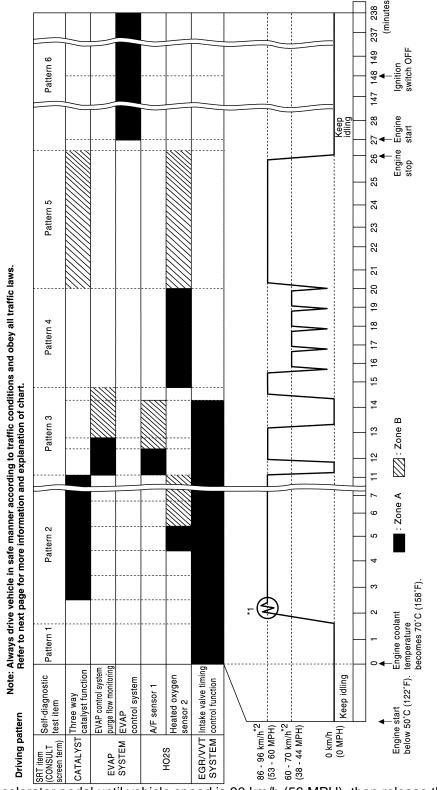
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Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.



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

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

<sup>• &</sup>quot;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".

#### **HOW TO SET SRT CODE**

[VQ37VHR] < BASIC INSPECTION > \*: Normal conditions Sea level Α Flat road Ambient air temperature: 20 – 30°C (68 – 86°F) EC 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°C (68 – 86°F)] Work Procedure 1. CHECK DTC Check DTC. D Is any DTC detected? YES >> Repair malfunction(s) and erase DTC. Refer to EC-579, "DTC Index". NO >> GO TO 2. Е 2.CHECK SRT STATUS (P)With CONSULT F Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT. Perform "SRT status" mode with EC-143, "On Board Diagnosis Function". Select Service \$01 with GST. Is SRT code(s) set? Н >> GO TO 12. YFS NO-1 >> With CONSULT: GO TO 3. NO-2 >> Without CONSULT: GO TO 4. 3.DTC CONFIRMATION PROCEDURE 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 EC-26, "Description". Check DTC. Is any DTC detected? K >> Repair malfunction(s) and erase DTC. Refer to EC-579, "DTC Index". >> GO TO 11. NO 4.PERFORM ROAD TEST Check the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-26, "Description"</u>. Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to EC-27, "SRT Set Driving In order to set all SRTs, the SRT set driving pattern must be performed at least once. >> GO TO 5. N 5. PATTERN 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). Start the engine. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F) Р 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-535, "Reference Value".

Revision: 2013 March **EC-29** 2014 QX50

>> GO TO 6.

#### 6. PATTERN 2

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

#### NOTE:

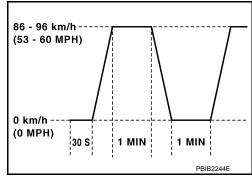
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

#### 7. PATTERN 3

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).

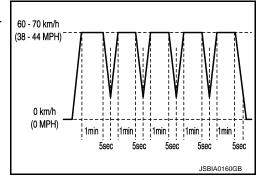
>> GO TO 8.



### 8. PATTERN 4

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

>> GO TO 9.



### 9. PATTERN 5

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

>> GO TO 10.

### 10.PATTERN 6

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

>> GO TO 11.

### 11.CHECK SRT STATUS

(P)With CONSULT

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

Perform "SRT status" mode with EC-143, "On Board Diagnosis Function".

With GST

HOW TO SET SRT CODE					
< BASIC INSPECTION > [VQ37VHR]					
Select Service \$01 with GST.					
Is SRT(s) set?	Α				
YES >> GO TO 12.  NO >> Call TECH LINE or take appropriate action.					
12. CHECK PERMANENT DTC	EC				
NOTE:					
Permanent DTC cannot be checked with a tool other than CONSULT or GST.  (B) With CONSULT	С				
Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.					
With GST	D				
Select Service \$0A with GST.  Is permanent DTC(s) detected?					
YES >> Go to EC-26, "Description".					
NO >> END	Е				
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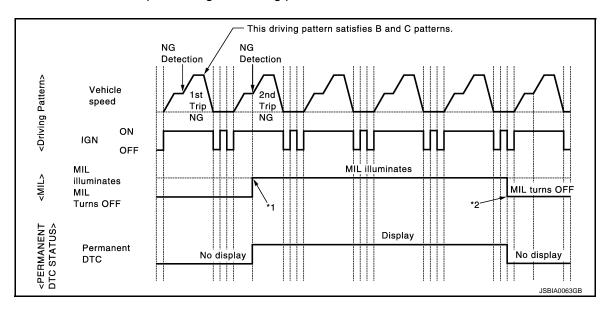
**EC-31** Revision: 2013 March 2014 QX50 < BASIC INSPECTION > [VQ37VHR]

### HOW TO ERASE PERMANENT DTC

#### **OUTLINE**

When a DTC is stored in ECM

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



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

When a DTC is not stored in ECM

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

#### NOTE:

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

×: Applicable —: Not applicable

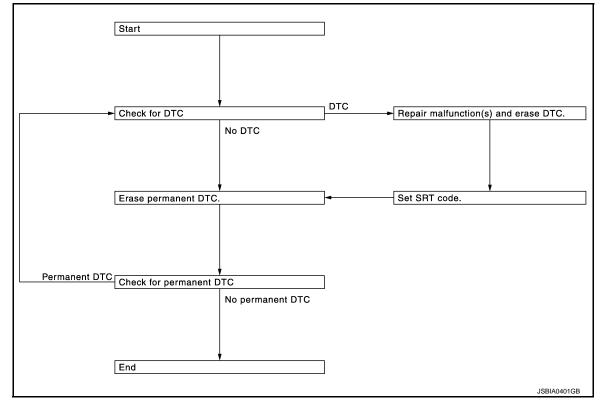
Group*	Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs.	Driving pattern	
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В	_	×	×

<sup>\*:</sup> For group, refer to EC-579, "DTC Index".

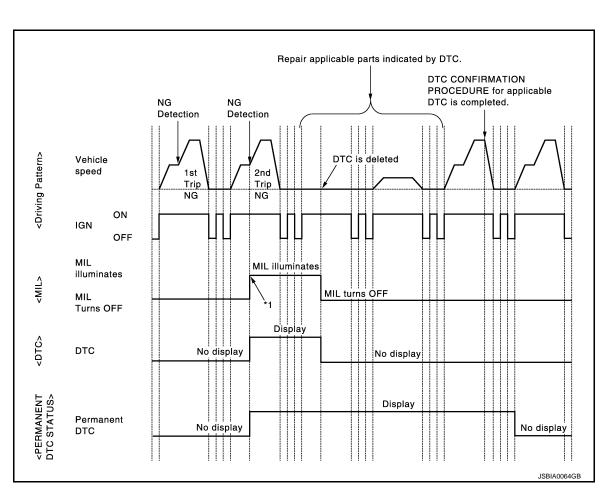
#### PERMANENT DTC ITEM

For permanent DTC items, MIL turns ON. Refer to EC-579, "DTC Index".

#### PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)



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

### 1. CHECK DTC

Check DTC.

#### Is any DTC detected?

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

NO >> GO TO 2.

### 2. CHECK PERMANENT DTC

#### (P)With CONSULT

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

#### Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

## 3. PERFORM DTC CONFIRMATION PROCEDURE

Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in ECM. Refer to <a href="EC-579">EC-579</a>, "DTC Index".

>> GO TO 4.

### 4. CHECK PERMANENT DTC

#### (P)With CONSULT

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

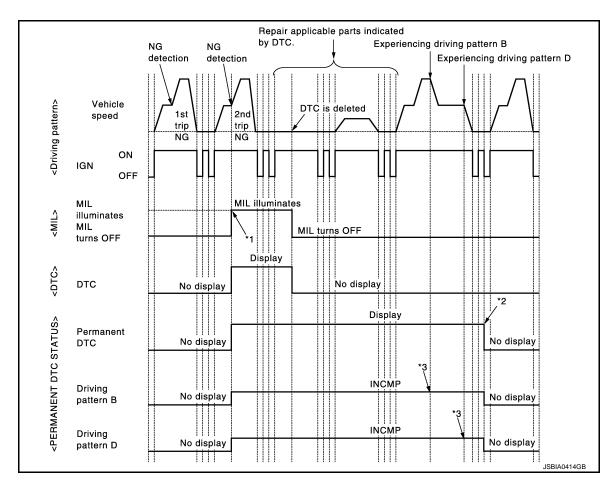
#### Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

Work Procedure (Group B)

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- \*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.
- After experiencing driving pattern B 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 EC-143, "On Board Diagnosis Function", EC-146, "CONSULT Function".

NO >> GO TO 2.

### 2.CHECK PERMANENT DTC

#### (E)With CONSULT

- 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.
- Turn ignition switch ON.
- Select "PERMANENT DTC STATUS" mode with CONSULT. 5.

#### ∰With GST

- 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.

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#### **HOW TO ERASE PERMANENT DTC**

< BASIC INSPECTION > [VQ37VHR]

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

#### Is any permanent DTC detected?

YES >> GO TO 3. NO >> END

3.drive driving pattern b

#### **CAUTION:**

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

(P)With CONSULT

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

@With GST

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

>> GO TO 4.

### 4. CHECK PERMANENT DTC

#### (E)With CONSULT

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

#### With GST

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

#### Is any permanent DTC detected?

YES >> GO TO 5.

NO >> END

### 5.DRIVE DRIVING PATTERN D

#### **CAUTION:**

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

>> GO TO 6.

### 6. CHECK PERMANENT DTC

#### (P)With CONSULT

- 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.
- 4. Turn ignition switch ON.

## **HOW TO ERASE PERMANENT DTC**

< BASIC INSPECTION > [VQ37VHR]

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

### Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

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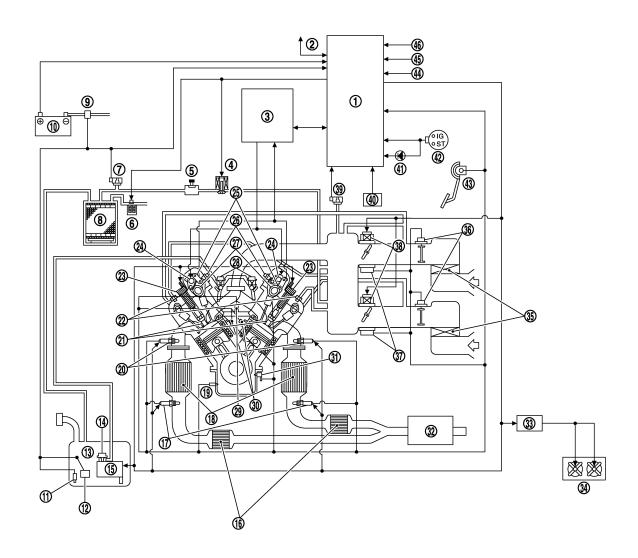
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# SYSTEM DESCRIPTION

## **ENGINE CONTROL SYSTEM**

System Diagram



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- 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)

- 3. VVEL control module
- 6. EVAP canister vent control valve
- 9. Battery current sensor
- 12. Fuel level sensor
- 15. Fuel pump
- 18. Three way catalyst 1
- 21. Spark plug
- 24. VVEL actuator motor

### **ENGINE CONTROL SYSTEM**

44. Power steering pressure sensor

[VQ37VHR] < SYSTEM DESCRIPTION >

- 25. VVEL control shaft position sensor 26. Intake valve timing control solenoid valve 28. Fuel damper 29. Engine coolant temperature sensor
  - Crankshaft position sensor (POS) 32. Muffler

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41. MIL

Air cleaner

- Electric throttle control actuator 38. 37.
  - Throttle position sensor
- Brake booster pressure sensor 43. Accelerator pedal position sensor
- 46. PNP signal

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- 27. Camshaft position sensor (PHASE)
- 30. Knock sensor
- 33. Cooling fan control module
- 36. Mass air flow sensor (with intake air temperature sensor)
- 39. Manifold absolute pressure (MAP) sensor
- 42. Ignition switch
- 45. Refrigerant pressure sensor

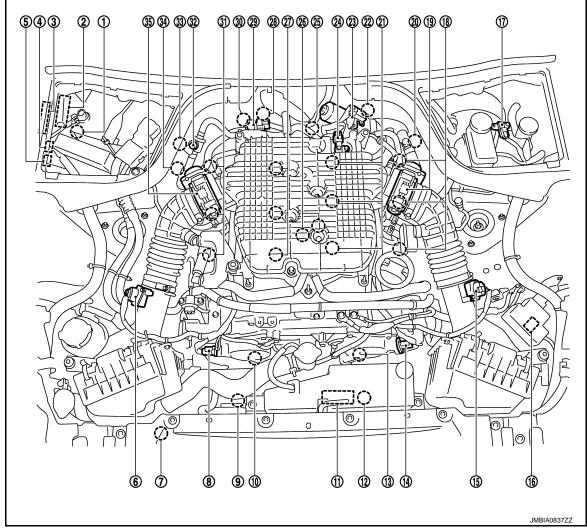
## System Description

Cooling fan

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

### Component Parts Location

543 29 27 28 25 39 39 39 39 20(19(18) (3)(3)(2)



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

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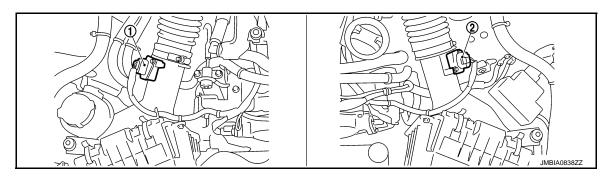
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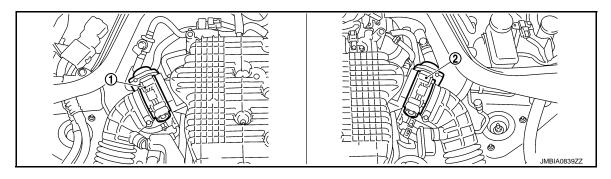
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Camshaft position sensor (PHASE) 9. Cooling fan motor-2 Refrigerant pressure sensor (bank 1) 10. Intake valve timing control solenoid 11. Cooling fan control module 12. Cooling fan motor-1 valve (bank 1) 14. Camshaft position sensor (PHASE) 13. Intake valve timing control solenoid 15. Mass air flow sensor (bank 2) valve (bank 2) (bank 2) 16. ICC brake hold relay (ICC models) 17. Brake booster pressure sensor 18. Ignition coil (with power transistor) and spark plug (bank 2) 19. Electric throttle control actuator 20. A/F sensor 1 (bank 2) 21. Fuel injector (bank 2) (bank 2) 22. VVEL control shaft position sensor VVEL actuator motor (bank 2) 24. Manifold absolute pressure (MAP) (bank 2) sensor 27. Fuel injector (bank 1) 25. Engine coolant temperature sensor 26. Knock sensor 30. VVEL control shaft position sensor 28. VVEL actuator motor (bank 1) 29. EVAP canister purge volume control solenoid valve (bank 1) 31. Ignition coil (with power transistor) 32. EVAP service port 33. A/F sensor 1 (bank 1) and spark plug (bank 1) 34. Crankshaft position sensor (POS) 35. Electric throttle control actuator

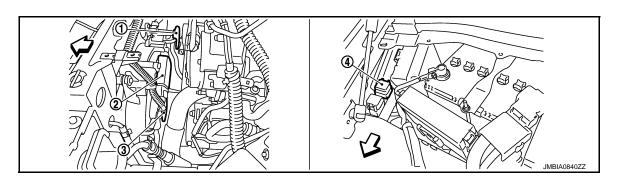


(bank 1)

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



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

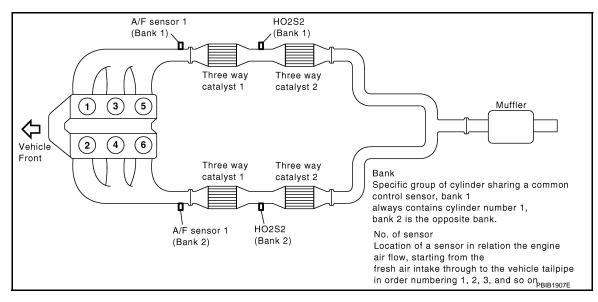


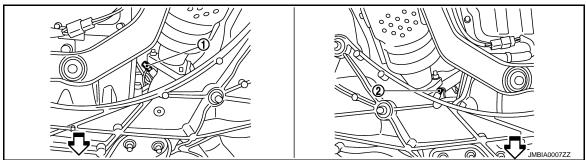
1. Cooling fan motor-2

2. Cooling fan control module

3. Cooling fan motor-1

4. Cooling fan relay

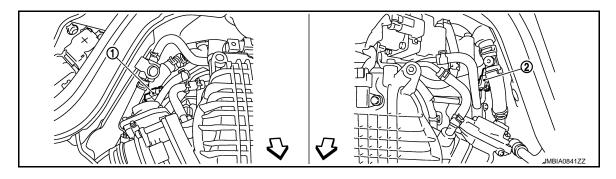




∵ : Vehicle front

1. A/F sensor 1 (bank 1)

2. A/F sensor 1 (bank 2)



: Vehicle front

Revision: 2013 March

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

EC-41 2014 QX50

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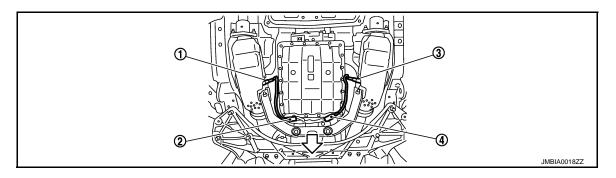
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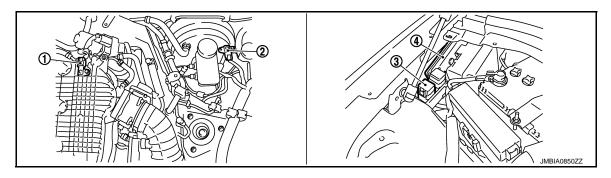
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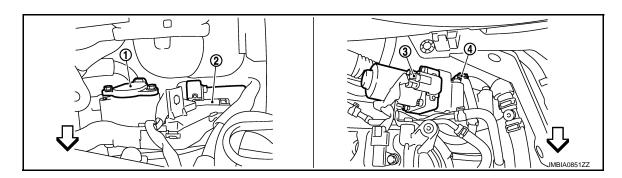
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



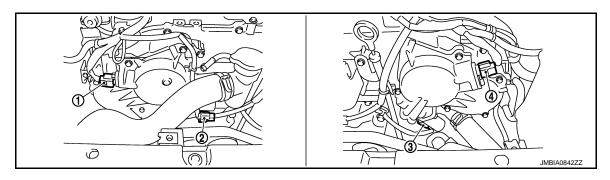
- Manifold absolute pressure (MAP)
   sensor
- . Brake booster pressure sensor
- 3. VVEL actuator motor relay

4. VVEL control module

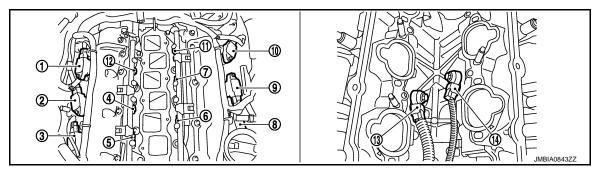


### ∵ : Vehicle front

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



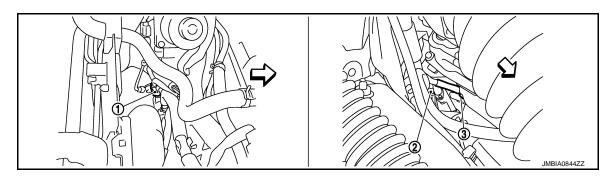
- Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid 3. valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector



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

- Ignition coil No.3 (with power transis- 3. tor)
- Fuel injector No.1
- Ignition coil No.2 (with power transis- 9.
- Fuel injector No.6
- 14. Knock sensor (bank 2)

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



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

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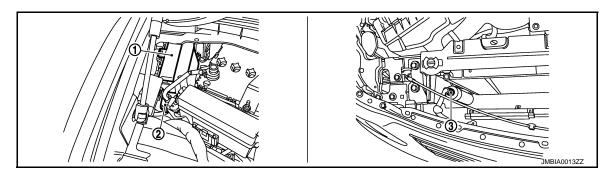
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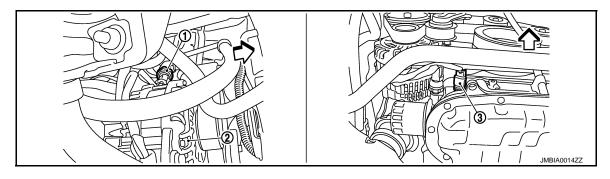
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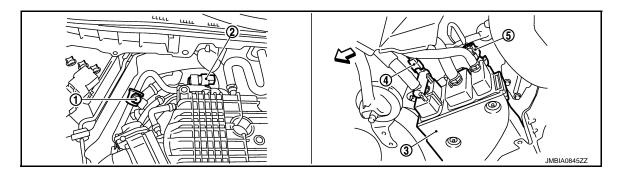
1. IPDM E/R

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

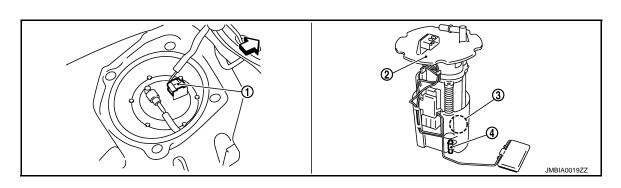


- ∵ : Vehicle front
- 1. Power steering pressure sensor
- Alternator

3. Engine oil temperature sensor



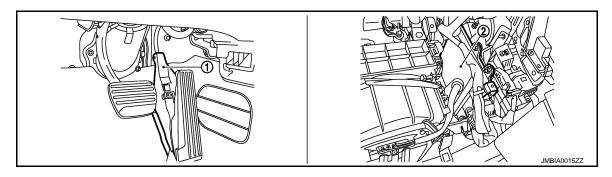
- $\triangleleft$ : Vehicle front
- EVAP service port
- 4. EVAP canister vent control valve
- EVAP canister purge volume control 3. EVAP canister solenoid valve
- 5. EVAP control system pressure sensor



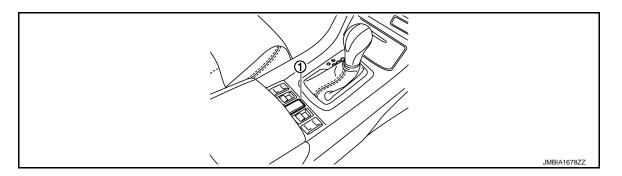
 $\triangleleft$ : Vehicle front

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

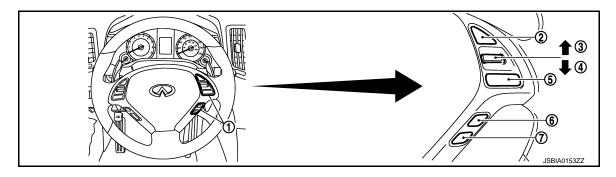
4. Fuel tank temperature sensor



1. Accelerator pedal position sensor 2. ECM

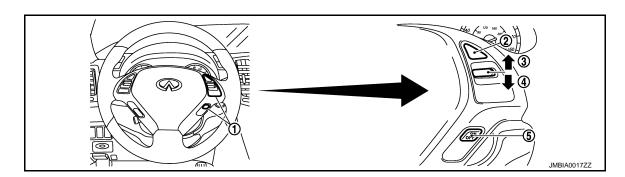


Snow mode switch



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

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



Revision: 2013 March EC-45 2014 QX50

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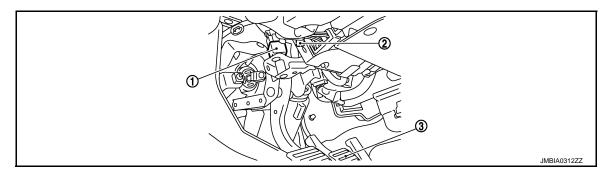
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- 1. ASCD steering switch
- SET/COAST switch
- CANCEL switch MAIN switch

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3. RESUME/ACCELERATE switch



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

# **Component Description**

INFOID:0000000009063884

Component	Reference
A/F sensor 1	EC-228, "Description"
A/F sensor 1 heater	EC-179, "Description"
Accelerator pedal position sensor	EC-483, "Description"
ASCD brake switch	EC-452, "Description"
ASCD steering switch	EC-445. "Description"
Battery current sensor	EC-432, "Description"
Brake booster pressure sensor	EC-375, "Description"
Camshaft position sensor (PHASE)	EC-304, "Description"
Cooling fan control module	EC-501, "Description"
Cooling fan motor	EC-501, "Description"
Crankshaft position sensor (POS)	EC-300. "Description"
Electric throttle control actuator	EC-425, "Description"
Engine coolant temperature sensor	EC-213, "Description"
Engine oil temperature sensor	EC-280. "Description"
EVAP canister purge volume control solenoid valve	EC-318. "Description"
EVAP canister vent control valve	EC-326, "Description"
EVAP control system pressure sensor	EC-334, "Description"
Fuel injector	EC-507, "Description"
Fuel level sensor	EC-355. "Description"
Fuel pump	EC-510, "Description"
Fuel tank temperature sensor	EC-273. "Description"
Heated oxygen sensor 2	EC-238. "Description"
Heated oxygen sensor 2 heater	EC-182, "Description"
ICC brake switch	EC-457, "Description"
ICC steering switch	EC-448. "Description"
Ignition signal	EC-517, "Description"
Intake air temperature sensor	EC-207, "Description"
Intake valve timing control solenoid valve	EC-185, "Description"

### **ENGINE CONTROL SYSTEM**

# < SYSTEM DESCRIPTION >

[VQ37VH	R1
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Component	Reference	
Knock sensor	EC-297, "Description"	
Manifold absolute pressure (MAP) sensor	EC-200, "Description"	
Mass air flow sensor	EC-188, "Description"	
PCV valve	EC-528, "Description"	
Power steering pressure sensor	EC-372, "Description"	
Refrigerant pressure sensor	EC-530, "Description"	
Stop lamp switch	EC-475, "Description"	
Throttle control motor	EC-422, "Description"	
Throttle control motor relay	EC-430, "Description"	
Throttle position sensor	EC-216, "Description"	<del></del>
VVEL actuator motor	EC-400, "Description"	
VVEL actuator motor relay	EC-404, "Description"	
VVEL control module	EC-468, "Description"	
VVEL control shaft position sensor	EC-396, "Description"	

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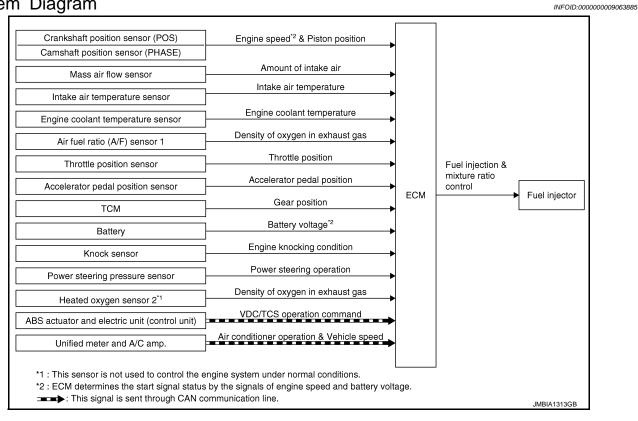
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[VQ37VHR]

# MULTIPORT FUEL INJECTION SYSTEM

System Diagram



### System Description

INFOID:0000000009063886

### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3		Fuel injector
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature	Fuel injection	
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
TCM	Gear position	& mixture ratio	
Battery	Battery voltage*3	control	
Knock sensor	Engine knocking condition		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
ABS actuator and electric unit (control unit)*2	VDC/TCS operation command		
Unified meter and A/C amp.	Air conditioner operation*2		
onlined meter and AVO amp.	Vehicle speed* <sup>2</sup>		

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

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

[VQ37VHR]

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

#### SYSTEM DESCRIPTION

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

### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

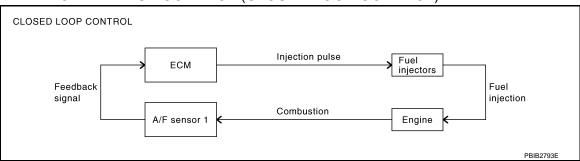
#### <Fuel increase>

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

#### <Fuel decrease>

- During deceleration
- During high engine speed operation

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



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 1 can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to EC-228. "Description". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

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

Open Loop Control

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

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

#### MIXTURE RATIO SELF-LEARNING CONTROL

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

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### **MULTIPORT FUEL INJECTION SYSTEM**

### < SYSTEM DESCRIPTION >

[VQ37VHR]

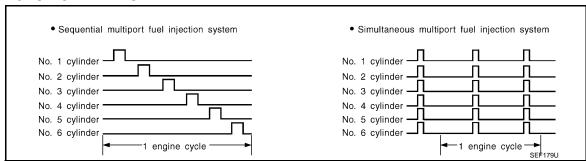
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

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

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

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

#### **FUEL INJECTION TIMING**



Two types of systems are used.

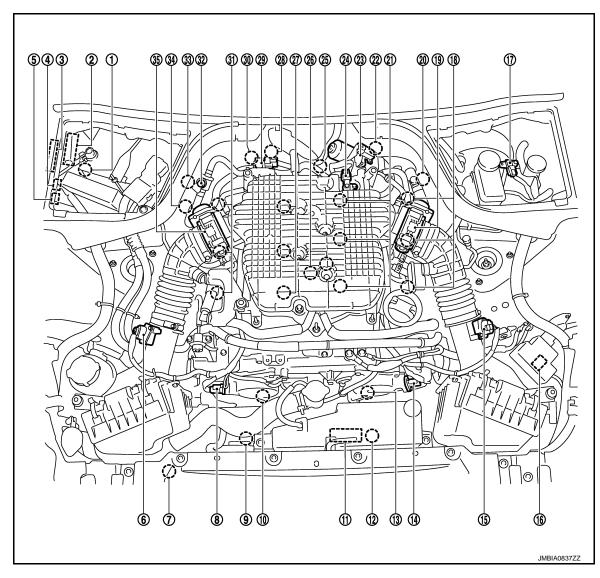
- Sequential Multiport Fuel Injection System
  - Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
  - Fuel is injected simultaneously into all six cylinders twice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

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

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

### **Component Parts Location**

INFOID:0000000009241913



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

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

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

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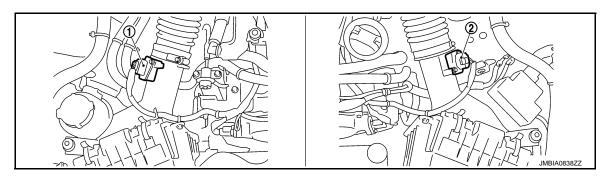
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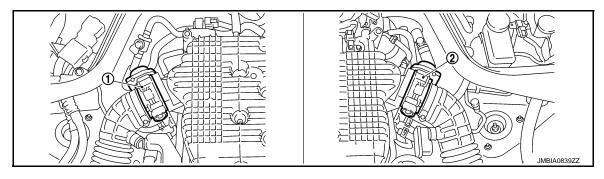
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- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

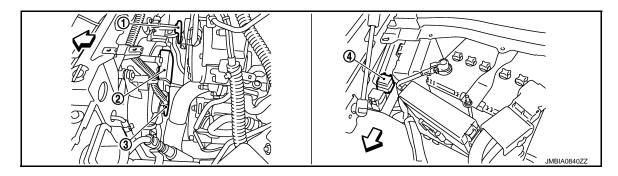
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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

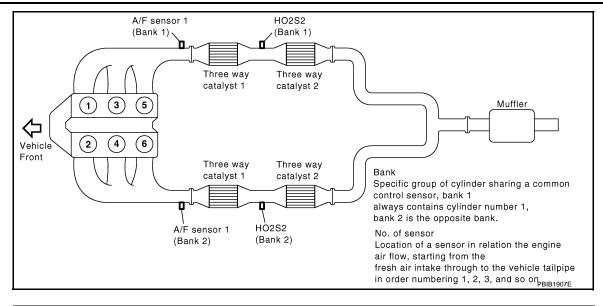


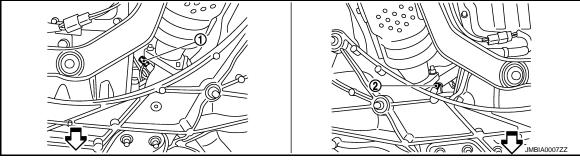
- Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



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

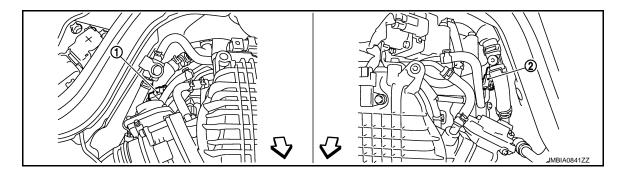
4. Cooling fan relay





1. A/F sensor 1 (bank 1)

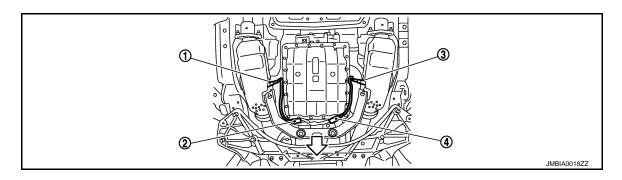
2. A/F sensor 1 (bank 2)



∵ : Vehicle front

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

 A/F sensor 1 (bank 2) harness connector



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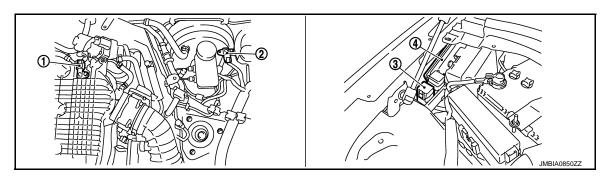
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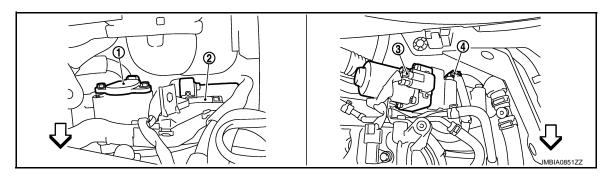
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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

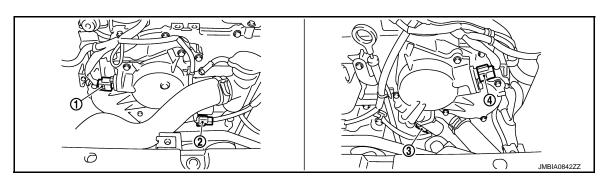
4. VVEL control module



#### ∵ : Vehicle front

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

4. VVEL control shaft position sensor (bank 2)

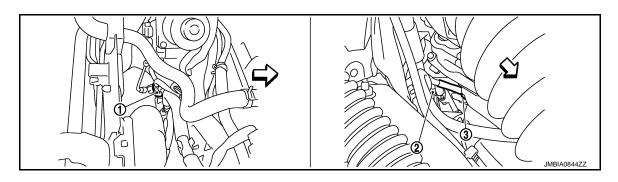


- Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector

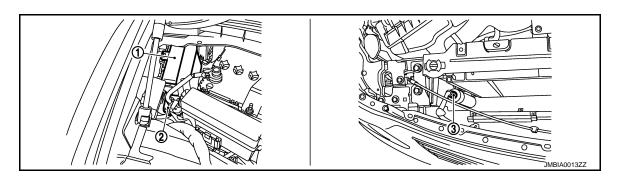
- Ignition coil No.5 (with power transis- 2.
- 4. Fuel injector No.3
- Fuel injector No.4 7.
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- 13. Knock sensor (bank 1)

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

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

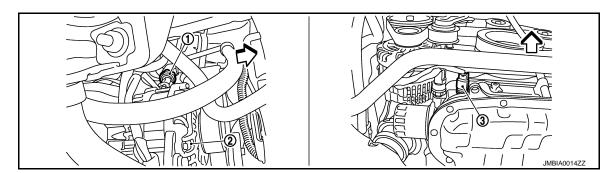


- Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- Crankshaft position sensor (POS)



IPDM E/R

- Battery current sensor
- Refrigerant pressure sensor



**EC-55** Revision: 2013 March 2014 QX50

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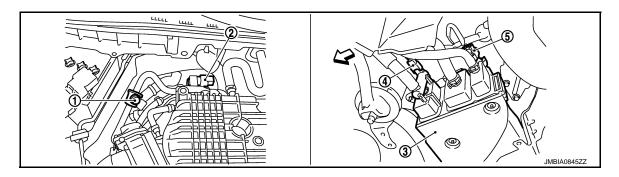
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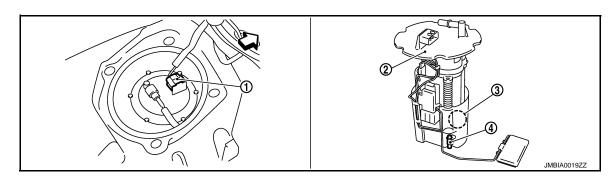
- 1. Power steering pressure sensor
- 2. Alternator

Engine oil temperature sensor



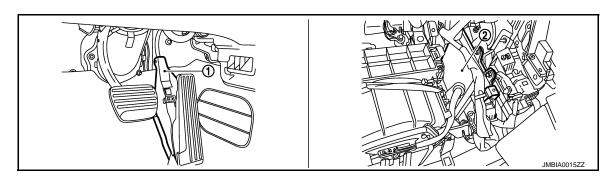
#### ∵ : Vehicle front

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

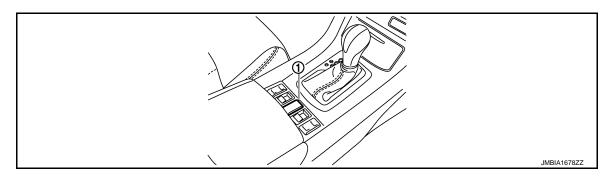


#### : Vehicle front

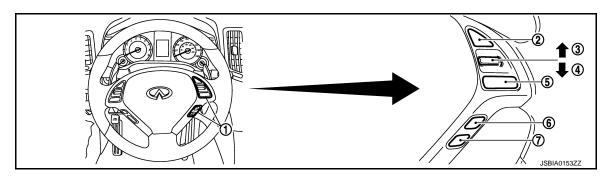
- harness connector
- Fuel level sensor unit and fuel pump 2. Fuel level sensor unit and fuel pump 3. Fuel pressure regulator
- Fuel tank temperature sensor



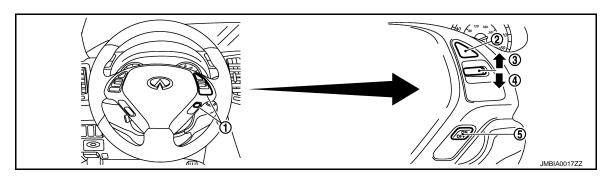
Accelerator pedal position sensor ECM



1. Snow mode switch

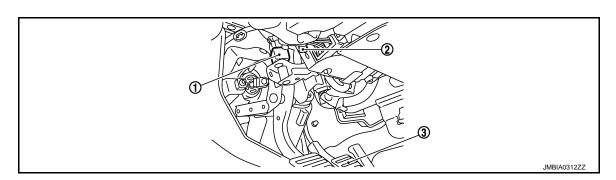


- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch
- 2. CANCEL switch
- 5. DISTANCE switch
- 3. RESUME/ACCELERATE switch
- 6. MAIN switch



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

3. RESUME/ACCELERATE switch



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

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### **MULTIPORT FUEL INJECTION SYSTEM**

## < SYSTEM DESCRIPTION >

[VQ37VHR]

# **Component Description**

INFOID:0000000009063888

Component	Reference
A/F sensor 1	EC-228, "Description"
Accelerator pedal position sensor	EC-483, "Description"
Camshaft position sensor (PHASE)	EC-304, "Description"
Crankshaft position sensor (POS)	EC-300, "Description"
Engine coolant temperature sensor	EC-213, "Description"
Fuel injector	EC-507, "Description"
Heated oxygen sensor 2	EC-238, "Description"
Intake air temperature sensor	EC-207, "Description"
Knock sensor	EC-297, "Description"
Mass air flow sensor	EC-188, "Description"
Power steering pressure sensor	EC-372, "Description"
Throttle position sensor	EC-216, "Description"

[VQ37VHR]

# **ELECTRIC IGNITION SYSTEM**

System Diagram

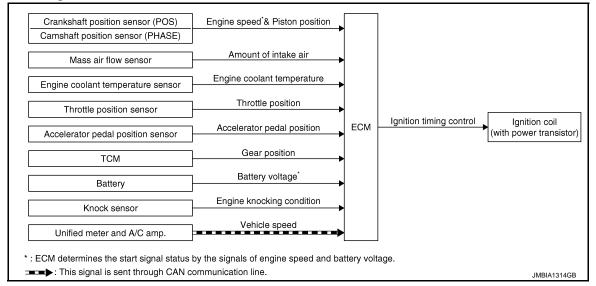
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## System Description

INFOID:0000000009063890

#### INPUT/OUTPUT SIGNAL CHART

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

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

#### 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

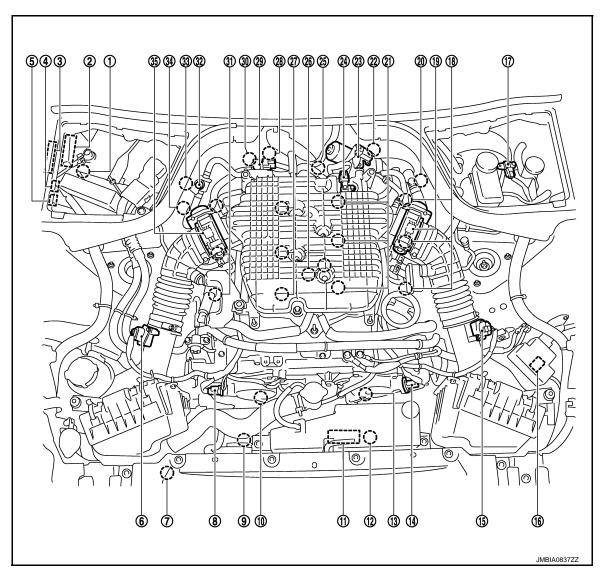
The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not

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

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

### **Component Parts Location**

INFOID:0000000009241914



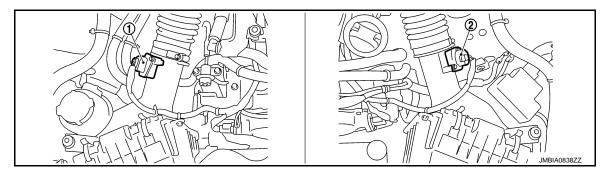
- 1. Battery current sensor
- Cooling fan relay
- Refrigerant pressure sensor
- Intake valve timing control solenoid valve (bank 1)
- 13. Intake valve timing control solenoid valve (bank 2)
- 16. ICC brake hold relay (ICC models)
- Electric throttle control actuator (bank 2)
- VVEL control shaft position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

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

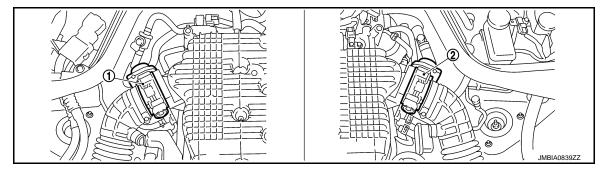
- 3. VVEL control module
- Mass air flow sensor (with intake air temperature sensor) (bank 1)
- Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure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

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

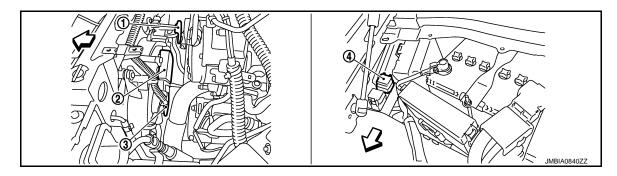
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



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



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

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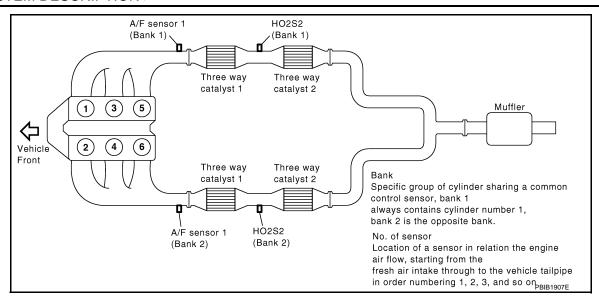
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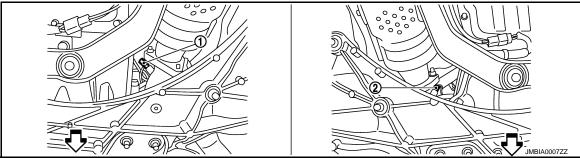
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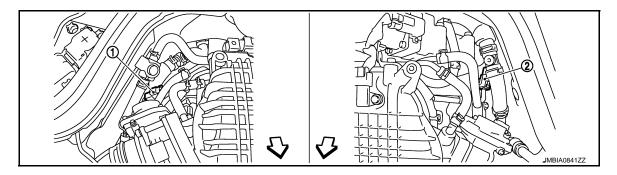
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A/F sensor 1 (bank 1)

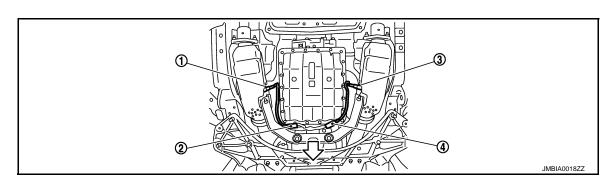
2. A/F sensor 1 (bank 2)



∵ : Vehicle front

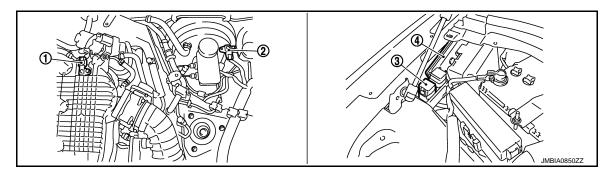
1. A/F sensor 1 (bank 1) harness con- 2. A/F sensor 1 (bank 2) harness connector

nector



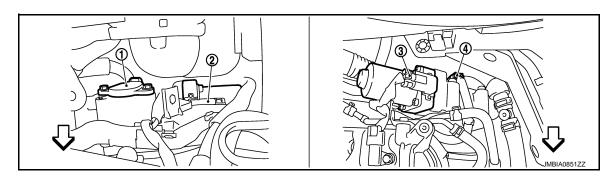
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- Heated oxygen sensor 2 (bank 1)

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



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

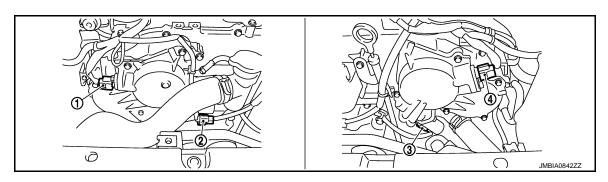
4. VVEL control module



: Vehicle front

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

 VVEL control shaft position sensor (bank 2)



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

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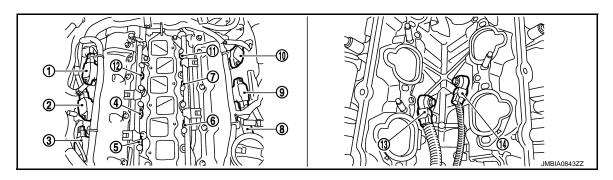
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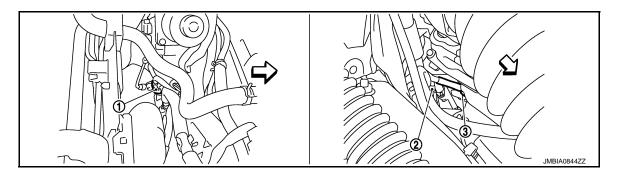
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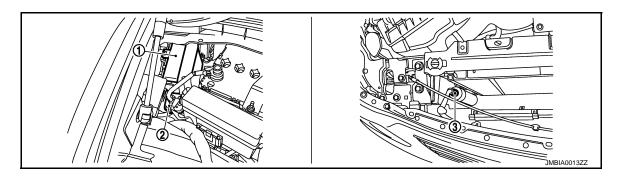
- Ignition coil No.5 (with power transis- 2.
- 4. Fuel injector No.3
- Fuel injector No.4
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- 13. Knock sensor (bank 1)

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

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

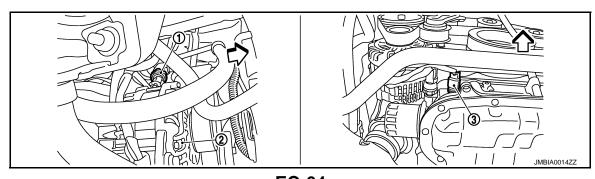


- Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- Crankshaft position sensor (POS)



IPDM E/R

- Battery current sensor
- Refrigerant pressure sensor

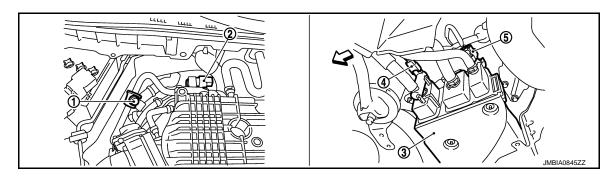


 $\triangleleft$ : Vehicle front

1. Power steering pressure sensor

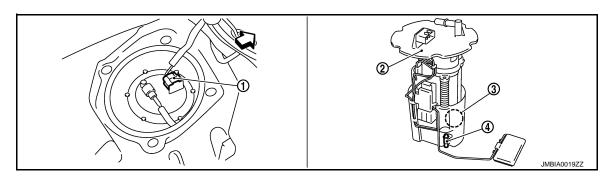
2. Alternator

3. Engine oil temperature sensor



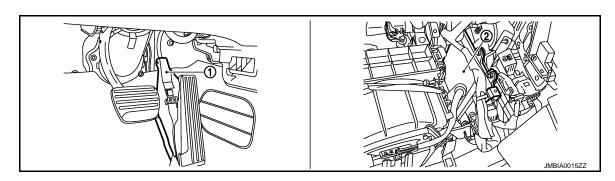
 $\triangleleft$ : Vehicle front

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



: Vehicle front

- 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



Accelerator pedal position sensor

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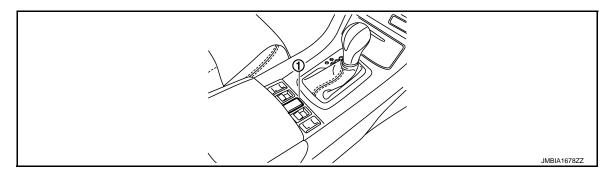
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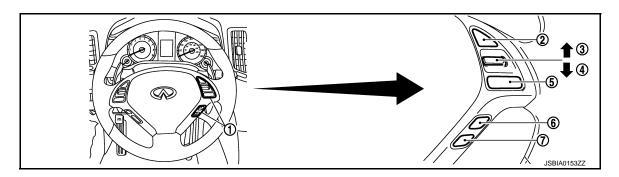
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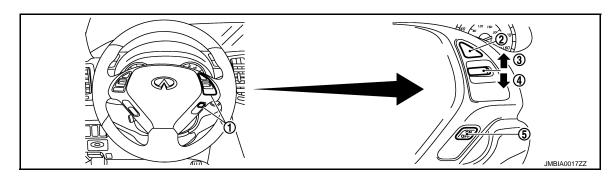


Snow mode switch



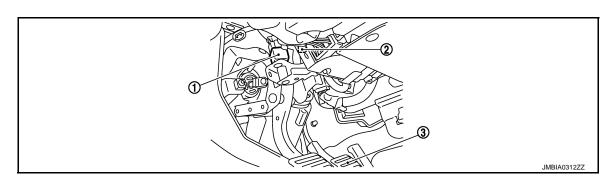
- ICC steering switch 1.
- SET/COAST switch 4.
- LDP/DCA switch 7.

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



- ASCD steering switch
- SET/COAST switch
- **CANCEL** switch
- MAIN switch

RESUME/ACCELERATE switch



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

## **ELECTRIC IGNITION SYSTEM**

## < SYSTEM DESCRIPTION >

## [VQ37VHR]

# **Component Description**

INFOID:0000000009063892

Component	Reference
Accelerator pedal position sensor	EC-483, "Description"
Camshaft position sensor (PHASE)	EC-304, "Description"
Crankshaft position sensor (POS)	EC-300, "Description"
Engine coolant temperature sensor	EC-213, "Description"
Ignition signal	EC-517, "Description"
Knock sensor	EC-297, "Description"
Mass air flow sensor	EC-188, "Description"
Throttle position sensor	EC-216, "Description"

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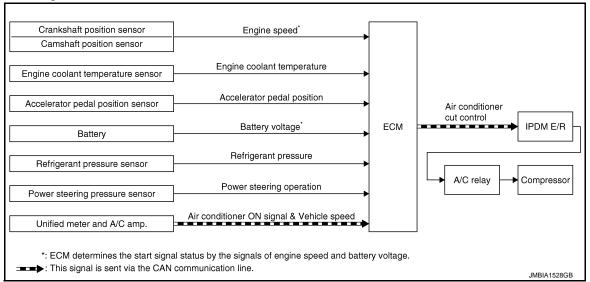
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[VQ37VHR]

### AIR CONDITIONING CUT CONTROL

System Diagram

INFOID:0000000009063893



## System Description

INFOID:0000000009063894

#### INPUT/OUTPUT SIGNAL CHART

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

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

### SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.

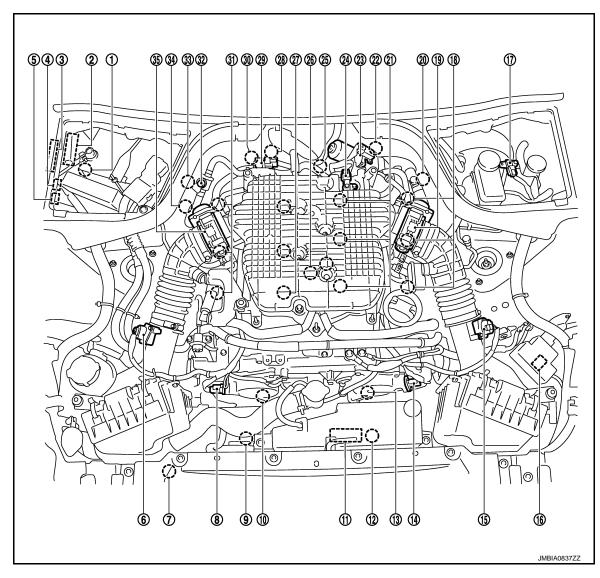
Under the following conditions, the air conditioner is turned off.

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

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

## **Component Parts Location**

INFOID:0000000009241915



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

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

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

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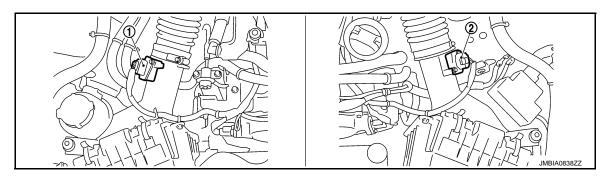
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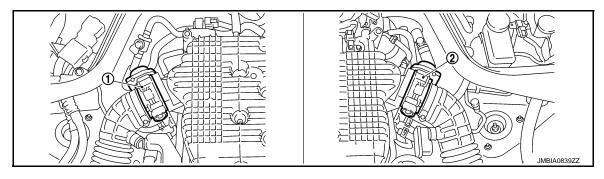
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- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

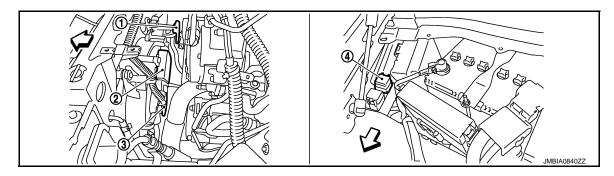
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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

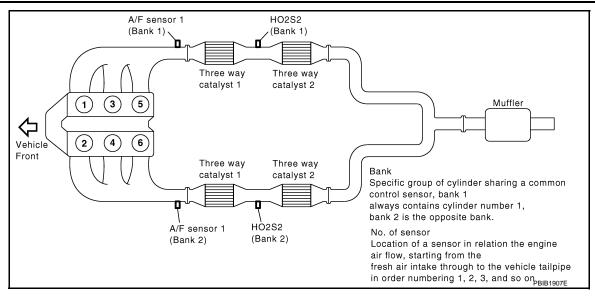


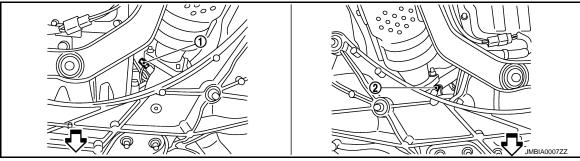
- Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



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

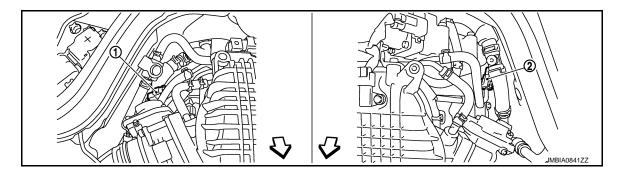
4. Cooling fan relay





A/F sensor 1 (bank 1)

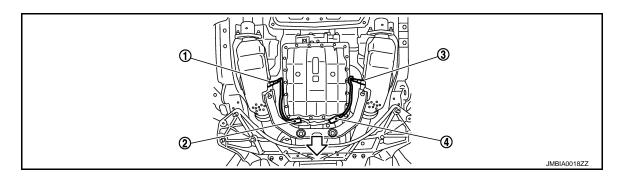
A/F sensor 1 (bank 2)



∵ : Vehicle front

nector

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



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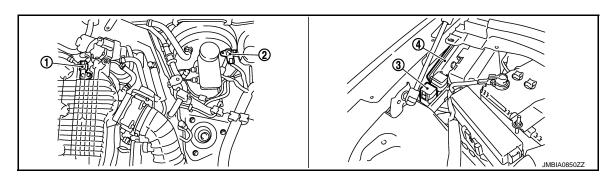
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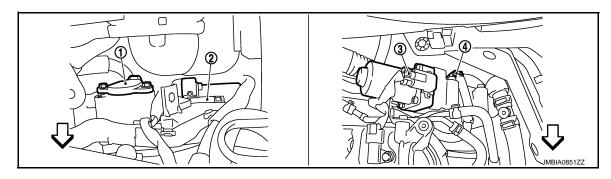
- 1. Heated oxygen sensor 2 (bank 2)
- Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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

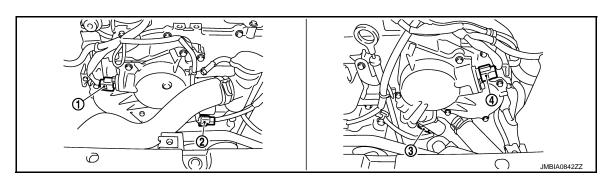
4. VVEL control module



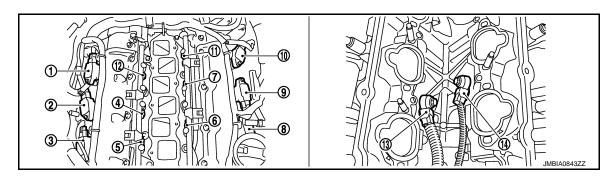
#### ∵ : Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



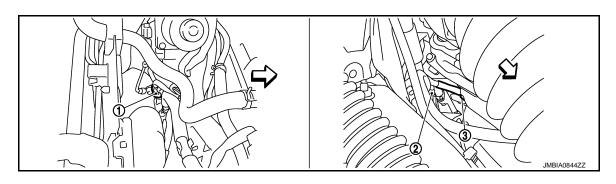
- Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector



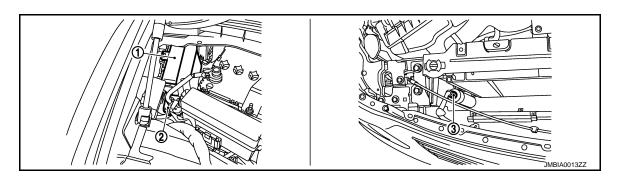
- Ignition coil No.5 (with power transis- 2.
- 4. Fuel injector No.3
- Fuel injector No.4 7.
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- 13. Knock sensor (bank 1)

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

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

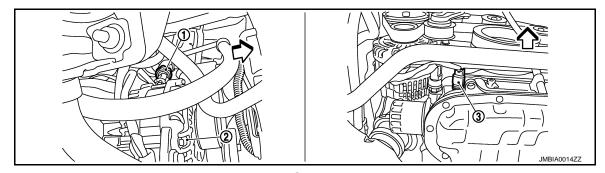


- Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- Crankshaft position sensor (POS)



IPDM E/R

- Battery current sensor
- Refrigerant pressure sensor



**EC-73** Revision: 2013 March 2014 QX50

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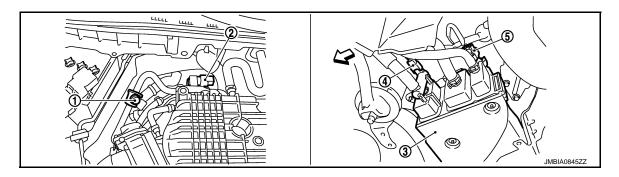
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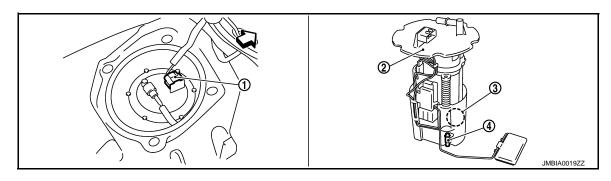
- 1. Power steering pressure sensor
- 2. Alternator

Engine oil temperature sensor



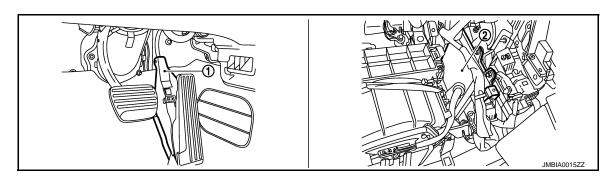
#### ∵ : Vehicle front

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



#### : Vehicle front

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



Accelerator pedal position sensor

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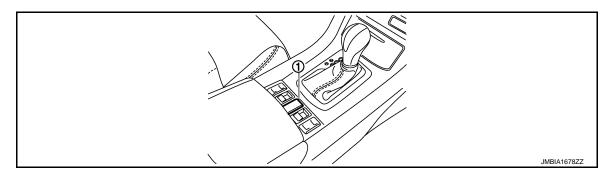
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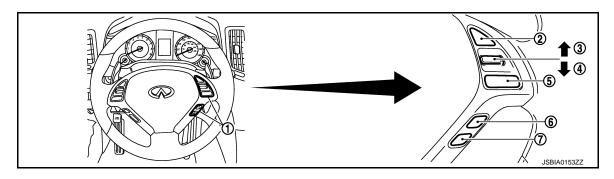
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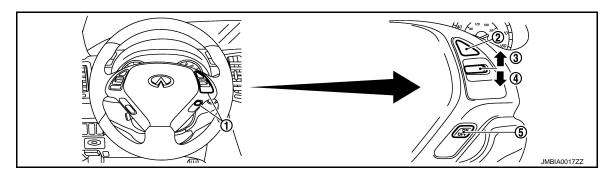
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1. Snow mode switch

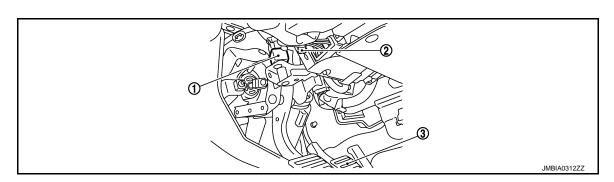


- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch
- 2. CANCEL switch
- 5. DISTANCE switch
- 3. RESUME/ACCELERATE switch
- 6. MAIN switch



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

3. RESUME/ACCELERATE switch



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

## **AIR CONDITIONING CUT CONTROL**

## < SYSTEM DESCRIPTION >

[VQ37VHR]

# **Component Description**

INFOID:0000000009063896

Component	Reference
Accelerator pedal position sensor	EC-483, "Description"
Camshaft position sensor (PHASE)	EC-304, "Description"
Crankshaft position sensor (POS)	EC-300, "Description"
Engine coolant temperature sensor	EC-213, "Description"
Power steering pressure sensor	EC-372, "Description"
Refrigerant pressure sensor	EC-530, "Description"

### AUTOMATIC SPEED CONTROL DEVICE (ASCD)

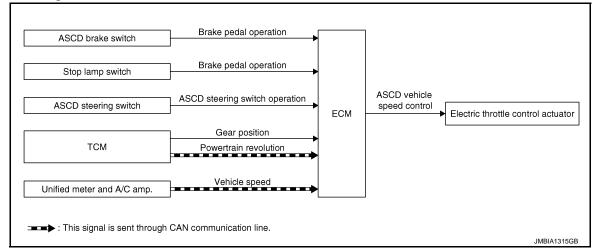
< SYSTEM DESCRIPTION >

[VQ37VHR]

# AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram

INFOID:0000000009063897



# System Description

INFOID:0000000009063898

#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
ASCD brake switch	Brake pedal operation			
Stop lamp switch	Brake pedal operation			
ASCD steering switch	ASCD steering switch operation	ASCD vehicle apped central	Electric throttle control	
Unified meter and A/C amp.	Vehicle speed*  ASCD vehicle speed control		actuator	
TCM	Gear position			
TOW	Powertrain revolution*			

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

#### BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

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

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

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

#### NOTE:

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

#### SET OPERATION

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

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

#### ACCELERATE OPERATION

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

**EC-77** Revision: 2013 March 2014 QX50

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### **AUTOMATIC SPEED CONTROL DEVICE (ASCD)**

#### < SYSTEM DESCRIPTION >

[VQ37VHR]

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

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

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE lamp may blink slowly.
  - When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by pressing SET/COAST switch or RESUME/ACCELERATE switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

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

#### COAST OPERATION

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

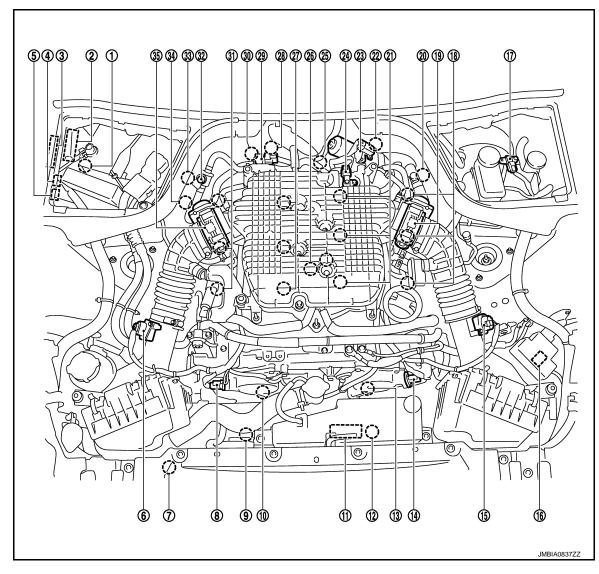
#### RESUME OPERATION

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

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

**Component Parts Location** 

INFOID:0000000009241916



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

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

- VVEL control module
- Mass air flow sensor (with intake air temperature sensor) (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. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP)
- 27. Fuel injector (bank 1)
- 30. VVEL control shaft position sensor (bank 1)

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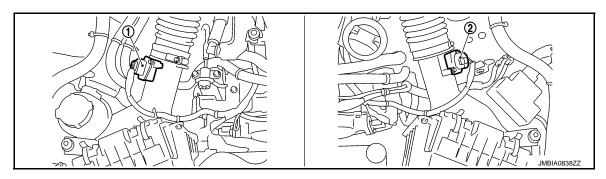
# **AUTOMATIC SPEED CONTROL DEVICE (ASCD)**

< SYSTEM DESCRIPTION >

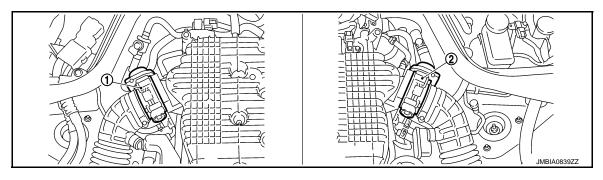
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- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

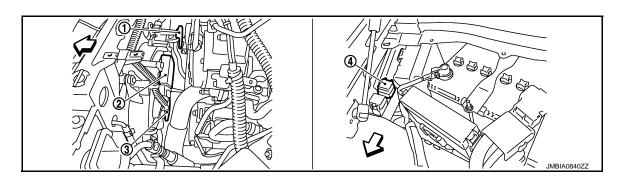
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



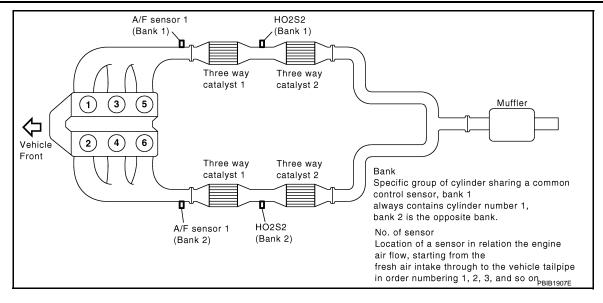
- Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)

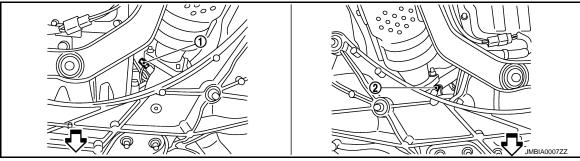


: Vehicle front

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

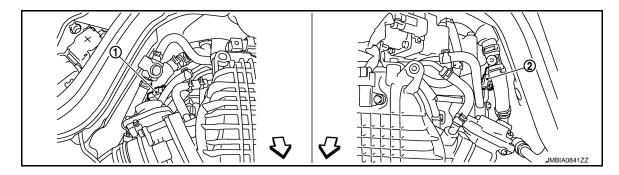
4. Cooling fan relay





1. A/F sensor 1 (bank 1)

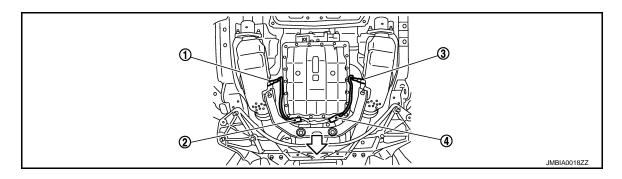
2. A/F sensor 1 (bank 2)



: Vehicle front

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

A/F sensor 1 (bank 2) harness connector



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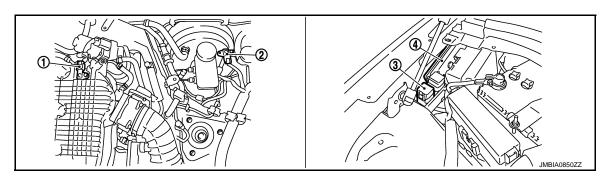
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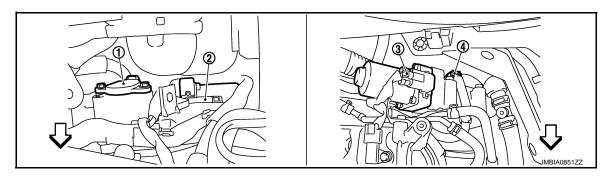
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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

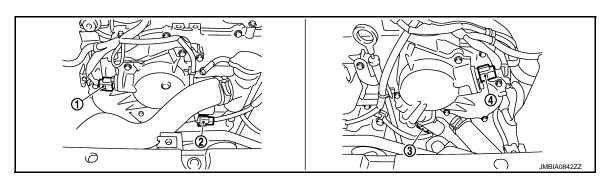
4. VVEL control module



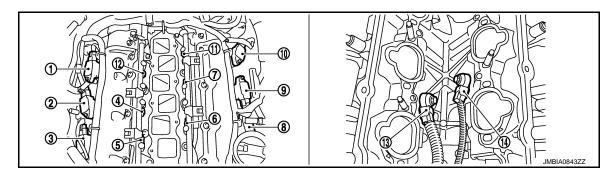
#### ∵ : Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



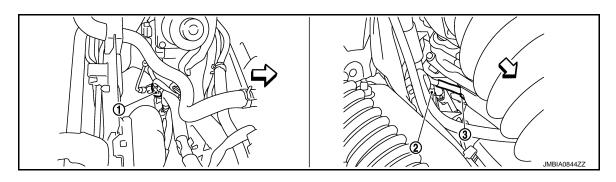
- Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector



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

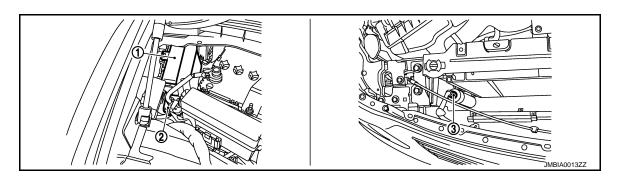
- Ignition coil No.3 (with power transis- 3. tor)
- 5. Fuel injector No.1
- 8. Ignition coil No.2 (with power transis- 9. tor)
- 11. Fuel injector No.6
- 14. Knock sensor (bank 2)

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



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

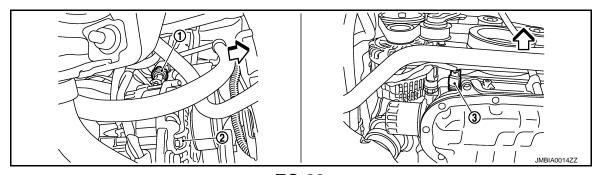
3. Crankshaft position sensor (POS)



1. IPDM E/R

2. Battery current sensor

3. Refrigerant pressure sensor



Revision: 2013 March **EC-83** 2014 QX50

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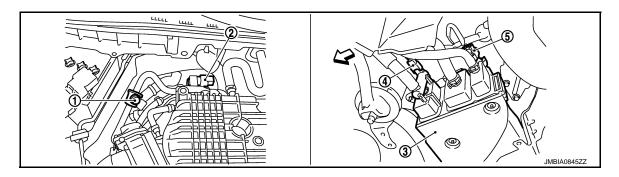
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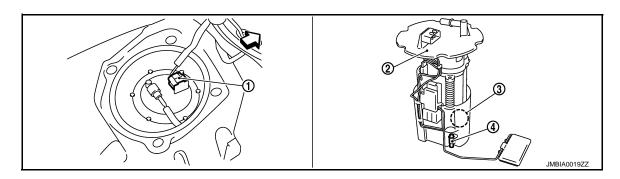
- 1. Power steering pressure sensor
- 2. Alternator

Engine oil temperature sensor



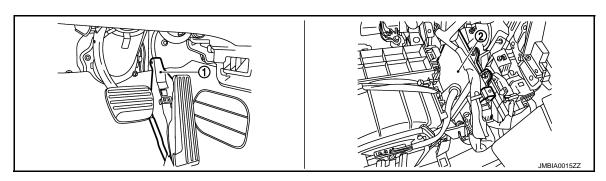
#### ∵ : Vehicle front

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



#### : Vehicle front

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



Accelerator pedal position sensor

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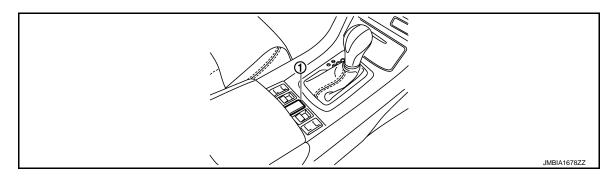
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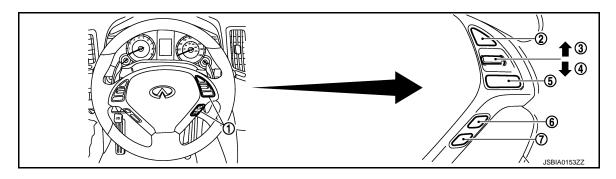
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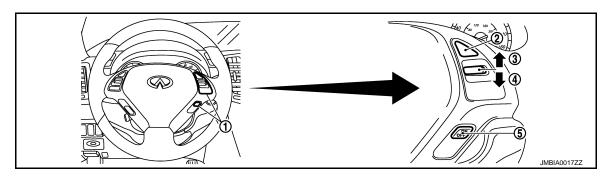
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1. Snow mode switch

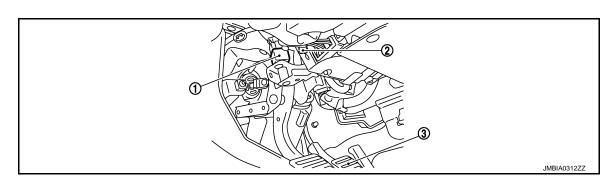


- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch
- 2. CANCEL switch
- 5. DISTANCE switch
- 3. RESUME/ACCELERATE switch
- 6. MAIN switch



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

3. RESUME/ACCELERATE switch



- Stop lamp switch
- ASCD brake switch (ASCD models) 3.
   ICC brake switch (ICC models)

**EC-85** 

Brake pedal

2014 QX50

# **AUTOMATIC SPEED CONTROL DEVICE (ASCD)**

< SYSTEM DESCRIPTION >

[VQ37VHR]

# Component Description

INFOID:0000000009063900

Component	Reference
ASCD brake switch	EC-452, "Description"
ASCD indicator	EC-500, "Description"
ASCD steering switch	EC-445, "Description"
Electric throttle control actuator	EC-430, "Description"
Stop lamp switch	EC-452, "Description"

### **CAN COMMUNICATION**

< SYSTEM DESCRIPTION >

[VQ37VHR]

INFOID:0000000009063901

### CAN COMMUNICATION

## System Description

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

Refer to LAN-8, "CAN Communication Control Circuit", about CAN communication for detail.

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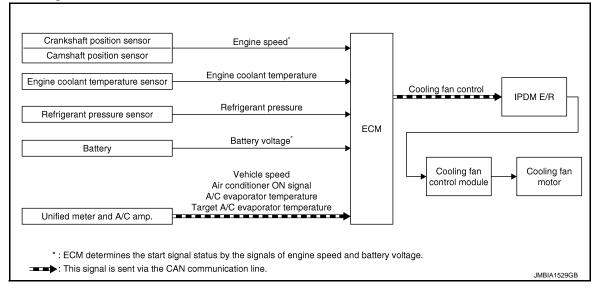
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[VQ37VHR]

### **COOLING FAN CONTROL**

### System Diagram

INFOID:0000000009063902



# System Description

INFOID:0000000009063903

#### INPUT/OUTPUT SIGNAL CHART

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

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

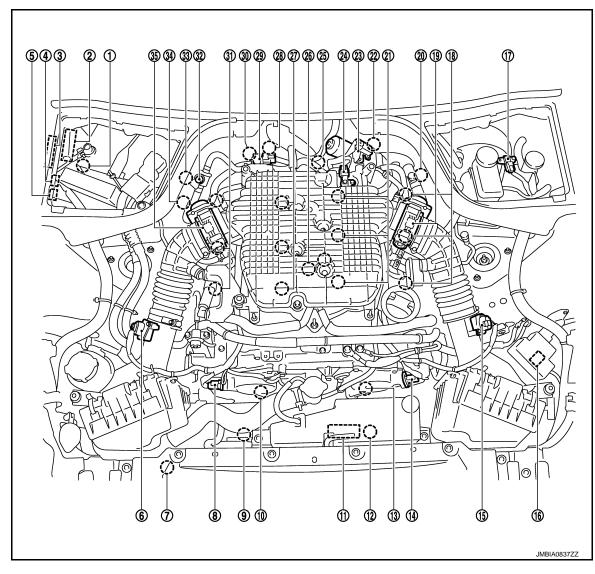
#### SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, 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.

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

### **Component Parts Location**

INFOID:0000000009241917



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

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

- VVEL control module
- Mass air flow sensor (with intake air temperature sensor) (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. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP)
- 27. Fuel injector (bank 1)
- 30. VVEL control shaft position sensor (bank 1)

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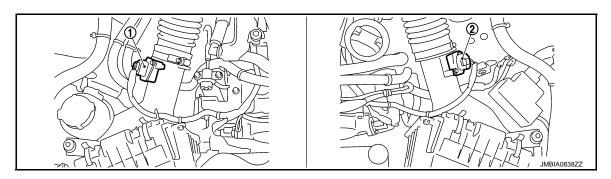
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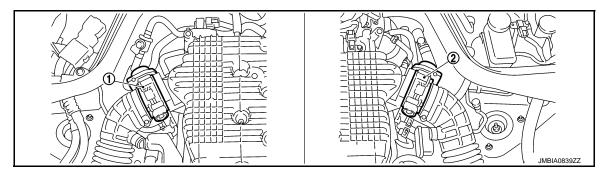
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- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- ) 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

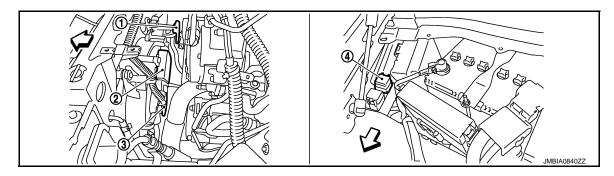
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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

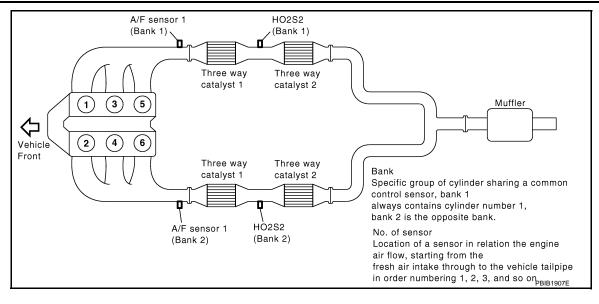


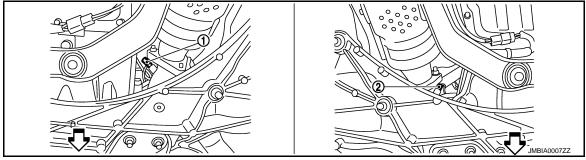
- Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)



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

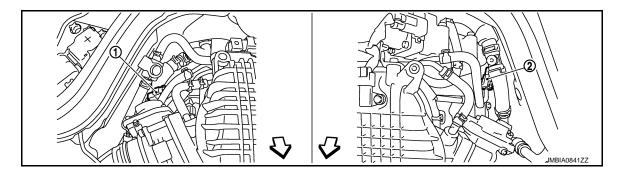
4. Cooling fan relay





A/F sensor 1 (bank 1)

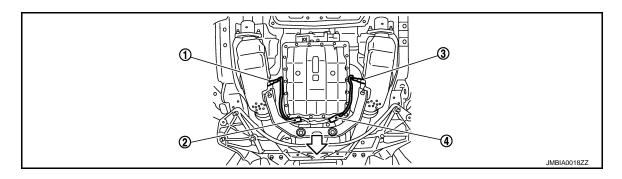
A/F sensor 1 (bank 2)



∵ : Vehicle front

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



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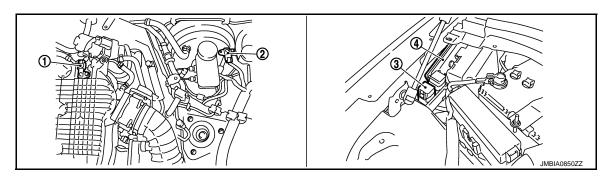
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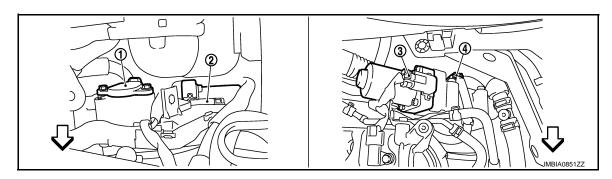
- 1. Heated oxygen sensor 2 (bank 2)
- Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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

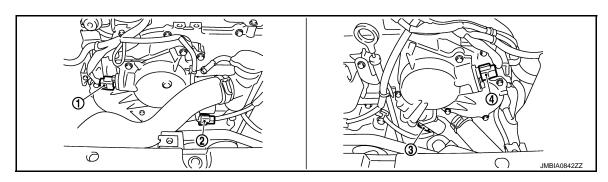
4. VVEL control module



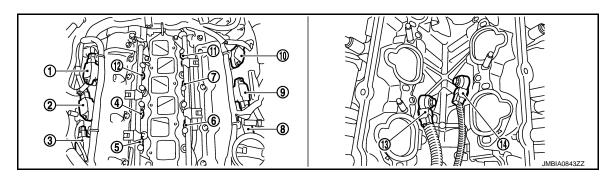
#### ∵ : Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



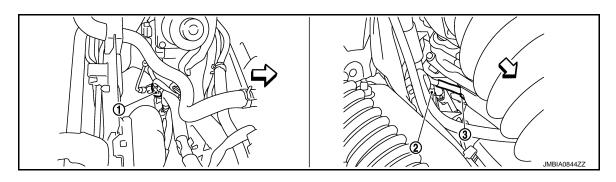
- Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid valve (bank 1) harness connector
- . Intake valve timing control solenoid valve (bank 2) harness connector



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

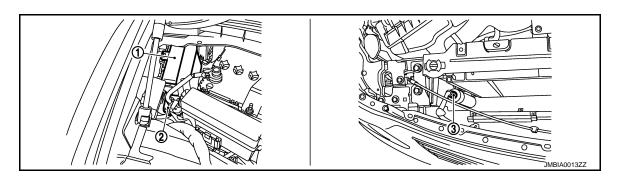
- Ignition coil No.3 (with power transis- 3. tor)
- Fuel injector No.1
- Ignition coil No.2 (with power transis- 9.
- 14. Knock sensor (bank 2)

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



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

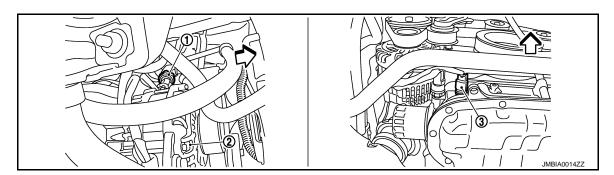
Crankshaft position sensor (POS)



IPDM E/R

Battery current sensor

Refrigerant pressure sensor



**EC-93** Revision: 2013 March 2014 QX50

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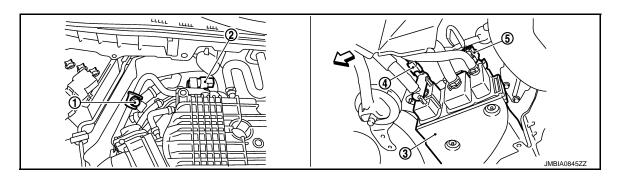
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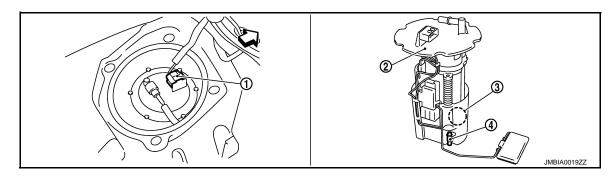
- 1. Power steering pressure sensor
- Alternator

Engine oil temperature sensor



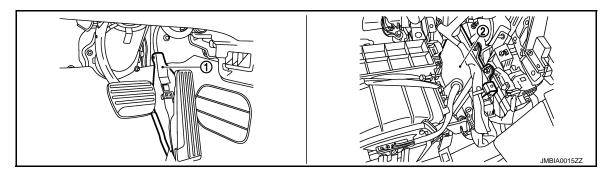
#### ∵ : Vehicle front

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



#### : Vehicle front

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



Accelerator pedal position sensor

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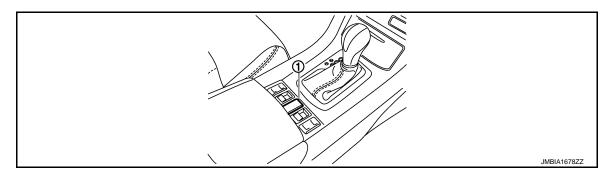
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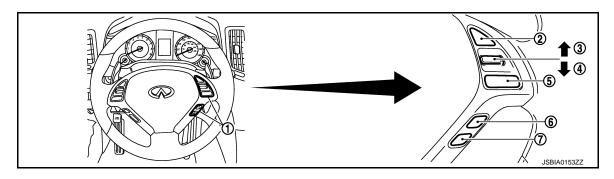
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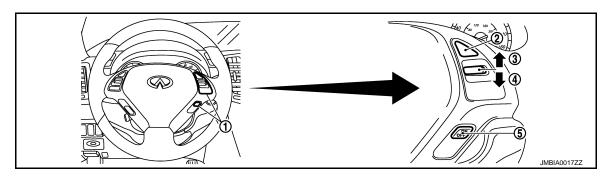
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1. Snow mode switch

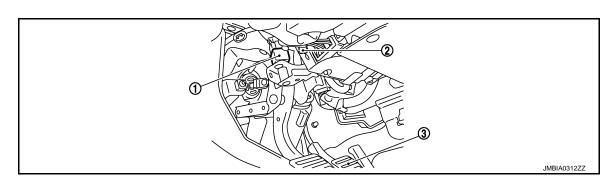


- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch
- 2. CANCEL switch
- 5. DISTANCE switch
- 3. RESUME/ACCELERATE switch
- 6. MAIN switch



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

3. RESUME/ACCELERATE switch



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

## **COOLING FAN CONTROL**

## < SYSTEM DESCRIPTION >

[VQ37VHR]

# **Component Description**

INFOID:0000000009063905

Component	Reference
Camshaft position sensor (PHASE)	EC-304, "Description"
Cooling fan control module	EC-501, "Description"
Cooling fan motor	EC-501, "Description"
Crankshaft position sensor (POS)	EC-300, "Description"
Engine coolant temperature sensor	EC-213, "Description"
Refrigerant pressure sensor	EC-530, "Description"

[VQ37VHR]

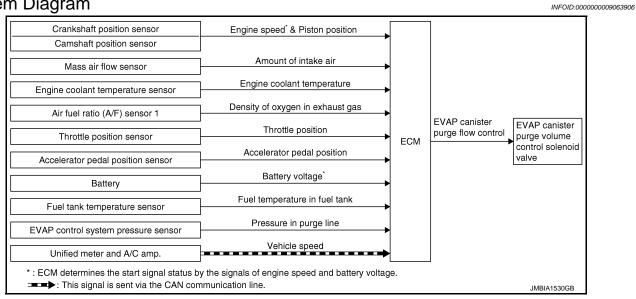
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# **EVAPORATIVE EMISSION SYSTEM**

System Diagram



# System Description

INFOID:0000000009063907

#### 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			
Accelerator pedal position sensor	Accelerator pedal position	purge flow control			
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	-			
Fuel tank temperature sensor	Fuel temperature in fuel tank				
EVAP control system pressure sensor	Pressure in purge line				
Unified meter and A/C amp.	Vehicle speed*2				

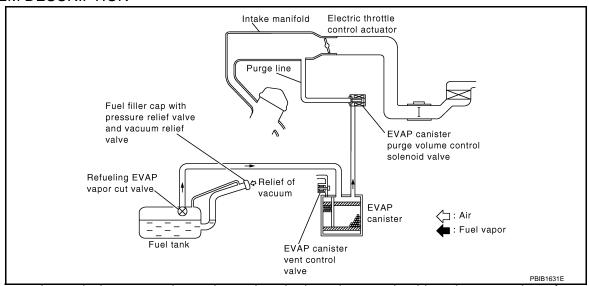
<sup>\*1:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

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

#### SYSTEM DESCRIPTION



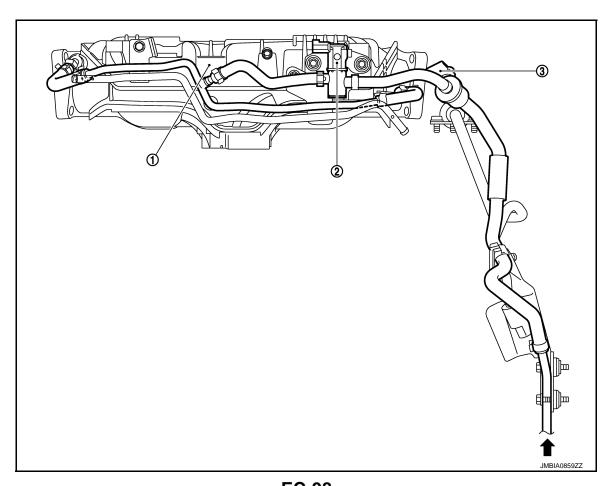
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

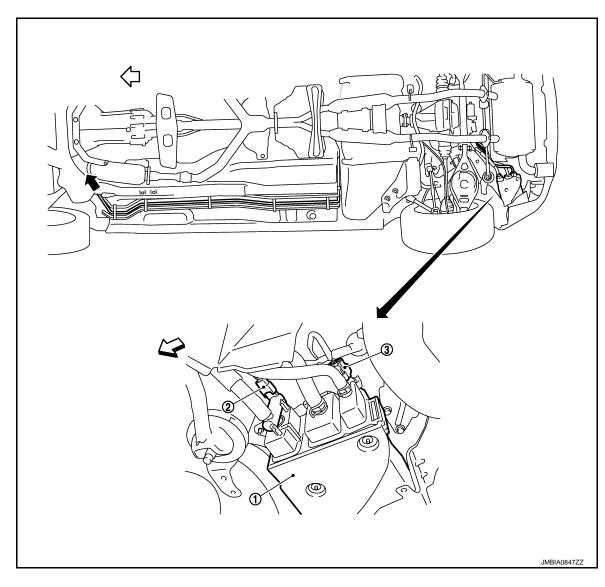
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid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

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

#### **EVAPORATIVE EMISSION LINE DRAWING**



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



1. EVAP canister

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

-: To previous figure

#### NOTE:

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

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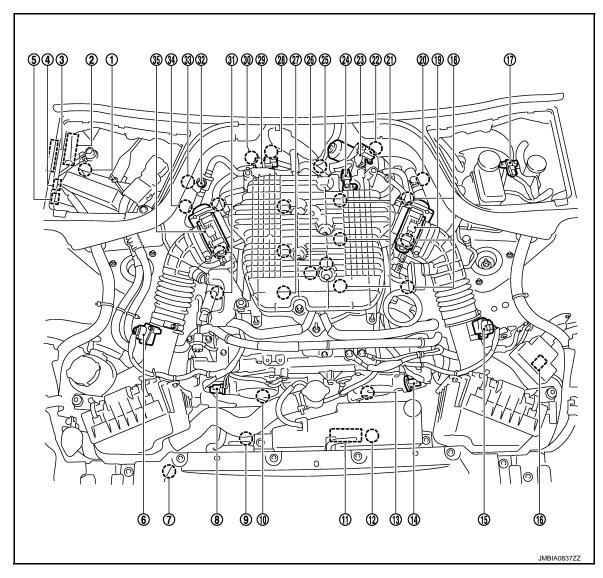
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### Component Parts Location

INFOID:0000000009241918



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

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

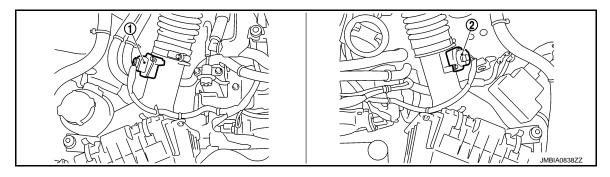
- VVEL control module
- Mass air flow sensor (with intake air temperature sensor) (bank 1)
- Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP)
- 27. Fuel injector (bank 1)
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor (bank 1)

### **EVAPORATIVE EMISSION SYSTEM**

< SYSTEM DESCRIPTION > [VQ37VHR]

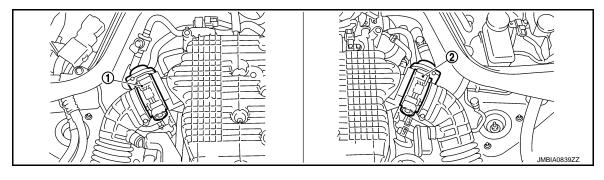
- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

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



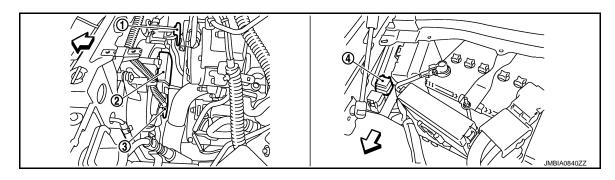
 Mass air flow sensor (with intake air 2. temperature sensor) (bank 1)

Mass air flow sensor (bank 2)



Electric throttle control actuator (bank 1)

2. Electric throttle control actuator (bank 2)



: Vehicle front

Cooling fan motor-2
 Cooling fan relay

2. Cooling fan control module

3. Cooling fan motor-1

Revision: 2013 March **EC-101** 2014 QX50

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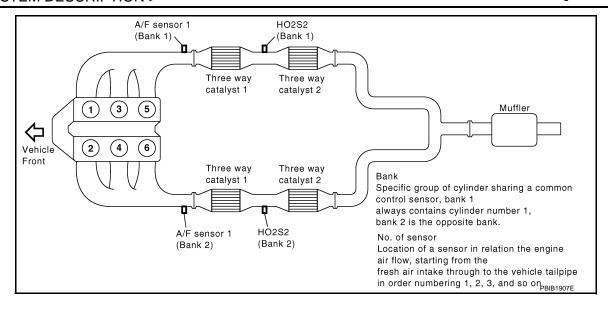
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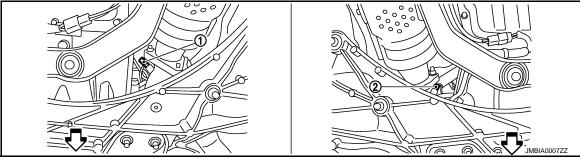
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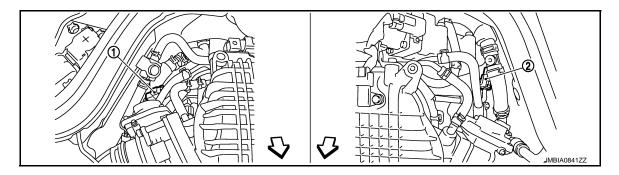
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A/F sensor 1 (bank 1)

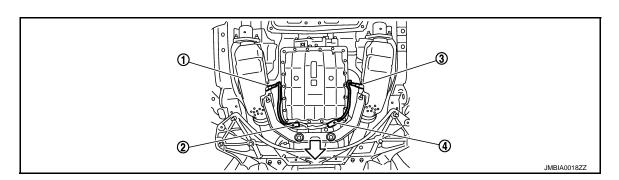
A/F sensor 1 (bank 2)



∵ : Vehicle front

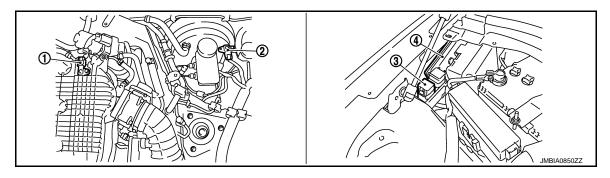
nector

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



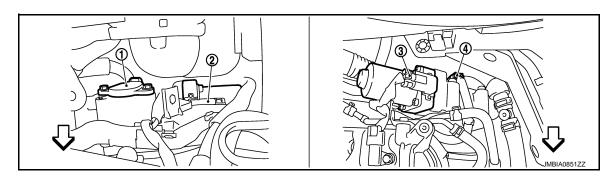
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- Heated oxygen sensor 2 (bank 1)

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



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

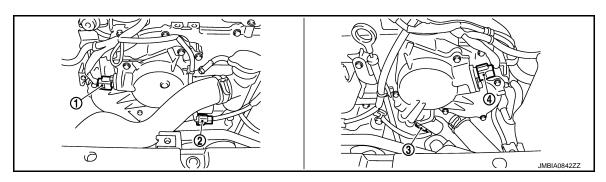
4. VVEL control module



: Vehicle front

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

 VVEL control shaft position sensor (bank 2)



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

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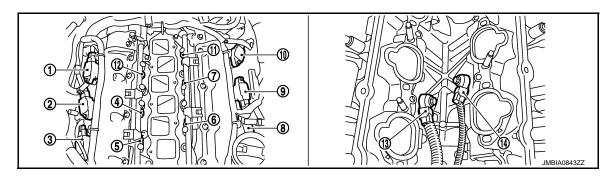
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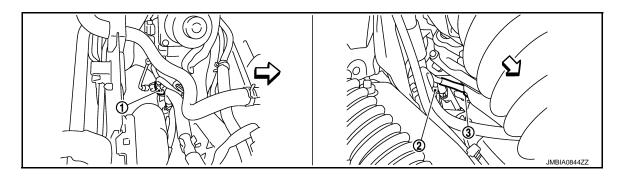
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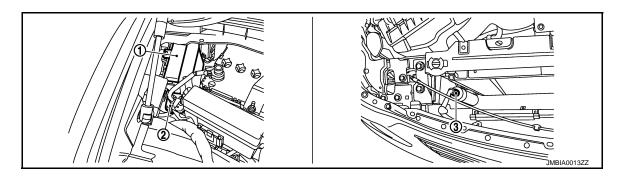
- Ignition coil No.5 (with power transis- 2.
- 4. Fuel injector No.3
- Fuel injector No.4
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- 13. Knock sensor (bank 1)

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

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

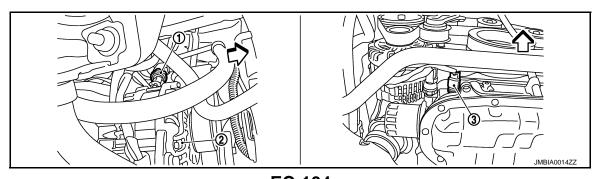


- Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- Crankshaft position sensor (POS)



IPDM E/R

- Battery current sensor
- Refrigerant pressure sensor

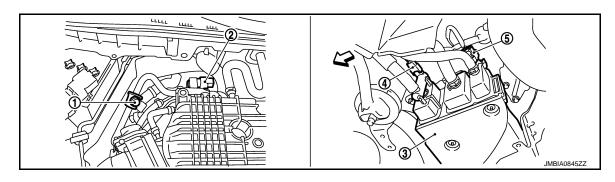


 $\triangleleft$ : Vehicle front

1. Power steering pressure sensor

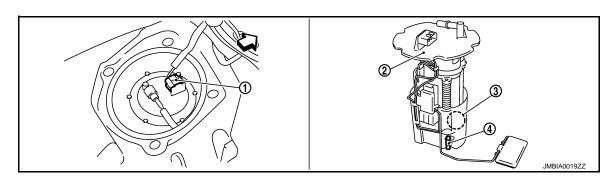
Alternator

3. Engine oil temperature sensor



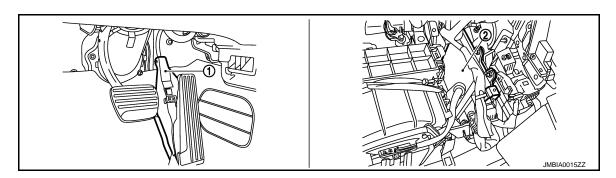
 $\triangleleft$ : Vehicle front

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



: 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



Accelerator pedal position sensor

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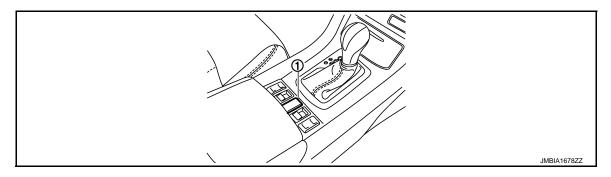
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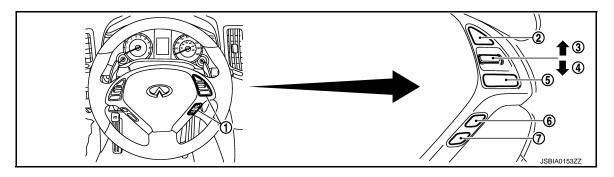
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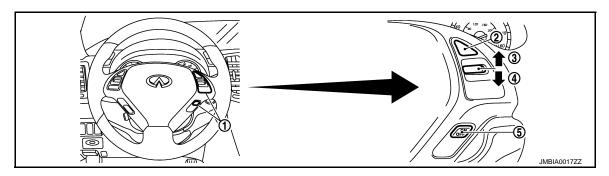


Snow mode switch



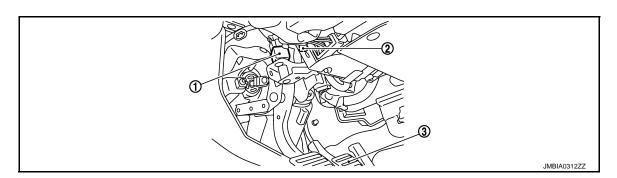
- ICC steering switch 1.
- SET/COAST switch 4.
- LDP/DCA switch 7.

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



- ASCD steering switch
- SET/COAST switch
- **CANCEL** switch
- MAIN switch

RESUME/ACCELERATE switch



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

### **EVAPORATIVE EMISSION SYSTEM**

### < SYSTEM DESCRIPTION >

## [VQ37VHR]

# Component Description

INFOID:0000000009063909

Component	Reference	
A/F sensor 1	EC-228, "Description"	
Accelerator pedal position sensor	EC-483, "Description"	
Camshaft position sensor (PHASE)	EC-304, "Description"	
Crankshaft position sensor (POS)	EC-300, "Description"	
Engine coolant temperature sensor	EC-213, "Description"	
EVAP canister purge volume control solenoid valve	EC-318, "Description"	
EVAP control system pressure sensor	EC-334, "Description"	
Fuel tank temperature sensor	EC-273, "Description"	
Mass air flow sensor	EC-188, "Description"	
Throttle position sensor	EC-216, "Description"	

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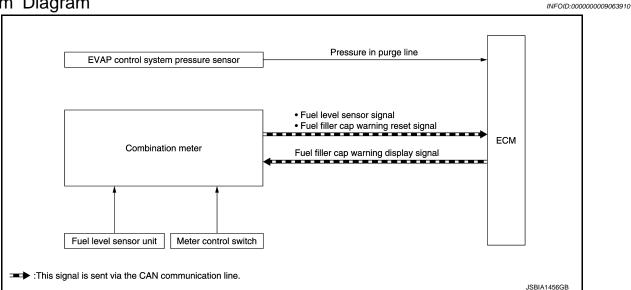
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[VQ37VHR]

### FUEL FILLER CAP WARNING SYSTEM

System Diagram



### System Description

INFOID:0000000009063911

#### 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*	

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

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Unit	Output signal	Actuator
ECM	Fuel filler cap warning display signal*	Combination meter

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

#### SYSTEM DESCRIPTION

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

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

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

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

#### **CAUTION:**

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

#### **Reset Operation**

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

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

· DTC erased by using CONSULT.

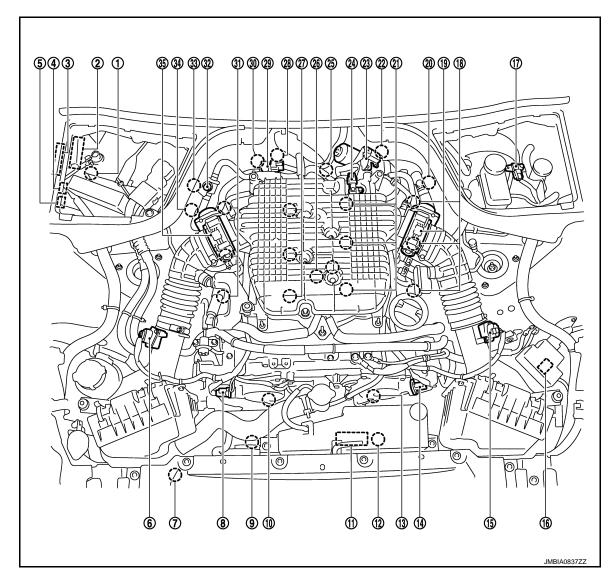
#### NOTE:

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

INFOID:0000000009241919

[VQ37VHR]



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

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

- VVEL control module 3.
- Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 9. Cooling fan motor-2
- Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- Ignition coil (with power transistor) 18. and spark plug (bank 2)
- 21. Fuel injector (bank 2)

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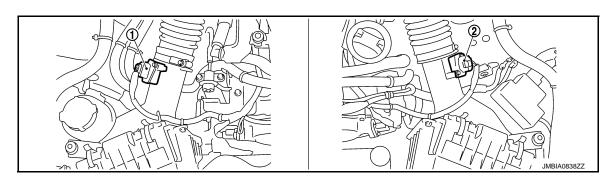
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24. Manifold absolute pressure (MAP)

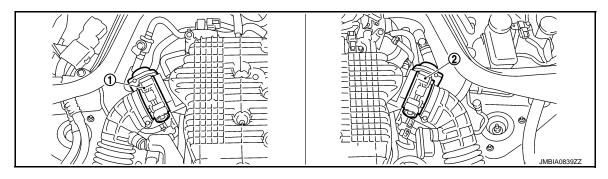
27. Fuel injector (bank 1)

- 28. VVEL actuator motor (bank 1)
- solenoid valve
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor (bank 1)
- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

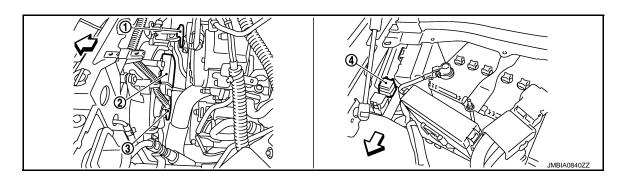
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



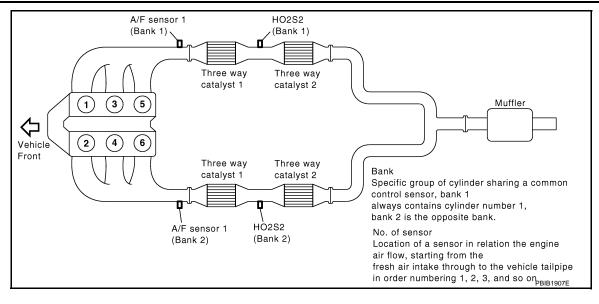
- Mass air flow sensor (with intake air 2. Mass air flow sensor (bank 2) temperature sensor) (bank 1)

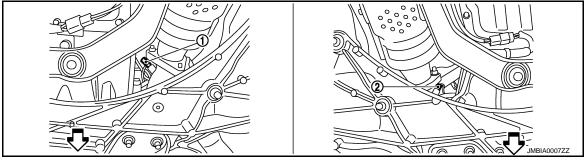


- Electric throttle control actuator (bank 1)
- Electric throttle control actuator (bank 2)



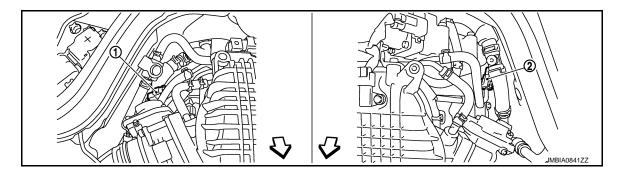
- Cooling fan motor-2
- Cooling fan control module
- Cooling fan motor-1





1. A/F sensor 1 (bank 1)

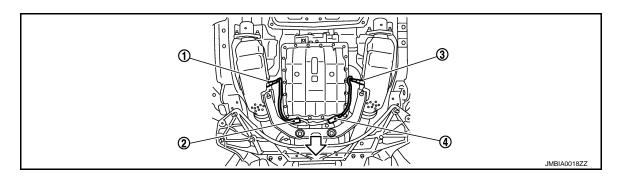
2. A/F sensor 1 (bank 2)



∵ : Vehicle front

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

A/F sensor 1 (bank 2) harness connector



Revision: 2013 March **EC-111** 2014 QX50

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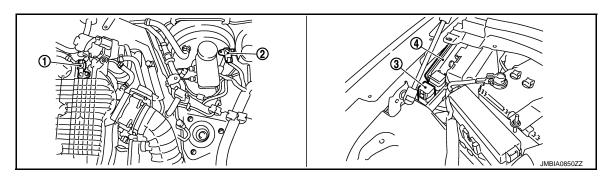
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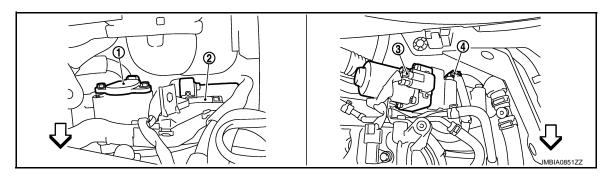
- 1. Heated oxygen sensor 2 (bank 2)
- Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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

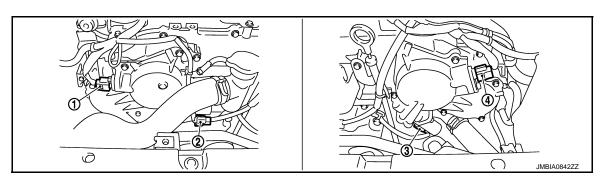
4. VVEL control module



### ∵ : Vehicle front

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

4. VVEL control shaft position sensor (bank 2)

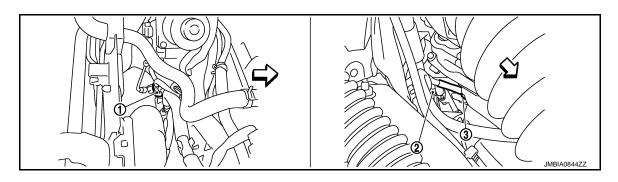


- Camshaft position sensor (PHASE) 2. (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- Intake valve timing control solenoid valve (bank 1) harness connector
- Intake valve timing control solenoid valve (bank 2) harness connector

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

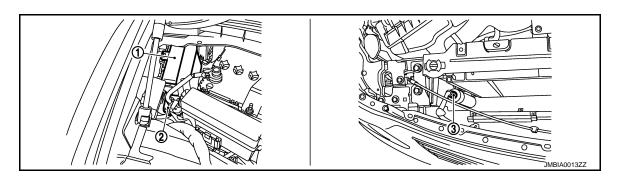
- Ignition coil No.3 (with power transis- 3. tor)
- Fuel injector No.1
- Ignition coil No.2 (with power transis- 9.
- 14. Knock sensor (bank 2)

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



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

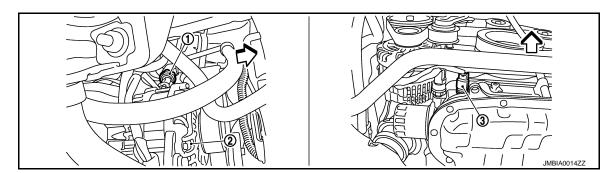
Crankshaft position sensor (POS)



IPDM E/R

Battery current sensor

Refrigerant pressure sensor



**EC-113** Revision: 2013 March 2014 QX50

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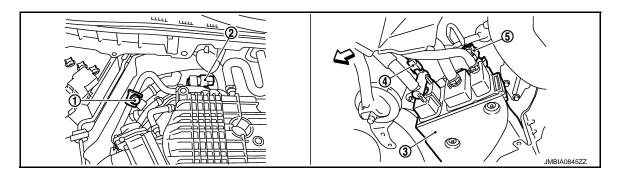
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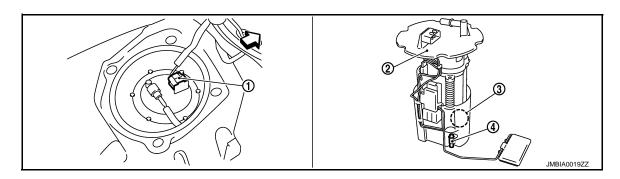
- 1. Power steering pressure sensor
- 2. Alternator

Engine oil temperature sensor



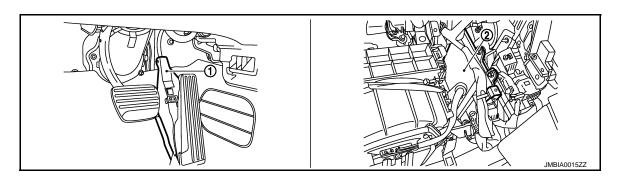
### ∵ : Vehicle front

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



### : Vehicle front

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



Accelerator pedal position sensor

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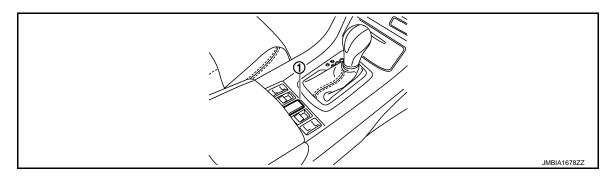
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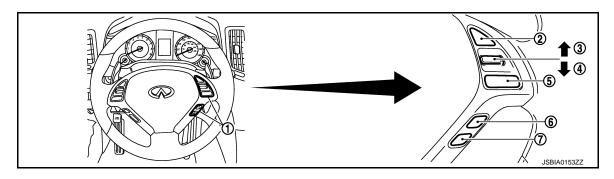
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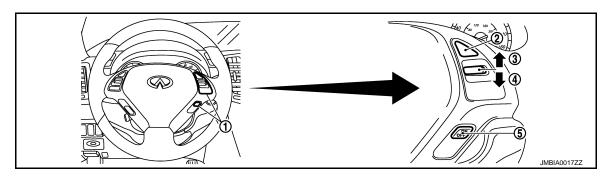
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1. Snow mode switch

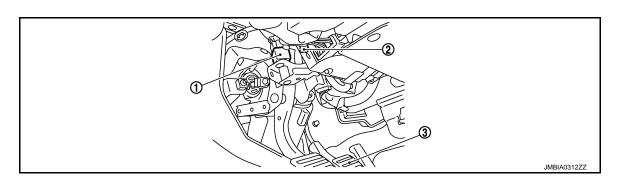


- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch
- 2. CANCEL switch
- 5. DISTANCE switch
- 3. RESUME/ACCELERATE switch
- 6. MAIN switch



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

3. RESUME/ACCELERATE switch



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

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Revision: 2013 March **EC-115** 2014 QX50

### **FUEL FILLER CAP WARNING SYSTEM**

< SYSTEM DESCRIPTION >

[VQ37VHR]

# Component Description

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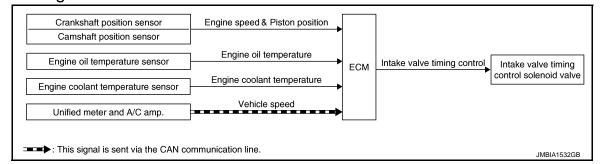
Component	Reference
EVAP control system pressure sensor	EC-334, "Description"
Fuel level sensor	EC-355, "Description"

[VQ37VHR]

# INTAKE VALVE TIMING CONTROL

### System Diagram

INFOID:0000000009063914



# System Description

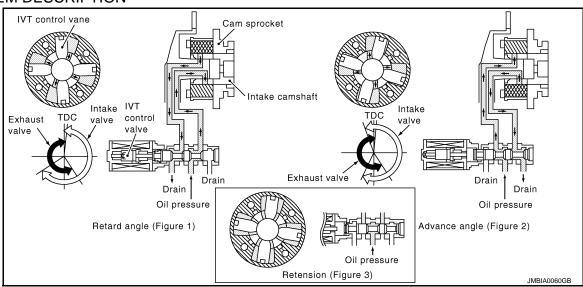
#### INFOID:0000000009063915

### 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)	Erigine 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			
Unified meter and A/C amp.	Vehicle speed*			

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

### SYSTEM DESCRIPTION



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

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.

**EC-117** Revision: 2013 March 2014 QX50

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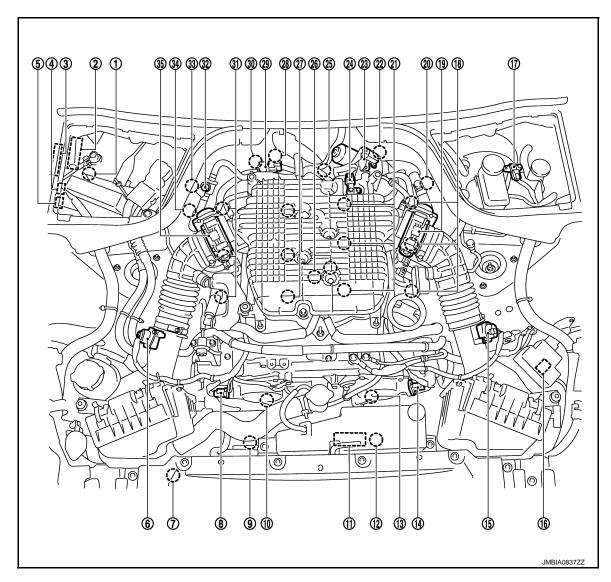
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### Component Parts Location

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

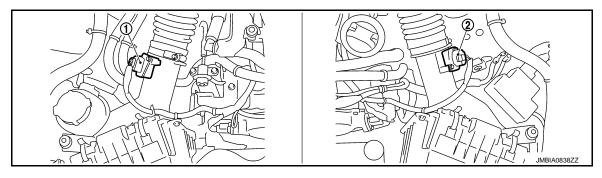
- IPDM E/R
- VVEL actuator motor relay
- Camshaft position sensor (PHASE) (bank 1)
- 11. Cooling fan control module
- 14. Camshaft position sensor (PHASE) (bank 2)
- 17. Brake booster pressure sensor
- 20. A/F sensor 1 (bank 2)
- 23. VVEL actuator motor (bank 2)
- 26. Knock sensor
- solenoid valve

- VVEL control module
- Mass air flow sensor (with intake air temperature sensor) (bank 1)
- Cooling fan motor-2
- 12. Cooling fan motor-1
- 15. Mass air flow sensor (bank 2)
- 18. Ignition coil (with power transistor) and spark plug (bank 2)
- 21. Fuel injector (bank 2)
- 24. Manifold absolute pressure (MAP)
- 27. Fuel injector (bank 1)
- 29. EVAP canister purge volume control 30. VVEL control shaft position sensor (bank 1)

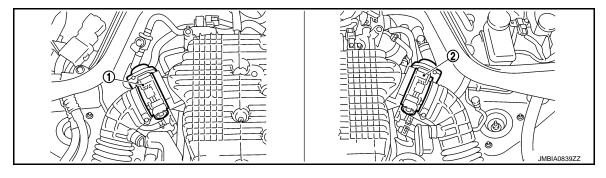
- 31. Ignition coil (with power transistor) and spark plug (bank 1)
- 32. EVAP service port
- 33. A/F sensor 1 (bank 1)

[VQ37VHR]

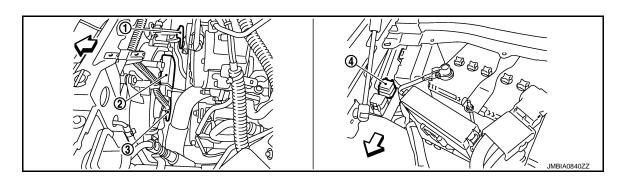
- 34. Crankshaft position sensor (POS)
- 35. Electric throttle control actuator (bank 1)



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



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



: Vehicle front

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

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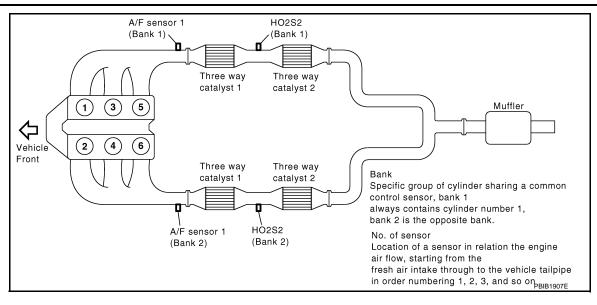
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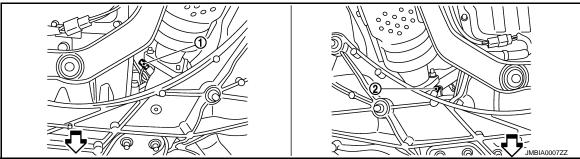
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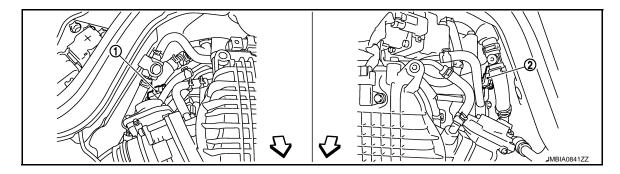
Revision: 2013 March **EC-119** 2014 QX50





A/F sensor 1 (bank 1)

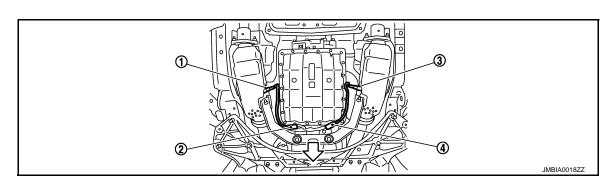
2. A/F sensor 1 (bank 2)



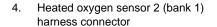
∵ : Vehicle front

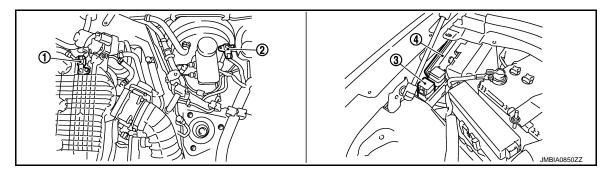
nector

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



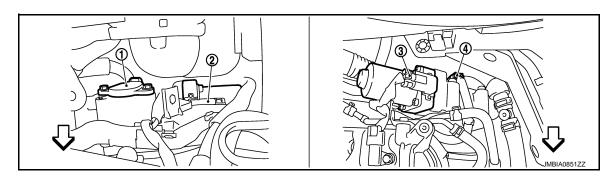
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)





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

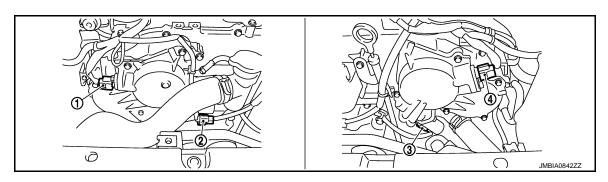
4. VVEL control module



: Vehicle front

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

 VVEL control shaft position sensor (bank 2)



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

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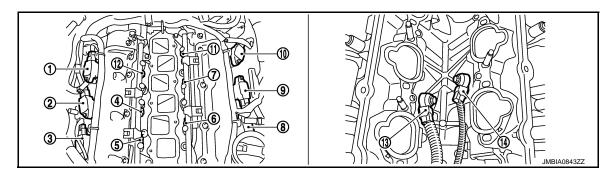
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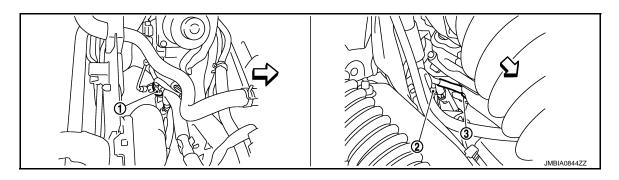
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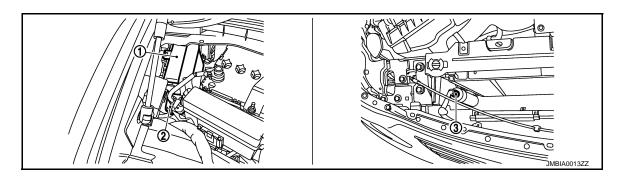
- Ignition coil No.5 (with power transis- 2.
- 4. Fuel injector No.3
- Fuel injector No.4
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- 13. Knock sensor (bank 1)

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

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

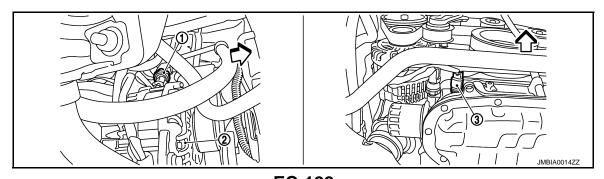


- Engine coolant temperature sensor 2. A/F sensor 1 (bank 1)
- Crankshaft position sensor (POS)



IPDM E/R

- Battery current sensor
- Refrigerant pressure sensor

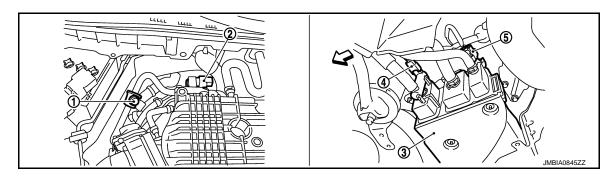


 $\triangleleft$ : Vehicle front

1. Power steering pressure sensor

2. Alternator

3. Engine oil temperature sensor



 $\triangleleft$ : Vehicle front

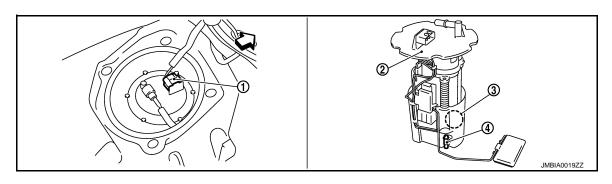
1. EVAP service port

EVAP canister purge volume control 3. EV/ solenoid valve

. EVAP canister

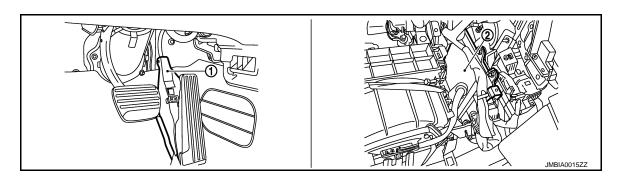
4. EVAP canister vent control valve

5. EVAP control system pressure sensor



: Vehicle front

- 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



Accelerator pedal position sensor

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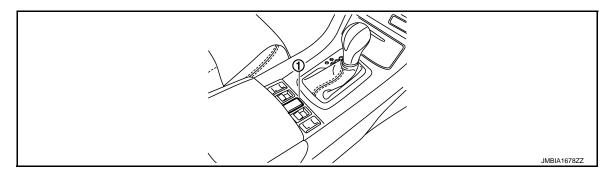
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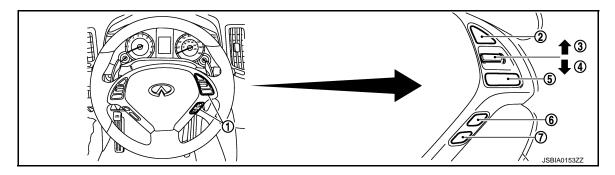
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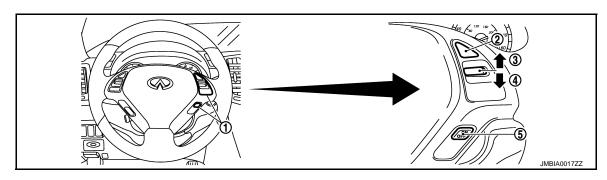


Snow mode switch



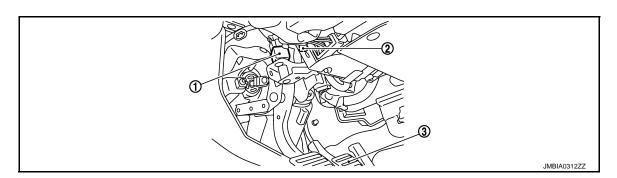
- ICC steering switch 1.
- SET/COAST switch 4.
- LDP/DCA switch

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



- ASCD steering switch
- SET/COAST switch
- **CANCEL** switch
- MAIN switch

3. RESUME/ACCELERATE switch



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

# **INTAKE VALVE TIMING CONTROL**

### < SYSTEM DESCRIPTION >

[VQ37VHR]

# **Component Description**

INFOID:0000000009063917

Component	Reference
Camshaft position sensor (PHASE)	EC-304, "Description"
Crankshaft position sensor (POS)	EC-300, "Description"
Engine coolant temperature sensor	EC-213, "Description"
Engine oil temperature sensor	EC-280, "Description"
Intake valve timing control solenoid valve	EC-185, "Description"

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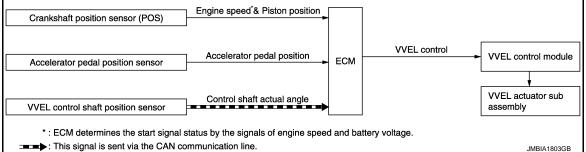
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### **VVEL SYSTEM**

### System Diagram





### System Description

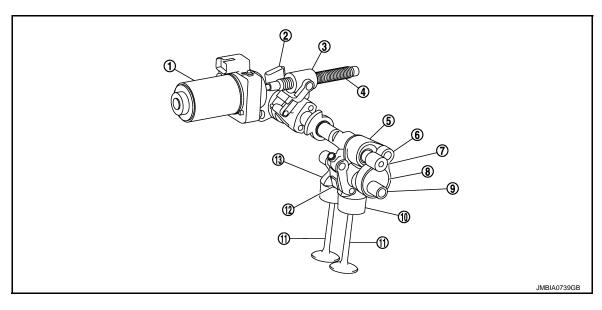
#### INFOID:0000000009063919

### 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	<b>↓</b>
VVEL control shaft position sensor	Control shaft actual angle*		VVEL actuator sub assembly

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

#### SYSTEM DESCRIPTION



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

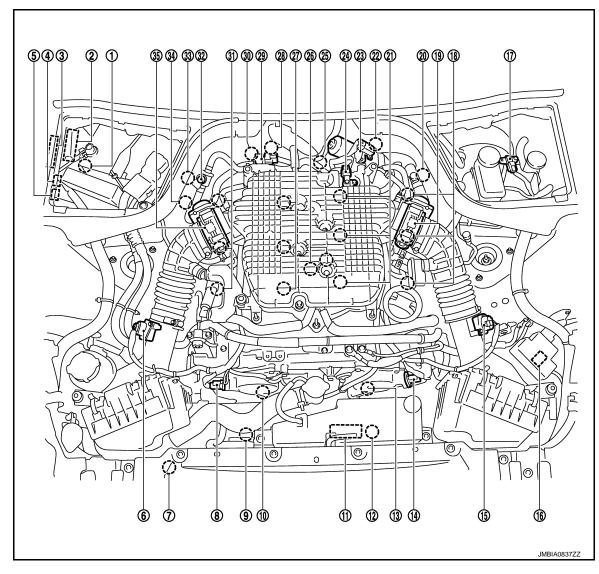
- VVEL control shaft position sensor
- 5. Rocker arm
- 8. Eccentric cam
- 11. Intake valve

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

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

### **Component Parts Location**

INFOID:0000000009241921



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

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

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

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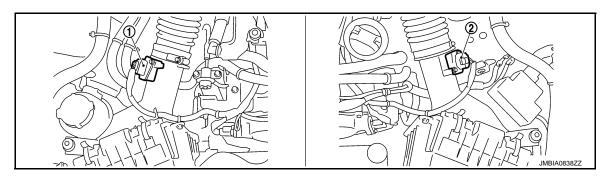
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- 31. Ignition coil (with power transistor) and spark plug (bank 1)

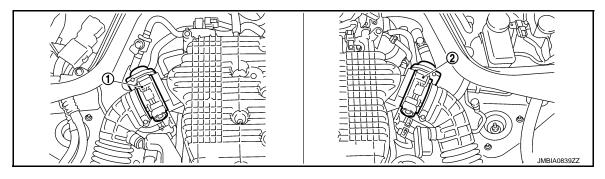
33. A/F sensor 1 (bank 1)

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

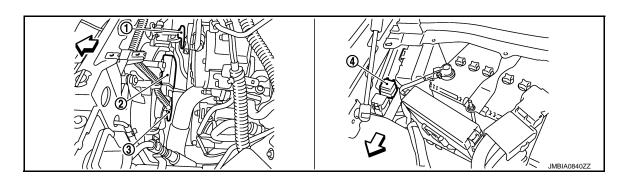
32. EVAP service port



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



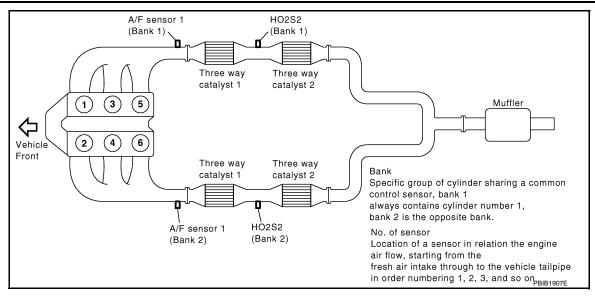
- Electric throttle control actuator (bank 1)
- 2. Electric throttle control actuator (bank 2)

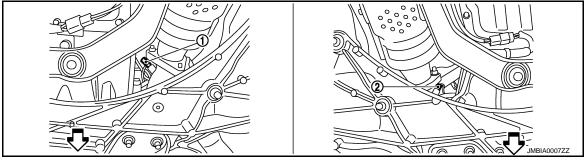


∵ : Vehicle front

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

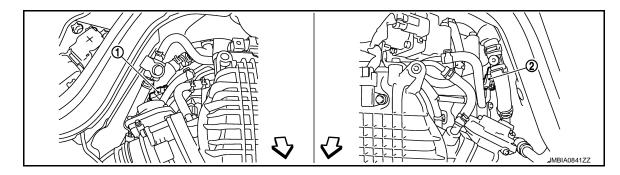
Cooling fan relay





A/F sensor 1 (bank 1)

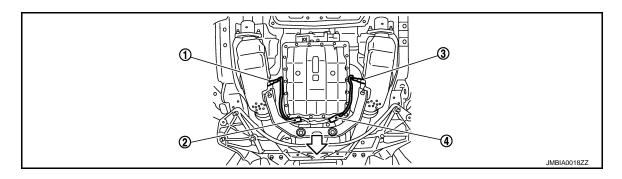
A/F sensor 1 (bank 2)



∵ : Vehicle front

nector

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



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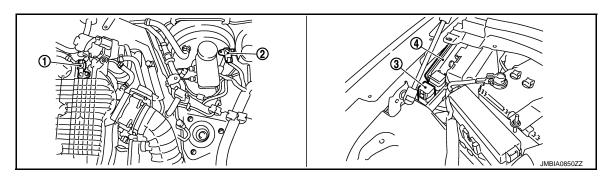
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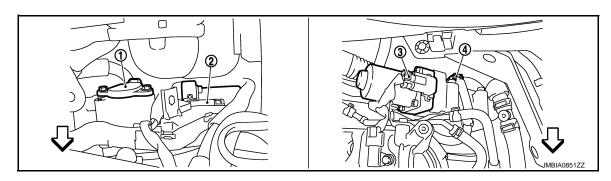
- 1. Heated oxygen sensor 2 (bank 2)
- 2. Heated oxygen sensor 2 (bank 2) harness connector
- 3. Heated oxygen sensor 2 (bank 1)

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



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

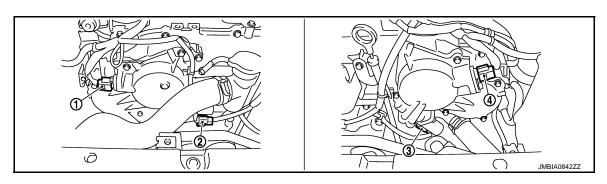
4. VVEL control module



### ∵ : Vehicle front

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

4. VVEL control shaft position sensor (bank 2)



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

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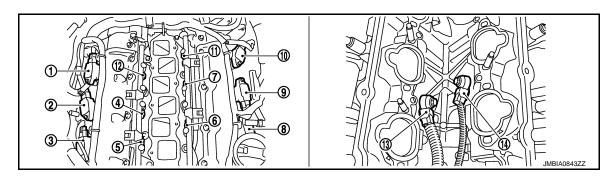
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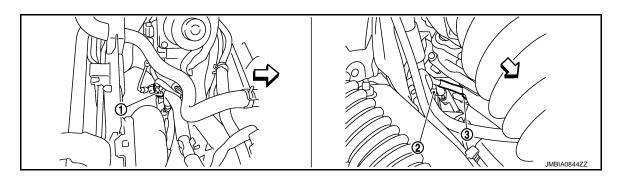
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- Ignition coil No.5 (with power transis- 2. tor)
- 4. Fuel injector No.3
- Fuel injector No.4 7.
- 10. Ignition coil No.6 (with power transis- 11. Fuel injector No.6
- 13. Knock sensor (bank 1)

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

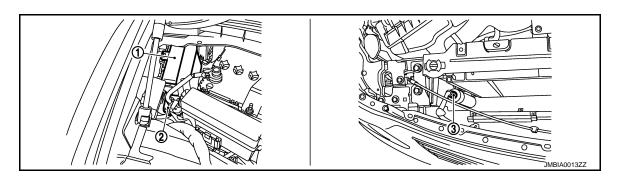
- Ignition coil No.1 (with power transistor)
- Fuel injector No.2
- Ignition coil No.4 (with power transistor)
- 12. Fuel injector No.5



: Vehicle front

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

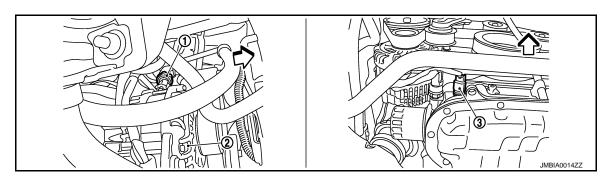
Crankshaft position sensor (POS)



IPDM E/R

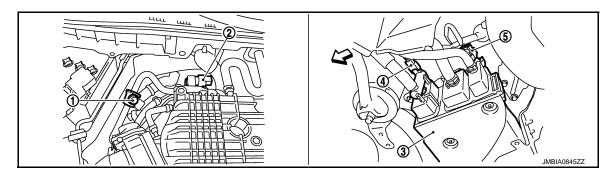
Battery current sensor

Refrigerant pressure sensor



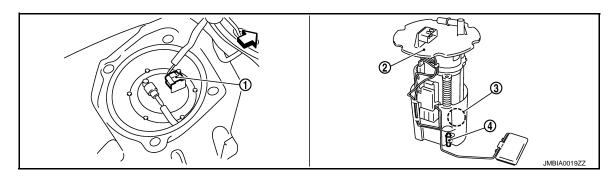
- 1. Power steering pressure sensor
- Alternator

Engine oil temperature sensor



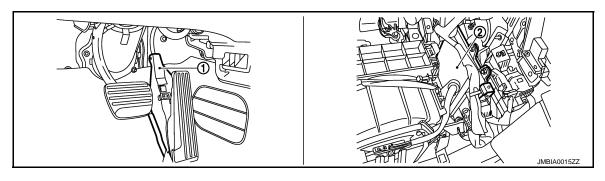
### ∵ : Vehicle front

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



### : Vehicle front

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



Accelerator pedal position sensor **ECM** 

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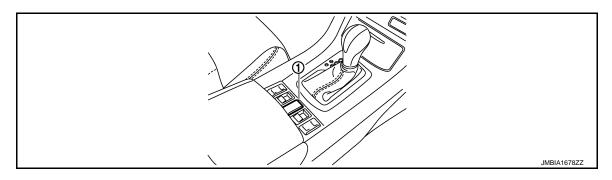
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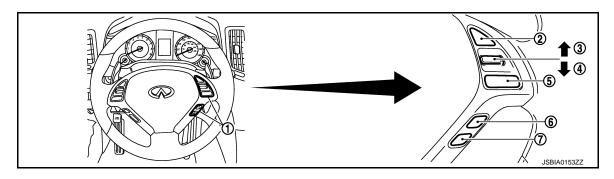
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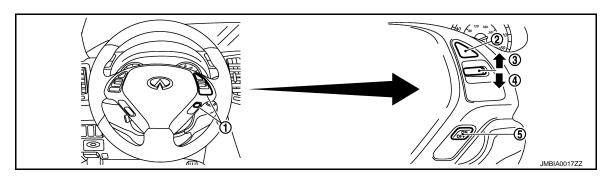
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1. Snow mode switch

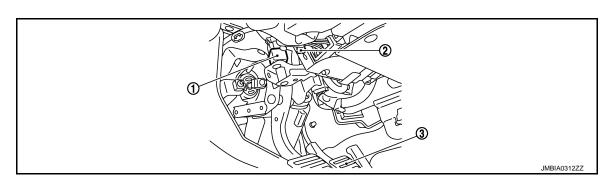


- 1. ICC steering switch
- 4. SET/COAST switch
- 7. LDP/DCA switch
- 2. CANCEL switch
- 5. DISTANCE switch
- 3. RESUME/ACCELERATE switch
- 6. MAIN switch



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

3. RESUME/ACCELERATE switch



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

### **VVEL SYSTEM**

# < SYSTEM DESCRIPTION >

[VQ37VHR]

# **Component Description**

INFOID:0000000009063921

Component	Reference
Accelerator pedal position sensor	EC-483, "Description"
Crankshaft position sensor (POS)	EC-300, "Description"
VVEL actuator motor	EC-400, "Description"
VVEL actuator motor relay	EC-404, "Description"
VVEL control module	EC-468, "Description"
VVEL control shaft position sensor	EC-396, "Description"

### ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION > [VQ37VHR]

# ON BOARD DIAGNOSTIC (OBD) SYSTEM

### **Diagnosis Description**

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

### GST (Generic Scan Tool)

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to <a href="EC-135">EC-135</a>, "Diagnosis Description".

### NOTE:

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

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# DIAGNOSIS SYSTEM (ECM) DIAGNOSIS DESCRIPTION

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

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

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

×: Applicable —: Not applicable

	N				DTC		1st trip DTC	
Items	1:	st trip	2nd trip		1st trip	2nd trip	1st trip	2nd trip
	Blinking	Illuminated	Blinking	Illuminated	displaying displaying	displaying	displaying	displaying
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected	×	_		_	_	_	×	_
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected	_	_	×	_	_	×	_	_
One trip detection diagnoses (Refer to EC-579, "DTC_Index".)	_	×	_	_	×	_	_	_
Except above	_	_	_	×	_	×	×	_

### DIAGNOSIS DESCRIPTION: DTC and Freeze Frame Data

INFOID:0000000009063925

### 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-579</u>, "<u>DTC Index</u>". These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

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

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to <u>EC-9</u>, "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.

### **DIAGNOSIS SYSTEM (ECM)**

### < SYSTEM DESCRIPTION >

[VQ37VHR]

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.

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

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

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

### DIAGNOSIS DESCRIPTION: Counter System

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

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

### COUNTER SYSTEM CHART

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 SYS-TEM".

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-137** Revision: 2013 March 2014 QX50

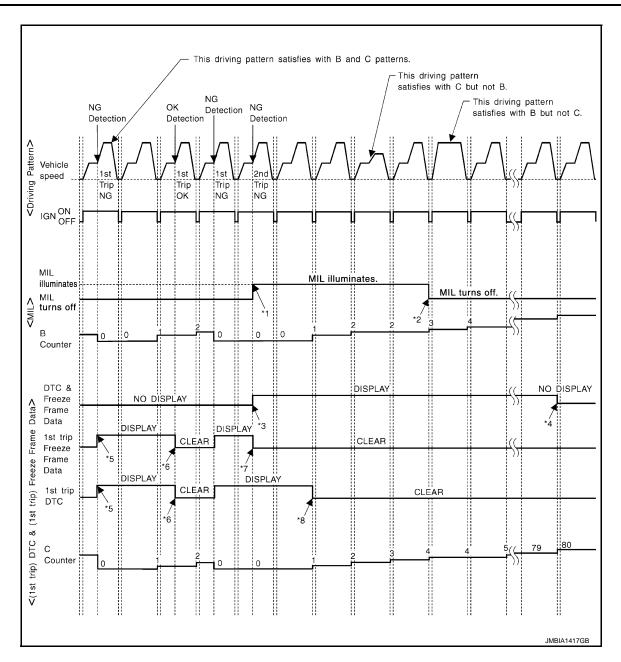
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- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC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

- \*2: MIL will turn OFF after vehicle is driv- \*3: When the same malfunction is deen 3 times (pattern B) without any malfunctions.
- \*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- \*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.
- tected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- \*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

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

Driving Pattern B

Refer to EC-140, "DIAGNOSIS DESCRIPTION: Driving Pattern".

Driving Pattern C

Refer to EC-140, "DIAGNOSIS DESCRIPTION: Driving Pattern".

Example:

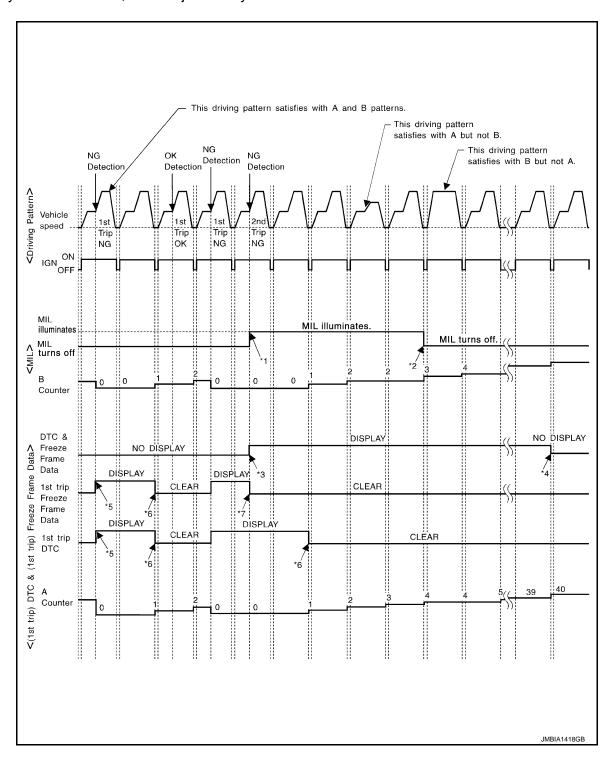
If the stored freeze frame data is as per the following:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

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

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



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

- \*2: MIL will turn OFF after vehicle is driv- \*3: When the same malfunction is deen 3 times (pattern B) without any malfunctions.
- \*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- tected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- \*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

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

Driving Pattern A

Refer to EC-140, "DIAGNOSIS DESCRIPTION: Driving Pattern".

Driving Pattern B

Refer to EC-140, "DIAGNOSIS DESCRIPTION: Driving Pattern".

DIAGNOSIS DESCRIPTION: Driving Pattern

INFOID:0000000009063927

#### **CAUTION:**

Always drive at a safe speed.

### DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.

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

#### NOTE:

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

#### DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.

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

#### NOTE:

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

#### DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:

The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data) ±375 rpm

### **DIAGNOSIS SYSTEM (ECM)**

### < SYSTEM DESCRIPTION >

[VQ37VHR]

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

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

#### NOTE:

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

#### 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

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

#### 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.

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				Example		
Self-diagn	osis result	Diagnosis $ \begin{array}{c} \text{Ignition cycle} \\ \leftarrow \text{ON} \rightarrow \text{ OFF } \leftarrow \text{ON} \rightarrow \text{ OFF } \leftarrow \text{ON} \rightarrow \text{ OFF } \end{array} $				$\leftarrow$ ON $\rightarrow$
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	—(1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"CMPLT"	"CMPLT"	"CMPLT"	"CMPLT"
	Case 2	P0400	OK (1)	— (1)	—(1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"INCMP"	"INCMP"	"CMPLT"	"CMPLT"
NG exists	Case 3	P0400	OK	OK	_	_
		P0402	_	_	_	_
		P1402	NG	_	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	_	1st trip DTC	DTC (= MIL ON)
		SRT of EGR	"INCMP"	"INCMP"	"INCMP"	"CMPLT"

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

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

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. → Case 2 above

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

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

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

#### NOTE:

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

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

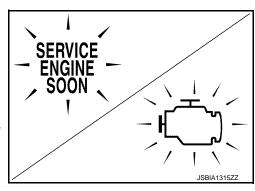
When emission-related ECU detects a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions), it turns on/blinks MIL to inform the driver that a malfunction has been detected.

 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-522</u>, "Component Function Check".

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



INFOID:0000000009063929

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

### **DIAGNOSIS SYSTEM (ECM)**

### < SYSTEM DESCRIPTION >

[VQ37VHR]

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).

### INFOID:0000000009063930

### On Board Diagnosis Function

### ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Self-diagnostic results	DTCs or 1st trip DTCs stored in ECM can be read.
Accelerator pedal released position learning	ECM can learn the accelerator pedal released position. Refer to <a href="EC-20">EC-20</a> , "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</u> , "THROTTLE VALVE <u>CLOSED POSITION LEARNING</u> : <u>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 EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Description".

#### **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-522</u>, "<u>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 EC-141, "DIAGNOSIS DESCRIPTION: System Readiness Test (SRT) Code".

### **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.

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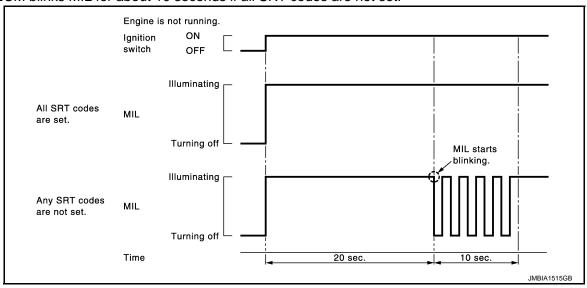
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ECM blinks MIL for about 10 seconds if all SRT codes are not set.



#### MALFUNCTION WARNING MODE

#### Description

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

#### Operation Procedure

- 1. Turn ignition switch ON.
- Check that MIL illuminates.
  - If it remains OFF, check MIL circuit. Refer to EC-522, "Diagnosis Procedure".
- Start engine and let it idle.
  - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
  - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
  - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

### SELF-DIAGNOSTIC RESULTS MODE

### Description

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

How to Set Self-diagnostic Results Mode

#### NOTE:

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

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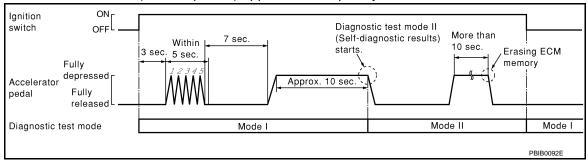
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#### NOTE:

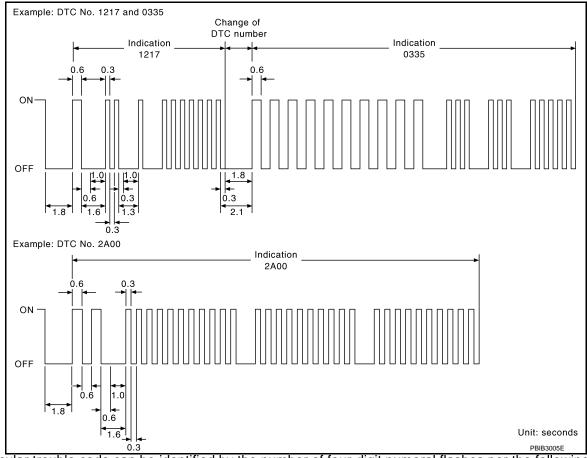
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

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

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in "malfunction warning" mode, it is a DTC; if two or more codes are displayed, they may be either 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	Α	В	С	D	Е	F
Flashes	10	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16

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

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

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

### < SYSTEM DESCRIPTION >

[VQ37VHR]

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to <u>EC-579</u>, "<u>DTC Index</u>".

How to Erase Self-diagnostic Results

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

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

#### NOTE:

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

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

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### **FUNCTION**

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

- \*: The following emission-related diagnostic information is cleared when the ECM memory is erased.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

#### SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-579, "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

### < SYSTEM DESCRIPTION >

[VQ37VHR]

#### 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 EC-579, "DTC Index"), skip step 1.
- Erase DTC in TCM. Refer to TM-64, "CONSULT Function".
- Select "ENGINE" with CONSULT.
- Select "SELF-DIAG RESULTS".
- 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 EC-579, "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 [%]	<ul> <li>The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel sched- ule.</li> </ul>
ENGINE SPEED [rpm]	The engine speed at the moment a malfunction is detected is displayed
VEHICL SPEED [km/h] or [mph]	The vehicle speed at the moment a malfunction is detected is displayed
ABSOL TH-P/S [%]	The throttle valve opening angle at the moment a malfunction is detected is displayed
B/FUEL SCHDL [msec]	The base fuel schedule at the moment a malfunction is detected is displayed
INT/A TEMP SE [°C] or [°F]	The intake air temperature at the moment a malfunction is detected is displayed
FUEL SYS-B1	"Fuel injection system status" at the moment a malfunction is detected is displayed.
FUEL SYS-B2	One of the following mode is displayed.     Mode2: Open loop due to detected system malfunction     Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment)     Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control     Mode5: Open loop - has not yet satisfied condition to go to closed loop
INT MANI PRES [kPa]	
COMBUST CONDI- TION	These items are displayed but are not applicable to this model.

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

### DATA MONITOR MODE

### NOTE:

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

#### Monitored Item

For reference values of the following items, refer to EC-535, "Reference Value".

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Monitored item	Unit	Description	×: Applicable Remarks
wormored item	Offit		Accuracy becomes poor if engine
ENG SPEED	rpm	Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	<ul> <li>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 certain
MAS A/F SE-B2	V	The signal voltage of the mass air flow sensor is displayed.	value is indicated.  • When engine is running, specification range is indicated in "SPEC".
B/FUEL SCHDL	msec	"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	When engine is running, specification range is indicated in "SPEC".
A/F ALPHA-B1			When the engine is stopped, a certain
A/F ALPHA-B2	%	The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated.	<ul> <li>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 tempera- ture sensor) is displayed.	When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The en- gine coolant temperature determined by the ECM is displayed.
A/F SEN1 (B1)	V	The A/F signal computed from the input signal of	
A/F SEN1 (B2)	V	the air fuel ratio (A/F) sensor 1 is displayed.	
HO2S2 (B1)	V	The signal voltage of the heated oxygen sensor 2	
HO2S2 (B2)	-	is displayed.	
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	RICH/LEAN	Display of heated oxygen sensor 2 signal:     RICH: means the amount of oxygen after three     way catalyst is relatively small.     LEAN: means the amount of oxygen after three     way catalyst is relatively large.	When the engine is stopped, a certain value is indicated.
VHCL SPEED SE	km/h or mph	The vehicle speed computed from the vehicle speed signal sent from combination meter is dis- played.	
BATTERY VOLT	V	The power supply voltage of ECM is displayed.	
ACCEL SEN 1		The accelerator pedal position sensor signal volt-	ACCEL SEN 2 signal is converted by
ACCEL SEN 2	V	age is displayed.	ECM internally. Thus, they differs from ECM terminal voltage signal.
TP SEN 1-B1		The throttle position sensor signal voltage is dis-	TP SEN 2-B1 signal is converted by  COM integrably. Thus, they different
TP SEN 2-B1	V	played.	ECM internally. Thus, they differs from ECM terminal voltage signal.
FUEL T/TMP SE	°C or °F	The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE	°C or °F	The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES	V	The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE	V	The signal voltage of the fuel level sensor is displayed.	
START SIGNAL	ON/OFF	Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	After starting the engine, [OFF] is dis- played regardless of the starter sig- nal.

## < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
CLSD THL POS	ON/OFF	Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG	ON/OFF	Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW	ON/OFF	Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.	
PW/ST SIGNAL	ON/OFF	[ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated.	
LOAD SIGNAL	ON/OFF	Indicates [ON/OFF] condition from the electrical load signal.     ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position.     OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	Indicates [ON/OFF] condition from the heater fan switch signal.	
BOOST VCUM SW	ON/OFF	Always a certain value is displayed.     This item is not efficient for this models.	
BRAKE SW	ON/OFF	Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1		Indicates the actual fuel injection pulse width	When the engine is stopped, a certain
INJ PULSE-B2	msec	compensated by ECM according to the input signals.	computed value is indicated.
IGN TIMING	BTDC	Indicates the ignition timing computed by ECM according to the input signals.	When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	"Calculated load value" indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g/s	Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	<ul> <li>Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
INT/V TIM (B1)	°CA	Indicates [°CA] of intake camshaft advance an-	
INT/V TIM (B2)		gle.	
INT/V SOL (B1)		The control value of the intake valve timing con- trol colons id valve (determined by ECM accord	
INT/V SOL (B2)	%	<ul> <li>trol 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>	
TP SEN 1-B2		The throttle position sensor signal voltage is dis-	TP SEN 2-B2 signal is converted by
TP SEN 2-B2	V	played.	ECM internally. Thus, they differs from ECM terminal voltage signal.
AIR COND RLY	ON/OFF	The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY	ON/OFF	Indicates the fuel pump relay control condition determined by ECM according to the input sig- nals.	

## < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
VENT CONT/V ON/OFF		The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated.     ON: Closed OFF: Open	
THRTL RELAY	ON/OFF	Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
HO2S2 HTR (B1)	011/0==	Indicates [ON/OFF] condition of heated oxygen	
HO2S2 HTR (B2)	ON/OFF	sensor 2 heater determined by ECM according to the input signals.	
I/P PULLY SPD	rpm	Indicates the engine speed computed from the in- put speed sensor signal.	
VEHICLE SPEED	km/h or mph	The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN	YET/CMPLT	Displays the condition of Idle Air Volume Learning     YET: Idle air volume learning has not been performed yet.     CMPLT: Idle air volume learning has already been performed successfully.	
SNOW MODE SW	ON/OFF	Indicates [ON/OFF] condition from snow mode switch signal.	
ENG OIL TEMP	°C or °F	The engine oil temperature (determined by the signal voltage of the engine oil temperature sen- sor) is displayed.	
TRVL AFTER MIL	km or mile	Distance traveled while MIL is activated.	
A/F S1 HTR (B1)  A/F S1 HTR (B2)	%	<ul> <li>Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals.</li> <li>The current flow to the heater becomes larger as the value increases.</li> </ul>	
AC PRESS SEN	V	The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE	km/h or mph	The vehicle speed computed from the vehicle speed signal sent from combination meter is dis- played.	
MAIN SW	ON/OFF	Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	Indicates [ON/OFF] condition from RESUME/AC- CELERATE switch signal.	
SET SW	ON/OFF	Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2	ON/OFF	Indicates [ON/OFF] condition of stop lamp switch signal.	
DIST SW	ON/OFF	Indicates [ON/OFF] condition from DISTANCE switch signal.	
CRUISE LAMP	ON/OFF	Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
BAT CUR SEN	mV	The signal voltage of battery current sensor is displayed.	

## < SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
ALT DUTY SIG	ON/OFF	The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated.     ON: Power generation voltage variable control is active.     OFF: Power generation voltage variable control is inactive.	
A/F ADJ-B1		Indicates the correction of factor stored in ECM.	
A/F ADJ-B2	_	The factor is calculated from the difference be- tween the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 sig- nal.	
FAN DUTY	%	<ul> <li>Indicates a command value for cooling fan. The value is calculated by ECM based on input sig- nals.</li> </ul>	
AC EVA TEMP	°C or °F	Indicates A/C evaporator temperature sent from "unified meter and A/C amp.".	
AC EVA TARGET	°C or °F	Indicates target A/C evaporator temperature sent from "unified meter and A/C amp.".	
ALTDUTY	%	Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	
ATOM PRES SEN	mV	<ul><li> Always a certain value is displayed.</li><li> This item is not efficient for this models.</li></ul>	
BRAKE BST PRES SE	mV	<ul><li>Always a certain value is displayed.</li><li>This item is not efficient for this models.</li></ul>	
VVEL SEN LEARN- B1			
VVEL SEN LEARN- B2	V	Indicates the VVEL learning value.	
VVEL POSITION SEN-B1 VVEL POSITION	V	The VVEL control shaft position sensor signal voltage is displayed.	
SEN-B2			
VVEL TIM-B1	deg	Indicates [deg] of VVEL control shaft angle.	
VVEL TIM-B2			
VVEL LEARN	YET/DONE	Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been performed successfully.	
EVAP LEAK DIAG	YET/CMPLT	Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully.	
EVAP DIAG READY	ON/OFF	Indicates the ready condition of EVAP leak diagnosis.     ON: Diagnosis has been ready condition.     OFF: Diagnosis has not been ready condition.	
THRTL STK CNT B1*	_	_	
HO2 S2 DIAG1 (B1)	INCMP/CM- PLT	Indicates DTC P0139 self-diagnosis (delayed response) condition.  INCMP: Self-diagnosis is incomplete.  CMPLT: Self-diagnosis is complete.	

Monitored item	Unit	Description	Remarks
HO2 S2 DIAG1 (B2)	INCMP/CM- PLT	Indicates DTC P0159 self-diagnosis (delayed response) condition.  INCMP: Self-diagnosis is incomplete.  CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG2 (B1)	INCMP/CM- PLT	Indicates DTC P0139 self-diagnosis (slow response) condition.  INCMP: Self-diagnosis is incomplete.  CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG2 (B2)	INCMP/CM- PLT	Indicates DTC P0159 self-diagnosis (slow response) condition.  INCMP: Self-diagnosis is incomplete.  CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG1 (B1)	INCMP/CM- PLT	Indicates DTC P015A or P015B self-diagnosis condition.  INCMP: Self-diagnosis is incomplete.  CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG1 (B2)	INCMP/CM- PLT	Indicates DTC P015C or P015D self-diagnosis condition.     INCMP: Self-diagnosis is incomplete.     CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG2 (B1)	INCMP/CM- PLT	Indicates DTC P014C or P014D self-diagnosis condition.     INCMP: Self-diagnosis is incomplete.     CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG2 (B2)	INCMP/CM- PLT	Indicates DTC P014E or P014F self-diagnosis condition.     INCMP: Self-diagnosis is incomplete.     CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG3 (B1)	ABSNT/ PRSNT	Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition.     ABSNT: The vehicle condition is not within the diagnosis range.     PRSNT: The vehicle condition is within the diagnosis range.	
A/F SEN1 DIAG3 (B2)	ABSNT/ PRSNT	Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition.     ABSNT: The vehicle condition is not within the diagnosis range.     PRSNT: The vehicle condition is within the diagnosis range.	

<sup>\*:</sup> 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

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WORK ITEM	CONDITION	USAGE	
IDLE AIR VOL LEARN	THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume	
EVAP SYSTEM CLOSE	CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS.  IGN SW ON  ENGINE NOT RUNNING  AMBIENT TEMPERATURE IS ABOVE 0°C (32°F).  NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM  FUEL TANK TEMP. IS MORE THAN 0°C (32°F).  WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION.  NOTE: WHEN STARTING ENGINE, CONSULT MAY DISPLAY "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN WHEN USING A CHARGED BATTERY.	When detecting EVAP vapor leak in the EVAP system	
FUEL PRESSURE RELEASE	FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING.     CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line	
SELF-LEARNING CONT	THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT.	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	
CLSD THL POS LEARN	IGNITION ON AND ENGINE STOPPED.	When learning the throttle valve closed position	
VVEL POS SEN ADJ PREP	USE THIS ITEM ONLY WHEN REPLACING VVEL ACTUATOR SUB ASSEMBLY. IGNITION ON AND ENGINE STOPPED.	When adjusting VVEL control shaft position sensor	

<sup>\*:</sup> This function is not necessary in the usual service procedure.

## ACTIVE TEST MODE

Test Item

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

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)					
FUEL/T TEMP SEN	Change the fuel tank temperature	Change the fuel tank temperature using CONSULT.						
PURG VOL CONT/V	<ul> <li>Engine: After warming up, run engine at 1,500 rpm.</li> <li>Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT.</li> </ul>	Engine speed changes according to the opening percent.	Harness and connectors     Solenoid valve					
FUEL PUMP RE- LAY	<ul> <li>Ignition switch: ON (Engine stopped)</li> <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.	Harness and connectors     Fuel pump relay					
IGNITION TIM- ING	<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*	Ignition switch: ON     Change duty ratio using CON-SULT.	Cooling fan speed changes.	Harness and connectors     Cooling fan motor     Cooling fan relay     Cooling fan control module     IPDM E/R					
ALTERNATOR DUTY	Engine: Idle     Change duty ratio using CON- SULT.	Battery voltage changes.	Harness and connectors     IPDM E/R     Alternator					
POWER BAL- ANCE	<ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch OFF</li> <li>Selector lever: P or N</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>					

<sup>\*:</sup> Leaving cooling fan OFF with CONSULT while engine is running may cause the engine to overheat.

## DTC WORK SUPPORT MODE

### Test Item

Test mode	Test item	Corresponding DTC No.	Reference page
	EVP SML LEAK P0442*/P1442*	_	_
EVAPORATIVE SYSTEM	EVP V/S LEAK P0456/P1456*	P0456	EC-349
EVAPORATIVE STSTEM	PURG VOL CN/V P1444	P0443	EC-318
	PURG FLOW P0441	P0441	EC-313
	A/F SEN1 (B1) P1278/P1279	_	_
A/E CENIA	A/F SEN1 (B1) P1276	P0130	EC-228
A/F SEN1	A/F SEN1 (B2) P1288/P1289	_	_
	A/F SEN1 (B2) P1286	P0150	EC-228
	HO2S2 (B1) P1146	P0138	EC-244
	HO2S2 (B1) P1147	P0137	EC-238
HO2S2	HO2S2 (B1) P0139	P0139	EC-252
110232	HO2S2 (B2) P1166	P0158	EC-244
	HO2S2 (B2) P1167	P0157	EC-238
	HO2S2 (B2) P0159	P0159	EC-252

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

[VQ37VHR] < SYSTEM DESCRIPTION >

#### 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

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

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).

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".

OFF twice to update the informa	ation on the
DRIVING PATTERN B	DRIVING PATTERN D
INCMP	INCMP
CMPLT	INCMP
INCMP	CMPLT
CMPLT	INCMP
INCMP	INCMP
INCMP	INCMP
	INCMP CMPLT INCMP CMPLT INCMP

#### NOTE:

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

#### SRT WORK SUPPORT Mode

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

#### PERMANENT DTC WORK SUPPORT Mode

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

#### NOTE:

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

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## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## DTC/CIRCUIT DIAGNOSIS

## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

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

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

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

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

## Component Function Check

INFOID:0000000009063933

## 1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.

#### **TESTING CONDITION**

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (1.003 1.064 kg/cm<sup>2</sup>, 14.25 15.12 psi)
- Atmospheric temperature: 20 30°C (68 86°F)
- Engine coolant temperature: 75 95°C (167 203°F)
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle until "ATF TEMP 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- · Engine speed: Idle

>> GO TO 2.

## 2. PERFORM SPEC IN DATA MONITOR MODE

## With CONSULT

#### NOTE:

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END

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

## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

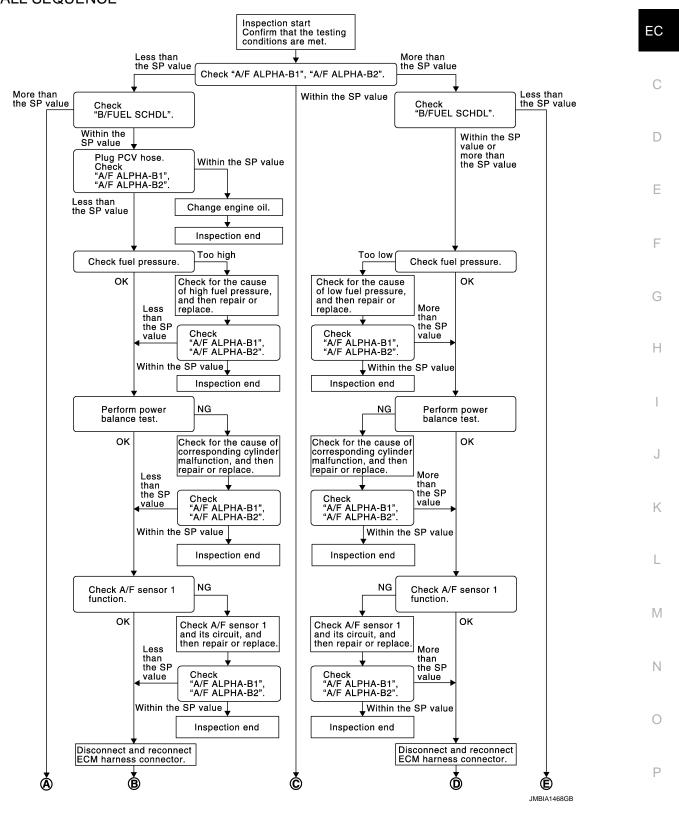
[VQ37VHR]

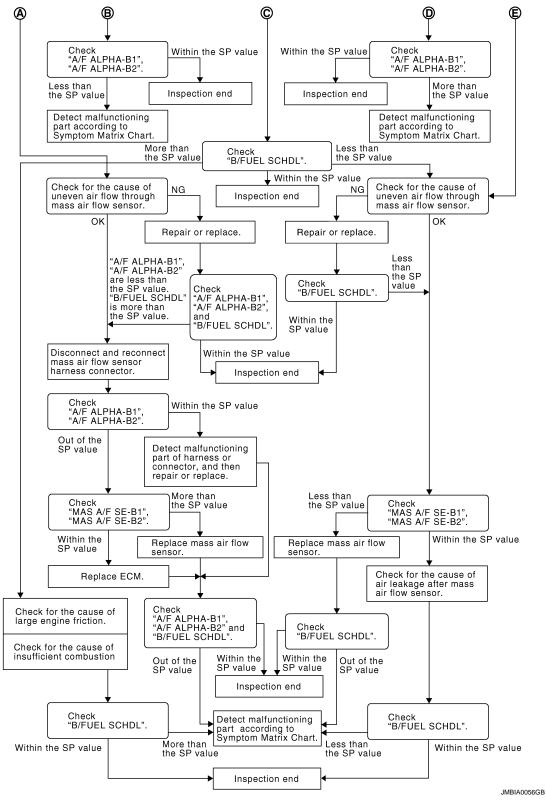
INFOID:0000000009063934

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## Diagnosis Procedure

## **OVERALL SEQUENCE**





### **DETAILED PROCEDURE**

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

## (I) With CONSULT

- Start engine.
- Confirm that the testing conditions are met. Refer to <u>EC-156, "Component Function Check"</u>.
- 3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

### TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

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.

 $oldsymbol{4}$  .CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

Stop the engine.

Disconnect PCV hose, and then plug it. 2.

Start engine. 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.

Is the measurement value within the SP value?

YES >> GO TO 5.

NO >> GO TO 6.

## 5. CHANGE ENGINE OIL

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

## $\mathbf{6}.$ 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 FL-6, "Removal and Installation".) and then GO TO 8.

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

.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

>> Replace "fuel filter and fuel pump assembly" (Refer to FL-6, "Removal and Installation".) and then YES GO TO 8.

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

**EC-159** Revision: 2013 March 2014 QX50

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### TROUBLE DIAGNOSIS - SPECIFICATION VALUE

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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

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

YES >> INSPECTION END

NO >> GO TO 9.

## 9. PERFORM POWER BALANCE TEST

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- Make sure that the each cylinder produces a momentary engine speed drop.

#### Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 10.

## 10.DETECT MALFUNCTIONING PART

#### Check the following bellow.

- Ignition coil and its circuit (Refer to <u>EC-517, "Component Function Check"</u>.)
- Fuel injector and its circuit (Refer to EC-507, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to EM-15, "Inspection".)

### Is the inspection result normal?

YES >> Replace fuel injector (Refer to EM-36, "Removal and Installation".) and then GO TO 11.

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

## 11.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

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

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

YES >> INSPECTION END

NO >> GO TO 12.

## 12. CHECK A/F SENSOR 1 FUNCTION

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

- For DTC P0130, P0150, refer to EC-228, "DTC Logic".
- For DTC P0131, P0151, refer to EC-232, "DTC Logic".
- For DTC P0132, P0152, refer to <u>EC-235, "DTC Logic"</u>.
- For DTC P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, refer to EC-259, "DTC Logic".
- For DTC P2096, P2097, P2098, P2099, refer to <u>EC-478, "DTC Logic"</u>.

### Are any DTCs detected?

YES >> GO TO 13.

NO >> GO TO 15.

## 13. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnosis Procedure according to corresponding DTC.

>> GO TO 14.

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

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

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

YES >> INSPECTION END

NO >> GO TO 15.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > 15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR 1. Stop the engine. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it. 2. EC >> GO TO 16. 16.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2" Start engine. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value. D Is the measurement value within the SP value? >> INSPECTION END YES NO >> Detect malfunctioning part according to EC-619, "Symptom Table". Е 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 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.

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## 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. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

1. Stop the engine.

Revision: 2013 March **EC-161** 2014 QX50

### TROUBLE DIAGNOSIS - SPECIFICATION VALUE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

>> GO TO 22.

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

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

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

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to <u>EC-195, "Diagnosis Procedure"</u>. Then GO TO 29.

NO >> GO TO 23.

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

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

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

YES >> GO TO 24.

NO >> More than the SP value: Replace malfunctioning mass air flow sensor (Refer to <u>EM-26, "Exploded View"</u>.), and then GO TO 29.

## 24.REPLACE ECM

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

>> GO TO 29.

## 25. CHECK INTAKE SYSTEM

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

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

### Is the inspection result normal?

YES >> GO TO 27.

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

26.check "B/FUEL SCHDL"

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

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

YES >> INSPECTION END

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

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

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

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

YES >> GO TO 28.

NO >> Less than the SP value: Replace malfunctioning mass air flow sensor (Refer to <u>EM-26, "Exploded View"</u>.), and then GO TO 30.

## 28. CHECK INTAKE SYSTEM

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

- · Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap

## TROUBLE DIAGNOSIS - SPECIFICATION VALUE

# < 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.

## $29.\mathsf{CHECK}$ "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 <a href="EC-619">EC-619</a>, "Symptom Table".

## 30. CHECK "B/FUEL SCHDL"

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

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

YES >> INSPECTION END

NO >> Detect malfunctioning part according to <a href="EC-619">EC-619</a>. "Symptom Table".

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## POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## POWER SUPPLY AND GROUND CIRCUIT

## Diagnosis Procedure

#### INFOID:0000000009063935

## 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

Е	ECM		Continuity	
Connector	Terminal	Ground	Continuity	
F101	8			
M107	123		Existed	
	124	Ground		
	127			
	128			

3. Also check harness for short to power.

### Is the inspection result normal?

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

## 3. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors F103, M116
- · Harness for open or short between ECM and ground
  - >> Repair open circuit or short to power in harness or connectors.

## 4. CHECK ECM POWER SUPPLY CIRCUIT-I

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

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

### Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13. F40
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between ECM and fuse

## POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

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

## 6. CHECK ECM POWER SUPPLY CIRCUIT-II

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

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

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 9.

## 7. CHECK ECM POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch ON.
- 2. Check the voltage between IPDM E/R harness connector and ground.

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

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

## 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "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.

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

ConnectorTerminalConnectorTerminalF10124E769Existed	E	CM	IPDN	ЛE/R	Continuity
F101 24 E7 69 Existed	Connector	Terminal	Connector	Terminal	Continuity
	F101	24	E7	69	Existed

### POWER SUPPLY AND GROUND CIRCUIT

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

### Is the inspection result normal?

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

## 11. DETECT MALFUNCTIONING PART

### Check the following.

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

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

## 12.CHECK 15 A FUSE

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

#### Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace 15 A fuse.

## 13. CHECK ECM POWER SUPPLY CIRCUIT-VI

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

Е	CM	IPDN	M E/R	Continuity
Connector	Terminal	Connector	Terminal	Continuity
M107	125	E7	49	Existed

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

#### Is the inspection result normal?

YES >> GO TO 15. NO >> GO TO 14.

# 14. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness or connectors E106, M6
- Harness for open or short between ECM and IPDM E/R

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

## 15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

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

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

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

## Diagnosis Procedure

INFOID:0000000009063936

## 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CHECK VVEL CONTROL MODULE GROUND CIRCUIT FOR OPEN AND SHORT

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

VVEL control module		Ground	Continuity	
Connector	Terminal	Glodila	Continuity	
E14	14	Ground	Existed	

Also check harness for short to power.

## 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

- Reconnect VVEL control module harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between VVEL control module harness connector and ground.

VVI	EL control mo	dule		
Connector	+	_	Voltage	
Connector	Terminal	Terminal		
E14	8	14	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.	

### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

## f 4.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF and wait at least 10 seconds.
- Disconnect VVEL control module harness connector. 2.
- Disconnect IPDM E/R harness connector. 3.
- Check the continuity between VVEL control module harness connector and IPDM E/R harness connector.

VVEL control module		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E14	8	E7	49	Existed

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

### Is the inspection result normal?

>> EC-164, "Diagnosis Procedure" YES

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

## ${f 5.}$ CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

**EC-167** Revision: 2013 March 2014 QX50

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

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

### Is the inspection result normal?

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

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

## **U0101 CAN COMM CIRCUIT**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## U0101 CAN COMM CIRCUIT

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

DTC Logic

#### DTC DETECTION LOGIC

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

### DTC CONFIRMATION PROCEDURE

## 1. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YES >> EC-169, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

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

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## U1001 CAN COMM CIRCUIT

Description INFOID:000000009241924

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

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1001	CAN communication line	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more.	Harness or connectors (CAN communication line is open or shorted)

## DTC CONFIRMATION PROCEDURE

## 1. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YES >> EC-170, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

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

INFOID:00000000009063942

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## U1003 CAN COMM CIRCUIT

Description INFOID:0000000009063943

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:00000000009063944

### DTC DETECTION LOGIC

#### NOTE:

If DTC U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.

Refer to EC-384, "DTC Logic".

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

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

#### TESTING CONDITION:

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

>> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YES >> Go to EC-171, "Diagnosis Procedure".

>> INSPECTION END NO

# Diagnosis Procedure

## 1. CHECK VVEL CAN COMMUNICATION CIRCUIT

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

ECM			VVEL control module		Continuity
Connector Terminal		Connector	Terminal	Continuity	
	F102	54	F14	24	Existed
	1 102	55	LIT	11	LXISICG

Also check harness for short to ground and power.

### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

## 2.DETECT MALFUNCTIONING PART

#### Check the following.

Harness connector E13, F40

**EC-171** Revision: 2013 March 2014 QX50

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## **U1003 CAN COMM CIRCUIT**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Harness for open or short between ECM and VVEL control module
  - >> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace.

## 4. REPLACE VVEL CONTROL MODULE

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

>> GO TO 5.

## 5. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Erase DTC.
- 4. Perform DTC Confirmation Procedure. See <u>EC-171</u>, "DTC Logic".
- 5. Check DTC.

### Is the DTC U1003 displayed again?

YES >> GO TO 6.

NO >> INSPECTION END

### 6. REPLACE ECM

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

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## U1024 CAN COMM CIRCUIT

Description INFOID:0000000009241925

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:00000000009063947

### DTC DETECTION LOGIC

#### NOTE:

If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.

Refer to EC-384, "DTC Logic".

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

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

### **TESTING CONDITION:**

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

>> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

YFS >> Go to EC-173, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

## 1. CHECK VVEL CAN COMMUNICATION CIRCUIT

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

E	CM	VVEL control module		Continuity	
Connector Termina		Connector Terminal		Continuity	
F102	54	F14	24	Existed	
1 102	55	LIT	11	LAISIEU	

Also check harness for short to ground and power.

### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

## 2.DETECT MALFUNCTIONING PART

**EC-173** Revision: 2013 March 2014 QX50

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## **U1024 CAN COMM CIRCUIT**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the following.

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

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

## 3. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace.

## 4. REPLACE VVEL CONTROL MODULE

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

>> GO TO 5.

## 5. PERFORM DTC CONFIRMATION PROCEDURE

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

### Is the DTC U1024 displayed again?

YES >> GO TO 6.

NO >> INSPECTION END

## **6.**REPLACE ECM

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

>> INSPECTION END

## P0011, P0021 IVT CONTROL

**DTC** Logic INFOID:0000000009063949

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to <u>EC-185, "DTC Logic"</u>.
- If DTC P0011 or P0021 is displayed with DTC P0524, first perform the trouble diagnosis for DTC P0524. Refer to EC-369, "DTC Logic".

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011	Intake valve timing control performance (bank 1)		Crankshaft position sensor (POS)     Camshaft position sensor (PHASE)     Intake valve control solenoid valve
P0021	Intake valve timing control performance (bank 2)	There is a gap between angle of target and phase-control angle degree.	<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 intake 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.
- 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

>> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE-I

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

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

## **CAUTION:**

#### Always drive at a safe speed.

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

### Is 1st trip DTC detected?

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

NO >> GO TO 3.

## 3.perform dtc confirmation procedure-ii

Select "DATA MONITOR" mode with CONSULT.

**EC-175** Revision: 2013 March 2014 QX50

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Maintain the following conditions for at least 20 consecutive seconds.

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

#### **CAUTION:**

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

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

NO >> INSPECTION END

## Diagnosis Procedure

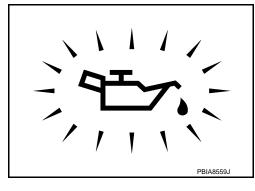
1. CHECK OIL PRESSURE WARNING LAMP

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

<u>Is oil pressure warning lamp illuminated?</u>

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

NO >> GO TO 2.



## 2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-177, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-303, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS). Refer to EM-120, "Exploded View".

4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-307, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-49, "Exploded View".

5. CHECK CAMSHAFT (INTAKE)

Check the following.

## **P0011, P0021 IVT CONTROL**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

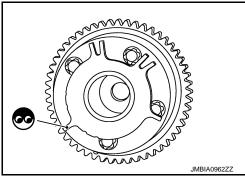
- Accumulation of debris on the signal plate of camshaft front end
- Chipping signal plate of camshaft front end

#### 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 <a href="EM-49">EM-49</a>, <a href=""Exploded View"</a>.



## 6. CHECK TIMING CHAIN INSTALLATION

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

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

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

NO >> GO TO 7.

## 7.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-103, "Inspection".

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

## 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000009063951

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

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

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

#### Is the inspection result normal?

YES >> GO TO 2.

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

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

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

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## **P0011, P0021 IVT CONTROL**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

#### **CAUTION:**

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

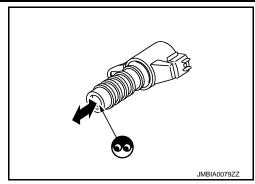
NOTE:

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO



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

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

Description INFOID:0000000009063952

### SYSTEM DESCRIPTION

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

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:0000000009063953

### DTC DETECTION LOGIC

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

## DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

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

>> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

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

### Is 1st trip DTC detected?

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

>> INSPECTION END NG

**EC-179** Revision: 2013 March 2014 QX50

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

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## Diagnosis Procedure

INFOID:0000000009063954

## 1. CHECK GROUND CONNECTION

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

DTC		A/F sensor	1	Ground	Voltage
ыс	Bank	Connector	Terminal	Giodila	voltage
P0031, P0032	1	F3	4	Ground	Battery voltage
P0051, P0052	2	F20	4	Ground	Dattery Voltage

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

## 3. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- · Harness for open or short between A/F sensor 1 and fuse

### >> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0031, P0032	1	F3	3	F101	1	Existed
P0051, P0052	2	F20	3		5	

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

#### Is the inspection result normal?

YES >> GO TO 5.

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

## 5. CHECK A/F SENSOR 1 HEATER

### Refer to EC-181, "Component Inspection".

## Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-33, "Exploded View". CAUTION:

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 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).

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>> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

>> Repair or replace.

## Component Inspection

INFOID:00000000009063955

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

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

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-33, "Exploded View".

### **CAUTION:**

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using 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

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Revision: 2013 March EC-181 2014 QX50

# P0037, P0038, P0057, P0058 HO2S2 HEATER

**Description** 

#### SYSTEM DESCRIPTION

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

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

#### **OPERATION**

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

DTC Logic

#### DTC DETECTION LOGIC

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

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### **TESTING CONDITION:**

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

>> GO TO 2.

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# $\overline{2.}$ PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 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 1 minute.
- 7. Check 1st trip DTC.

### Is 1st tip DTC detected?

YES >> Go to EC-183, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

## 1. CHECK GROUND CONNECTION

Turn ignition switch OFF.

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK HO2S2 POWER SUPPLY CIRCUIT

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

DTC	HO2S2			Ground	Voltage
ыс	Bank	Connector	Terminal	Ground	voltage
P0037, P0038	1	F54	2	Ground	Battery voltage
P0057, P0058	2	F53	2	Giodila	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between heated oxygen sensor 2 and fuse

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

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

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

DTC HO2S2		ECM		Continuity		
ы	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0037, P0038	1	F54	3	F101	17	Existed
P0057, P0058	2	F53	3	FIUI	33	Existed

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

#### Is the inspection result normal?

**EC-183** Revision: 2013 March 2014 QX50

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

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 5.

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

### ${f 5}$ .CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-184, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

### 6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-33. "Exploded View".

#### **CAUTION:**

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

>> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

### Component Inspection

INFOID:0000000009063959

# 1. CHECK HEATED OXYGEN SENSOR 2 HEATER

- 1. Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 harness connector.
- 3. Check resistance between HO2S2 terminals as follows.

Terminal	Resistance ( $\Omega$ )
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 normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EM-33, "Exploded View"</u>.

#### **CAUTION:**

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

>> INSPECTION END

## P0075, P0081 IVT CONTROL SOLENOID VALVE

Description INFOID:0000000009063960

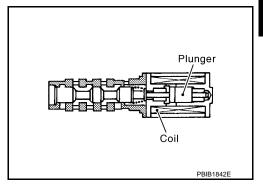
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

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



DTC Logic

# INFOID:00000000009063961

#### DTC DETECTION LOGIC

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

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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 5 seconds.
- Check 1st trip DTC. 2.

#### Is 1st trip DTC detected?

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

>> INSPECTION END NO

## Diagnosis Procedure

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

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

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

**EC-185** Revision: 2013 March 2014 QX50

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INFOID:00000000009063962

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### P0075, P0081 IVT CONTROL SOLENOID VALVE

### < DTC/CIRCUIT DIAGNOSIS > Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

# 2.DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E13, F40
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

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

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

DTC	IVT control solenoid valve		ECM		Continuity	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0075	1	F28	1	F101	18	Existed
P0081	2	F29	1	1 101	29	LXISIGU

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

#### Is the inspection result normal?

YES >> GO TO 4.

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

### 4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-186, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 5.

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

## 5. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009241926

[VQ37VHR]

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

- 1. Turn ignition switch OFF.
- Disconnect intake valve timing control solenoid valve harness connector.
- 3. Check resistance between intake valve timing control solenoid valve terminals as 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. Refer to <u>EM-49</u>, "Exploded View".

### P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 2.check intake valve timing control solenoid valve-ii

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

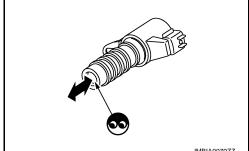
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

**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. Refer to <a href="EM-49">EM-49</a>, "Exploded View".

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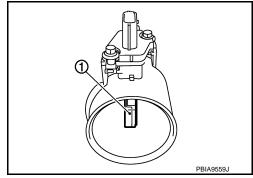
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### P0101, P010B MAF SENSOR

**Description** 

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

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



**DTC** Logic

INFOID:0000000009063965

#### DTC DETECTION LOGIC

#### NOTE:

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

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

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

# **CAUTION:** Always drive at a safe speed.

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

#### NOTE:

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

### P0101, P010B MAF SENSOR

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

#### Is 1st trip DTC detected?

YES >> Proceed to EC-189, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:00000000009063966

## 1. CHECK INTAKE SYSTEM

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

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Reconnect or replace error-detected parts.

# 2.CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

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

		+			
DTC	Mass air flow sensor			_	Voltage
	Bank	Connector	Terminal		
P0101	1	F31	5	Ground	Battery voltage
P010B	2	F42	3	Giodila	battery voltage

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# 3.DETECT MALFUNCTIONING PART

#### Check the following.

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

>> Repair or replace error-detected parts.

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

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

DTC	N	lass air flow s	ensor	EC	CM	Continuity
DIO	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0101	1	F31	4	F102	68	Existed
P010B	2	F42	4	1 102	94	LAISIEU

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

#### Is the inspection result normal?

YES >> GO TO 5.

>> Repair or replace error-detected parts. NO

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

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

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DTC	N	Mass air flow sensor ECM		Continuity		
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0101	1	F31	3	F102	77	Existed
P010B	2	F42	3	1 102	79	LXISIEU

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

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace error-detected parts.

### 6.CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to EC-208, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-26</u>, "<u>Exploded View</u>".

# 7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection".

#### Is the inspection result normal?

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

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

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

## 8.CHECK MASS AIR FLOW SENSOR (BANK 1)

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

#### Is the inspection result normal?

YES >> Check intermittent Incident. Refer to GI-42, "Intermittent Incident".

NO >> Replace mass air flow sensor (bank 1). Refer to EM-26, "Exploded View".

### $\mathbf{9}.$ CHECK MASS AIR FLOW SENSOR (BANK 2)

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

#### Is the inspection result normal?

YES >> Check intermittent Incident. Refer to GI-42, "Intermittent Incident".

NO >> Replace mass air flow sensor (bank 2). Refer to EM-26, "Exploded View".

# Component Inspection

INFOID:0000000009063967

## 1. CHECK MASS AIR FLOW SENSOR-I

#### (I) With CONSULT

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

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

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

#### **Without CONSULT**

Turn ignition switch OFF.

### **P0101, P010B MAF SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

	ECM				
Connector	+ -		Condition	Voltage (V)	
Connector	Terminal	Terminal			
			Ignition switch ON (Engine stopped.)	Approx. 0.4	
	77 [MAF sensor (bank 1)	68	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2	
	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*	
F 102	79	94	Ignition switch ON (Engine stopped.)	Approx. 0.4	
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2	
	[MAF sensor (bank 2) signal]		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*	

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

- 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

#### (P)With CONSULT

- Repair or replace malfunctioning part.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Connect CONSULT and select "DATA MONITOR" mode.
- 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 MAS A/F SE-B2	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.3 - 1.7
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

#### **♥Without CONSULT**

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

**EC-191** Revision: 2013 March 2014 QX50

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

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK MASS AIR FLOW SENSOR-III

### (I) With CONSULT

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

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

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

#### Without CONSULT

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

	ECM				
Connector	+ -		Condition	Voltage (V)	
Connector	Terminal	Terminal			
			Ignition switch ON (Engine stopped.)	Approx. 0.4	
	77 [MAF sensor (bank 1) signal]	68	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2	
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.3 - 1.7	
F102			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*	
F 102		79	Ignition switch ON (Engine stopped.)	Approx. 0.4	
	• •		Idle (Engine is warmed-up to normal operating 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*	

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

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace malfunctioning mass air flow sensor. Refer to <a href="EM-26">EM-26</a>, "Exploded View".

Revision: 2013 March **EC-193** 2014 QX50

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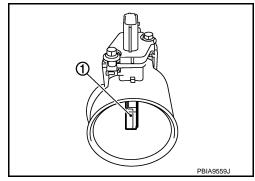
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# P0102, P0103, P010C, P010D MAF SENSOR

**Description** 

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

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



### **DTC** Logic

#### INFOID:0000000009063969

#### DTC DETECTION LOGIC

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

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

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

#### Is DTC detected?

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

NO >> INSPECTION END

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

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

#### [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Is DTC detected? Α YES >> Go to EC-195, "Diagnosis Procedure". NO >> GO TO 4. 4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-II EC Start engine and wait at least 5 seconds. Check DTC. 2. Is DTC detected? YES >> Go to EC-195, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure D INFOID:0000000009063970 1. INSPECTION START Е Confirm the detected DTC. Which DTC is detected? P0102, P010C>>GO TO 2. F P0103, P010D>>GO TO 3. CHECK INTAKE SYSTEM Check the following for connection. Air duct Vacuum hoses Intake air passage between air duct to intake manifold Н Is the inspection result normal? YES >> GO TO 3. NO >> Reconnect the parts. 3.CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection". Is the inspection result normal? YES >> GO TO 4. NO >> Repair or replace ground connection. K 4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT 1. Disconnect mass air flow (MAF) sensor harness connector. Turn ignition switch ON. Check the voltage between MAF sensor harness connector and ground. MAF sensor DTC Ground Voltage Bank Connector Terminal P0102, P0103 F31 1 5 N Ground Battery voltage P010C, P010D 2 F42 5 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.

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

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

DTC		MAF sensor ECM		ECM		Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0102, P0103	1	F31	4	F102	68	Existed
P010C, P010D	2	F42	4	1 102	94	LAISIEU

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

### Is the inspection result normal?

YES >> GO TO 7.

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

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

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

DTC		MAF sensor		ECM		Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0102, P0103	1	F31	3	F102	77	Existed
P010C, P010D	2	F42	3	F 102	79	Existed

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

#### Is the inspection result normal?

YES >> GO TO 8.

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

#### 8.CHECK MASS AIR FLOW SENSOR

Refer to EC-196, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace malfunctioning mass air flow sensor. Refer to EM-26, "Exploded View".

### 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009241928

# 1. CHECK MASS AIR FLOW SENSOR-I

### (P)With CONSULT

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

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

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

#### **♥Without CONSULT**

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

	ECM				
Connector	+	<ul><li>Condition</li></ul>		Voltage (V)	
Connector	Terminal	Terminal			
			Ignition switch ON (Engine stopped.)	Approx. 0.4	
	F102  77  [MAF sensor (bank 1) signal]  79	[MAF sensor (bank 1) 68 signal]	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2	
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.3 - 1.7	
E102			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*	
1 102			Ignition switch ON (Engine stopped.)	Approx. 0.4	
			Idle (Engine is warmed-up to normal operating 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*	

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

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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

- Turn ignition switch OFF.
- Check for the cause of uneven air flow through mass air flow sensor. Refer to the following. 2.
- 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 $\,$

#### (P)With CONSULT

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

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

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

#### Without CONSULT

Repair or replace malfunctioning part.

**EC-197** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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

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

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

## 4. CHECK MASS AIR FLOW SENSOR-III

### (I) With CONSULT

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

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

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

#### **Without CONSULT**

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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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

### Is the inspection result normal?

YES >> INSPECTION END

Revision: 2013 March

NO >> Clean or replace malfunctioning mass air flow sensor. Refer to <a href="EM-26">EM-26</a>, "Exploded View".

EC-199 2014 QX50

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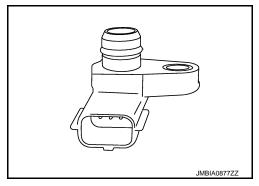
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### P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

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.



#### DTC DETECTION LOGIC

#### NOTE:

If DTC P010A is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "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>	Harness or connectors     (The sensor circuit is open or shorted.)     Manifold absolute pressure (MAP) 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.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is 1st trip DTC detected?

YES >> Go to EC-200, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009063974

### 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

### 2.CHECK MAP SENSOR POWER SUPPLY CIRCUIT

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

### P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

Turn ignition switch ON.

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

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#### Is the inspection result normal?

YES >> GO TO 3.

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

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

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

MAP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F50	3	F102	96	Existed

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

### Is the inspection result normal?

YES >> GO TO 4.

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

### f 4.CHECK MAP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

MAP	MAP sensor		ECM	
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-201, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace MAP sensor. Refer to EM-28, "Exploded View".

### 6.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection 1.CHECK MAP SENSOR-I

#### 1. Turn ignition switch OFF.

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

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**EC-201** Revision: 2013 March

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.

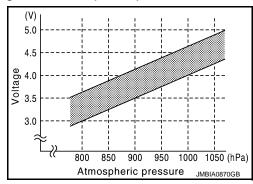
#### NOTE:

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. Refer to EM-28, "Exploded View".

# 2.CHECK MAP SENSOR-II

- 1. Start engine and let it idle.
- 2. Check intake manifold vacuum.
- Check the voltage between ECM harness connector terminals as per the following.

ECM				
	+		_	
Connector	Connector Terminal		Terminal	
F101	38	F102	96	

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

### P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace MAP sensor. Refer to <a href="EM-28">EM-28</a>, "Exploded View".

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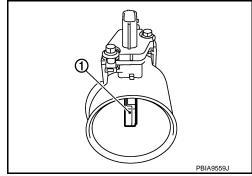
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### P0111 IAT SENSOR

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

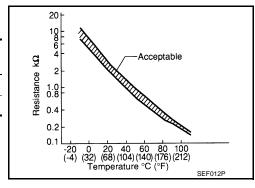
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



**DTC** Logic

INFOID:0000000009063977

### 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.	Harness or connectors     (High or low resistance in the IAT sensor circuit)     IAT sensor

### DTC CONFIRMATION PROCEDURE

### 1.INSPECTION START

### Is it necessary to erase permanent DTC?

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

### 2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-205, "Component Function Check".

### NOTE:

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-205, "Diagnosis Procedure".

# 3. PRECONDITIONING

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

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

#### **TESTING CONDITION:**

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

# 4.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place.

#### NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

#### **CAUTION:**

### Never turn ignition switch ON during soaking.

The vehicle must be cooled with the food open.

4. Start engine and let it idle for 5 minutes or more.

#### **CAUTION:**

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to EC-205, "Diagnosis Procedure".

NO >> INSPECTION END

## Component Function Check

# 1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

- Turn ignition switch OFF.
- Disconnect mass air flow sensor (bank 1) harness connector.
- Check resistance between mass air flow sensor (bank 1) terminals as follows.

Terminals	Condition	Resistance (kΩ)	
1 and 2	Temperature [°C (°F)]	25 (77)	1.800 – 2.200

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-205, "Diagnosis Procedure".

### 2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YFS >> INSPECTION END

NO >> Proceed to EC-205, "Diagnosis Procedure".

### Diagnosis Procedure

# 1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to EC-206, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

Revision: 2013 March

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### **P0111 IAT SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <u>EM-26</u>, "Exploded View".

# 2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

INFOID:0000000009063980

# ${\bf 1.} {\sf CHECK\ INTAKE\ AIR\ TEMPERATURE\ (IAT)\ SENSOR}$

- 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 (kΩ)
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 <a href="EM-26">EM-26</a>, <a href=""Exploded View"</a>.

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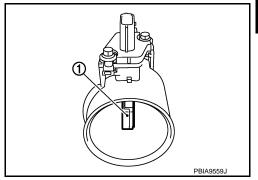
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### P0112, P0113 IAT SENSOR

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

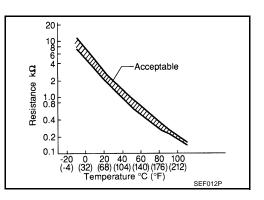
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



**DTC Logic** 

DTC DETECTION LOGIC

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

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

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

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 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.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-208, "Diagnosis Procedure".

NO >> INSPECTION END

Revision: 2013 March **EC-207** 2014 QX50

### < DTC/CIRCUIT DIAGNOSIS >

### Diagnosis Procedure

INFOID:0000000009063983

## 1. CHECK GROUND CONNECTION

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor (bank 1)		Ground	Voltage (V)
Connector	Terminal	Glound	voltage (v)
F31	2	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 3.

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

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

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

MAF sensor (bank 1)		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F31	1	F102	68	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

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

### 4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-208, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <a href="EM-26">EM-26</a>, <a href=""Exploded View"</a>.

# 5. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009063984

# 1. CHECK INTAKE AIR TEMPERATURE SENSOR

- Turn ignition switch OFF.
- Disconnect mass air flow sensor (bank 1) harness connector.
- Check resistance between mass air flow sensor (bank 1) terminals as follows.

## **P0112, P0113 IAT SENSOR**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Terminals	Condition		Resistance (kΩ)
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 EM-26, "Exploded View".

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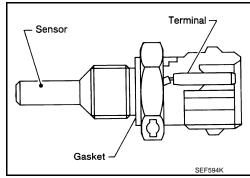
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### P0116 ECT SENSOR

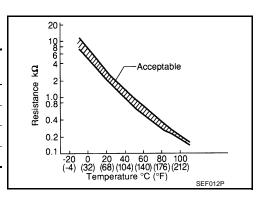
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

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

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



# DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to <a href="EC-213">EC-213</a>, "DTC 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.	Harness or connectors (High or low resistance in the ECT sensor circuit)     ECT sensor

#### DTC CONFIRMATION PROCEDURE

### 1.INSPECTION START

#### Is it necessary to erase permanent DTC?

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

## 2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <u>EC-211, "Component Function Check"</u>.

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?

#### P0116 ECT SENSOR

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

NO >> Proceed to EC-212, "Diagnosis Procedure".

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

#### **TEST CONDITION:**

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

# 4. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 60 minutes.
- Move the vehicle to a cool place.

#### NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

#### **CAUTION:**

Never turn ignition switch ON during soaking. NOTE:

The vehicle must be cooled with the food open.

4. Start engine and let it idle for 5 minutes or more.

#### **CAUTION:**

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to EC-212, "Diagnosis Procedure".

>> INSPECTION END NO

# Component Function Check

# 1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

- Turn ignition switch OFF.
- Disconnect ECT sensor harness connector.
- 3. Remove ECT sensor. Refer to CO-24, "Exploded View"
- Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-212, "Diagnosis Procedure".

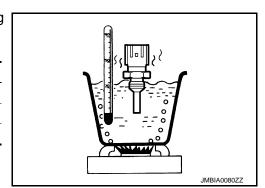
## 2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> INSPECTION END

>> Proceed to EC-212, "Diagnosis Procedure". NO



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#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## Diagnosis Procedure

INFOID:0000000009063988

# 1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to EC-212, "Component Inspection".

### Is the inspection result normal?

OK >> GO TO 2.

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

# 2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

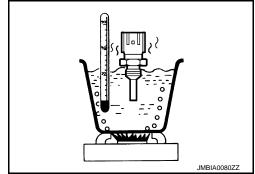
### Component Inspection

INFOID:0000000009063989

# 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 <a>CO-24</a>. "Exploded View"</a>.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

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



### Is the inspection result normal?

YES >> INSPECTION END

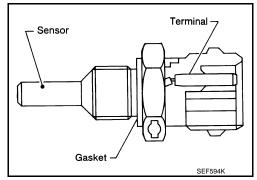
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>> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

## P0117, P0118 ECT SENSOR

Description INFOID:0000000009063990

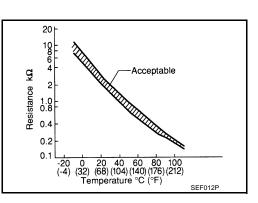
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

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

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



## **DTC** Logic

DTC DETECTION LOGIC

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause	ı
P0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors  (The connectors)	
P0118	Engine coolant tem- perature sensor cir- cuit high input	An excessively high voltage from the sensor is sent to ECM.	(The sensor circuit is open or shorted.)     Engine coolant temperature sensor	

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

- 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.

#### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

#### Is DTC detected?

>> Go to EC-214, "Diagnosis Procedure". YES

>> INSPECTION END NO

**EC-213** Revision: 2013 March 2014 QX50

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### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### Diagnosis Procedure

INFOID:0000000009063992

# 1. CHECK GROUND CONNECTION

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK 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	Glodila	voltage (v)
F17	1	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# ${f 3.}$ DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors F109, F110
- Harness for open or short between engine coolant temperature sensor and ECM

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

# 4. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

ECT sensor		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F17	2	F102	84	Existed

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

#### Is the inspection result normal?

YES >> GO TO 5.

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

### 5. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-215, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

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

### 6.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

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

#### < DTC/CIRCUIT DIAGNOSIS >

## Component Inspection

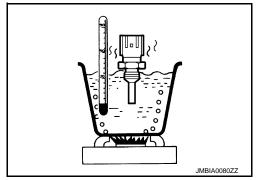
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# 1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

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



### Is the inspection result normal?

YES >> INSPECTION END

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

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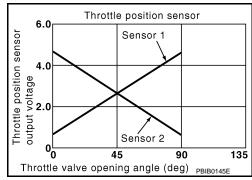
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## P0122, P0123, P0227, P0228 TP SENSOR

**Description** 

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

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



**DTC** Logic

### DTC DETECTION LOGIC

#### NOTE:

If DTC P0122, P0123, P0227 or P0228 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122	Throttle position sensor 2 (bank 1) circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	
P0123	Throttle position sensor 2 (bank 1) circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	Harness or connectors     (TP sensor 2 circuit is open or shorted.)
P0227	Throttle position sensor 2 (bank 2) circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	Electric throttle control actuator (TP sensor 2)
P0228	Throttle position sensor 2 (bank 2) circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

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

- 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.

### **TESTING CONDITION:**

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

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-217, "Diagnosis Procedure".

NO >> INSPECTION END

### P0122, P0123, P0227, P0228 TP SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## **Diagnosis Procedure**

#### INFOID:0000000009063996

## 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

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

DTC	Electr	ic throttle cont	rol actuator	Ground Voltage (		
ы	Bank	Connector	Terminal	Glound	voltage (v)	
P0122, P0123	1	F6	6	Ground	Approx. 5	
P0227, P0228	2	F27	1	Ground	Арргох. 5	

#### Is the inspection result normal?

YES >> GO TO 3.

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

## 3.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 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	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0122, P0123	1	F6	3	F101	40	Existed
P0227, P0228	2	F27	4	FIUI	48	Existed

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

#### Is the inspection result normal?

YES >> GO TO 4.

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

## 4.CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Electri	ic throttle control actuator		EC	Continuity	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0122, P0123	1	F6	5	F101	34	Existed
P0227, P0228	2	F27	3	1 101	35	LAISIEU

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

#### Is the inspection result normal?

YES >> GO TO 5.

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

### CHECK THROTTLE POSITION SENSOR

Refer to EC-218, "Component Inspection".

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### P0122, P0123, P0227, P0228 TP SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

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

## 6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation".
- Go to EC-218, "Special Repair Requirement".

#### >> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

INFOID:0000000009063997

## 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 position.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM						
Connector +		-	Condition		Voltage (V)	
Connector	Terminal	Terminal				
	30 [TP sensor 1 (bank 1)]	40		Fully released	More than 0.36	
	30 [TF Sellsol T (Dalik T)]	40	Accelerator pedal	Fully depressed	Less than 4.75	
•	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36	
F101	31 [1F Selisor I (balik 2)]			Fully depressed	Less than 4.75	
FIUI	34 [TP sensor 2 (bank 1)]	40		Fully released	Less than 4.75	
	54 [TF Selisor 2 (Darik 1)]	40		Fully depressed	More than 0.36	
	35 [TP sensor 2 (bank 2)]	48		Fully released	Less than 4.75	
	33 [1F 3611301 2 (bd11k 2)]	40		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-28, "Removal and Installation".
- Go to EC-218, "Special Repair Requirement".

#### >> INSPECTION END

## Special Repair Requirement

## 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

## 2. PERFORM IDLE AIR VOLUME LEARNING

Revision: 2013 March **EC-218** 2014 QX50

## P0122, P0123, P0227, P0228 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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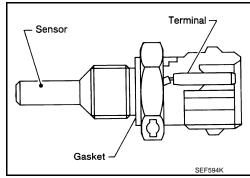
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INFOID:0000000009064000

### P0125 ECT SENSOR

Description INFOID:000000000241929

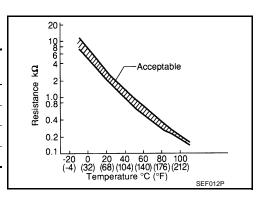
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM 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 EC-213, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125	Insufficient engine cool- ant temperature for closed loop fuel control	<ul> <li>Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.</li> <li>Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul>	Harness or connectors     (High resistance in the circuit)     Engine coolant temperature sensor     Thermostat

#### DTC CONFIRMATION PROCEDURE

## 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.
- 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

- Turn ignition switch ON.
- 2. Select "DATA MONITOR" mode with CONSULT.
- 3. Check that "COOLAN TEMP/S" is above -5°C (23°F).

### Is the temperature above -5°C (23°F)?

## **P0125 ECT SENSOR**

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]	
YES >> INSPECTION END NO >> GO TO 3.		
3. PERFORM DTC CONFIRMATION PROCEDURE		
<ol> <li>Start engine and run it for 65 minutes at idle speed.         If "COOLAN TEMP/S" increases to more than -5°C (23°F) within 65 minutes, stop of the test result will be OK.         CAUTION:         Be careful not to overheat engine.     </li> </ol>	engine because	
2. Check 1st trip DTC.		
Is 1st trip DTC detected?  YES >> EC-221. "Diagnosis Procedure"  NO >> INSPECTION END		
Diagnosis Procedure	INFOID:0000000009064001	
1. CHECK GROUND CONNECTION		
<ol> <li>Turn ignition switch OFF.</li> <li>Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".</li> </ol>		
Is the inspection result normal?  YES >> GO TO 2.  NO >> Repair or replace ground connection.  2.CHECK ENGINE COOLANT TEMPERATURE SENSOR		
Refer to EC-221, "Component Inspection".		
Is the inspection result normal?		
YES >> GO TO 3.  NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".		
3.CHECK THERMOSTAT OPERATION		
When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and cocolant does not flow.	onfirm the engine	
Is the inspection result normal?  YES >> GO TO 4.  NO >> Repair or replace thermostat. Refer to CO-22, "Removal and Installation".		
4.CHECK INTERMITTENT INCIDENT  Refer to GI-42, "Intermittent Incident".		
Note: to of 42, intermittent incluent.		
>> INSPECTION END		
Component Inspection	INFOID:0000000009241930	
1. CHECK ENGINE COOLANT TEMPERATURE SENSOR		
<ol> <li>Turn ignition switch OFF.</li> <li>Disconnect engine coolant temperature sensor harness connector.</li> <li>Remove engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.</li> </ol>		

Revision: 2013 March **EC-221** 2014 QX50

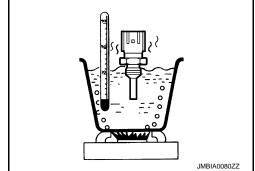
### **P0125 ECT SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

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



#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to  $\underline{\text{CO-}24}$ , "Exploded View".

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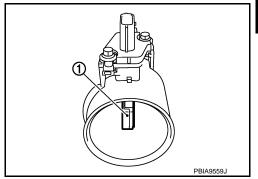
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### P0127 IAT SENSOR

Description INFOID:0000000009241931

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

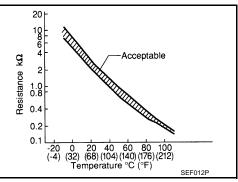
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



**DTC** Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	Harness or connectors     (The sensor circuit is open or shorted)     Intake air temperature sensor

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

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

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

INFOID:0000000009064004

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#### **P0127 IAT SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

#### NOTE:

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

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

#### **CAUTION:**

#### Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-224, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064005

## 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2. CHECK INTAKE AIR TEMPERATURE SENSOR

#### Refer to EC-224, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to <a href="EM-26">EM-26</a>. "Exploded View".

## 3.check intermittent incident

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

INFOID:0000000009241932

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

- 1. Turn ignition switch OFF.
- Disconnect mass air flow sensor (bank 1) harness connector.
- 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 <a href="EM-26">EM-26</a>, "Exploded View".

#### P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### P0128 THERMOSTAT FUNCTION

DTC Logic INFOID:0000000009064007

#### 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 EC-291.

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

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	Thermostat     Leakage from sealing portion of thermostat     Engine coolant temperature sensor

#### DTC CONFIRMATION PROCEDURE

#### NOTE:

Never refuel before and during the following procedure.

#### 1.PRECONDITIONING-I

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

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

>> GO TO 2.

## 2.PRECONDITIONING-II

#### (P)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

- Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
- Check the following conditions:

#### Is the condition satisfied?

YES >> GO TO 3.

NO >> 1. Satisfy the condition.

2. GO TO 3.

## 3.PERFORM DTC CONFIRMATION PROCEDURE-I

#### (P)With CONSULT

- Start engine.
- 2. Drive the vehicle until the following condition is satisfied.

#### **CAUTION:**

Revision: 2013 March

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).

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INFOID:0000000009064008

INFOID:0000000009241933

#### < DTC/CIRCUIT DIAGNOSIS >

65°C (149°F)

COOLAN TEMP/S	71°C (159°F) or less
FUEL T/TMP SE	Less than the value calculated by subtracting 25°C (45°F) from "COOLAN TEMP/S".*
*: Example	
COOLAN TEMP/S	FUEL T/TMP SE
70°C (158°F)	45°C (113°F) or less

## 60°C (140°F)

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.

40°C (104°F) or less

35°C (95°F) or less

#### NOTE:

Keep the accelerator pedal as steady as possible during cruising.

STEP 3

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

#### NOTE:

Keep the accelerator pedal as steady as possible during cruising.

#### Is the condition satisfied?

YES >> GO TO 4.

NO >> GO TO 1.

## 4. PERFORM DTC CONFIRMATION PROCEDURE-II

#### (P)With CONSULT

Drive the vehicle until the following condition is satisfied.

COOLAN TEMP/S	71°C (159°F) or more

#### **CAUTION:**

#### Always drive vehicle at safe speed.

2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to EC-226, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

## 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-226, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

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

### 2.CHECK THERMOSTAT

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

#### Is the inspection result normal?

YES >> INSPECTION END

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

## Component Inspection

## 1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

Revision: 2013 March **EC-226** 2014 QX50

### **P0128 THERMOSTAT FUNCTION**

### < DTC/CIRCUIT DIAGNOSIS >

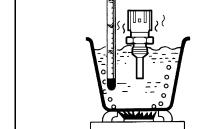
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Remove engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.

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

Terminals	Condition	Resistance (k $\Omega$ )	
		20 (68)	2.37 - 2.63
1 and 2	Temperature °C (°F)	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260



#### Is the inspection result normal?

YES >> INSPECTION END

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

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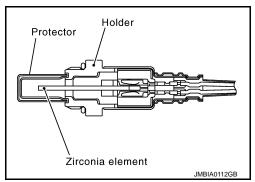
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## P0130, P0150 A/F SENSOR 1

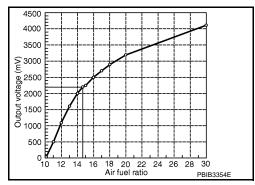
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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
P0130	Air fuel ratio (A/F) sensor 1 (bank 1) circuit	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V.	
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V.	Harness or connectors (The A/F sensor 1 circuit is open
P0150	P0150 Air fuel ratio (A/F) sensor 1 (bank 2) circuit		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
			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.

- 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 11 V at idle.

>> GO TO 2.

#### P0130, P0150 A/F SENSOR 1

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

## 2.perform dtc confirmation procedure for malfunction a

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

#### Is 1st trip DTC detected?

>> Go to EC-230, "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

- Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 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-230, "Diagnosis Procedure".

## f 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.
- 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

## 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.

### $oldsymbol{5}$ .PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

#### Release accelerator pedal fully.

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.

## $oldsymbol{6}$ 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-230, "Diagnosis Procedure".

## /.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to EC-230, "Component Function Check".

#### NOTE:

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

#### Is the inspection result normal?

YES >> INSPECTION END EC

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2014 QX50

### P0130, P0150 A/F SENSOR 1

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Go to EC-230, "Diagnosis Procedure".

## Component Function Check

INFOID:0000000009064012

## 1. PERFORM COMPONENT FUNCTION CHECK

#### **With GST**

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

#### **CAUTION:**

#### Always drive vehicle at a safe speed.

#### NOTÉ:

Never apply brake when releasing the accelerator pedal.

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

#### Is 1st trip DTC detected?

YES >> Go to EC-230, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064013

## 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

DTC	A/F sensor 1			Ground	Voltage
DIC	Bank	Connector	Terminal	Giodila	voltage
P0130	1	F3	4	Ground	Battery voltage
P0150	2	F20	4	Giodila	battery voltage

#### Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

[VQ37VHR]

## 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	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0130	20130 1	1 F3 1		57		
F0130	Į į	13	2	F102	61	Existed
P0150	2	E20	1	F 102	65	EXISTEC
F0150		F20	2		66	

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

DTC	A/F sensor 1			1 Ground					
DIC	Bank	Connector	Terminal	Giodila	Continuity				
P0130	1	F3	1		Not existed				
1 0130	'	гэ	2	Ground					
P0150	2	F20	1	Giodila	Not existed				
F0130	2	1 20	2						

DTC		ECM		Ground	Continuity	
ыс	Bank	Connector	Terminal	Giodila	Continuity	
P0130	4	1		57		
F0130	'	E102	61	Ground	Not existed	
P0150	2	F102	65	Giouna	Not existed	
	2	66				

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

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

#### 5. CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

### $\mathsf{6}.\mathsf{REPLACE}$ AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-33, "Exploded View".

**CAUTION:** 

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

>> INSPECTION END

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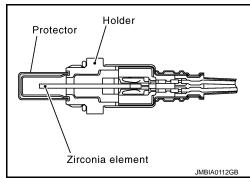
## P0131, P0151 A/F SENSOR 1

Description INFOID:000000009241935

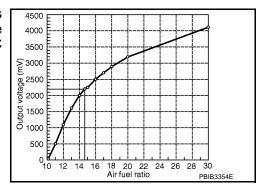
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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
P0131	Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage	The A/F signal computed by ECM from the A/	Harness or connectors     (The A/F sensor 1 circuit is open or
P0151	Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage	F sensor 1 signal is constantly approx. 0 V.	shorted.) • A/F sensor 1

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

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

- Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 0 V?

#### P0131, P0151 A/F SENSOR 1

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> Go to EC-233, "Diagnosis Procedure".

NO >> GO TO 3.

## 3.perform dtc confirmation procedure

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.
- 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
- 7. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-233, "Diagnosis Procedure".

>> INSPECTION END NO

## Diagnosis Procedure

## 1. CHECK GROUND CONNECTION

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

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

DTC		A/F senso	r 1	Ground	Voltage
DIC	Bank	Connector	Terminal	Giodila	voltage
P0130	1	F3	4	Ground	Battery voltage
P0150	2	F20	4	Giodila	

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

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>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			EC	Continuity			
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity		
P0130	1	F3	1		57			
F0130	Į.	ı F3	2	F102	61	Existed		
P0150	2	E20	1	1 102	65	LXISIGU		
F0130		F20	2 F20	2	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	ank Connector Te		Giodila	Continuity
P0130	1	F3	1		
F0130	'	13	2	Ground	Not existed
P0150	2	F20	1	Giodila	Not existed
F0150	2	F20	2		

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

5. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

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

### 5. CHECK INTERMITTENT INCIDENT

Perform GI-42. "Intermittent Incident".

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to <u>EM-33, "Exploded View"</u>. **CAUTION:** 

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

#### >> INSPECTION END

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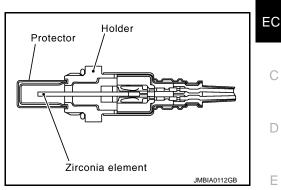
## P0132, P0152 A/F SENSOR 1

Description INFOID:0000000009241936

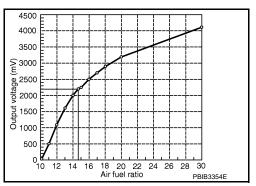
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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 INFOID:0000000009064018

#### DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage	The A/F signal computed by ECM from the A/F	Harness or connectors     (The A/F sensor 1 circuit is open or
P0152	Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage	sensor 1 signal is constantly approx. 5 V.	shorted.) • A/F sensor 1

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

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

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

- Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT. 2.
- Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 5V?

**EC-235** Revision: 2013 March 2014 QX50 K

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### P0132, P0152 A/F SENSOR 1

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> Go to EC-236, "Diagnosis Procedure".

NO >> GO TO 3.

## 3.perform dtc confirmation procedure

- Turn ignition 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
- 7. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-236, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064019

## 1. CHECK GROUND CONNECTION

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

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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

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

DTC		A/F sensor	r 1	Ground	Voltage	
DIC	Bank	Connector	Terminal	Glound	voltage	
P0130	1	F3	4	Ground	Battery voltage	
P0150	2	F20	4	Glound	battery voltage	

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

[VQ37VHR]

>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0130	1	F3	1		57	
F0130	'	1   F3	2	F102	61	Existed
P0150	2	E20	1	1 102	65	LXISIEU
F0150		2 F20	2 F20 2		66	

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

DTC		A/F sensor 1			Continuity
DIC	Bank	Connector	Terminal	Ground	Continuity
P0130	1	F3	1		
F0130	'	2	Ground	Not existed	
P0150	2	F20	1	Giodila	NOT EXISTED
F0150		F20	2		

DTC		ECM		Ground	Continuity
DIC	Bank	k Connector Terminal		Giodila	Continuity
P0130	P0130 1 F102		57		
F0130			61	Ground	Not existed
D0150		F102	65	Glound	
F0150		2	66		

Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

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

### 5.CHECK INTERMITTENT INCIDENT

Perform GI-42. "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-33, "Exploded View".

**CAUTION:** 

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

>> INSPECTION END

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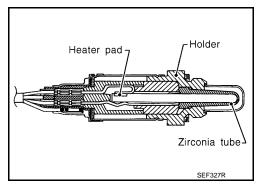
## P0137, P0157 HO2S2

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

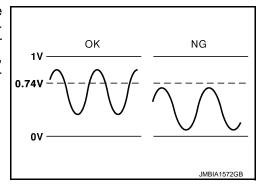
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



## **DTC** Logic

#### DTC DETECTION LOGIC

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



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137	Heated oxygen sensor 2 (bank 1) circuit low voltage	The maximum voltage from the sensor does not	Harness or connectors     (The sensor circuit is open or shorted)     Heated oxygen sensor 2
P0157	Heated oxygen sensor 2 (bank 2) circuit low voltage	The maximum voltage from the sensor does not reach the specified voltage.	<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 5.

## 2.PRECONDITIONING

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

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

## 3.perform dtc confirmation procedure

#### With CONSULT

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

- 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

>> Go to EC-240, "Diagnosis Procedure". NG

CAN NOT BE DIAGNOSED>>GO TO 4.

#### f 4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

- Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- Perform DTC confirmation procedure again.

>> GO TO 3.

## ${f 5}$ .PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-239, "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-240, "Diagnosis Procedure".

## Component Function Check

## 1.PERFORM COMPONENT FUNCTION CHECK-I

#### **⋈**Without CONSULT

- 1. Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.
- Check the voltage between ECM harness connector terminals under the following condition.

	ECM					
DTC	Connector	+	_	Condition	Voltage	
	Connector	Terminal	Terminal			
P0137	F102	76	84	Revving up to 4,000 rpm under no load at	The voltage should be above 0.74 V at	
P0157	80		04	least 10 times	least once during this procedure.	

#### Is the inspection result normal?

#### YES >> INSPECTION END

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**EC-239** Revision: 2013 March 2014 QX50

#### [VQ37VHR]

#### < DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 2.

## 2.PERFORM COMPONENT FUNCTION CHECK-II

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

	ECM					
DTC	Connector	+	_	Condition	Voltage	
	Connector	Terminal	rminal Terminal			
P0137	F102	76	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at	
P0157	1 102	80	04	Reeping engine at lule for 10 minutes	least once during this procedure.	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

## 3.PERFORM COMPONENT FUNCTION CHECK-III

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

	ECM					
DTC	Connector	+	_	Condition	Voltage	
	Connector		Terminal			
P0137	F102	76	84	Coasting from 80 km/h (50 MPH) in D po-	The voltage should be above 0.74 V at	
P0157	80		04	sition	least once during this procedure.	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-240, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000009064023

## 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to <a href="EC-24">EC-24</a>, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- 2. Run engine for at least 10 minutes at idle speed.

#### Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to <u>EC-265, "DTC Logic"</u>.

NO >> GO TO 3.

## 3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC		HO2S2		EC	Continuity	
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0137	1	F54	1	F102	84	Existed
P0157	2	F53	1	1 102	04	LAISIEU

[VQ37VHR]

5. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC		HO2S2		EC	Continuity	
БТО	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0137	1	F54	4	F102	76	Existed
P0157	2	F53	4	F102	80	EXISTEC

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC		HO2S2	Ground	Continuity	
	Bank	Connector	Terminal	Giodila	Continuity
P0137	1	F54	4	Ground	Not existed
P0157	2	F53	4	Giodila	NOT EXISTED

DTC		ECM	Ground	Continuity	
DIC	Bank	Connector	Terminal	Giodila	Continuity
P0137	1	F102	76	Ground	Not existed
P0157	2	1102	80	Giodila	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-242, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

### 6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <a href="EM-33">EM-33</a>, "Exploded View". CAUTION:

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

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## Component Inspection

INFOID:0000000009064024

## 1. INSPECTION START

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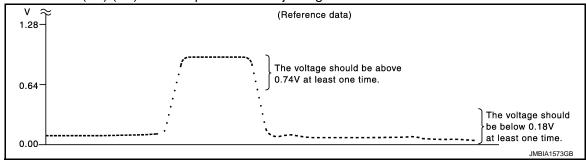
### Do you have CONSULT?

YES >> GO TO 2. NO >> GO TO 3.

## 2.CHECK HEATED OXYGEN SENSOR 2

#### (A) 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.
- Let engine idle for 1 minute.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
- 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.74 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

## 3.CHECK HEATED OXYGEN SENSOR 2-I

#### **⋈**Without CONSULT

- 1. Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector 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 least 10 times	The voltage should be above 0.74 V at least once during this procedure.  The voltage should be below 0.18 V at least once during this procedure.	
1 102	80 [HO2S2 (bank 2)]				

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

## 4. CHECK HEATED OXYGEN SENSOR 2-II

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	ECM			
Connector	+ -		Condition	Voltage
Connector	Terminal	Terminal		
	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
F102	80 [HO2S2 (bank 2)]			

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)]		Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.74 V at least once during this procedure.
1 102	80 [HO2S2 (bank 2)]	84		The voltage should be below 0.18 V at least once during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

### 6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <a href="Maintain: Em-33">EM-33</a>, "Exploded View".

#### **CAUTION:**

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

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INFOID:0000000009064026

## P0138, P0158 HO2S2

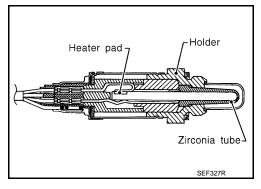
Description INFOID:000000009241938

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



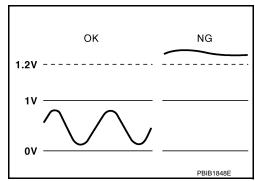
**DTC** Logic

### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time.

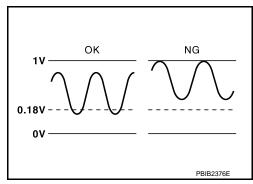
#### **MALFUNCTION A**

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



#### **MALFUNCTION B**

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
	Heated oxygen sensor	A)	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted)     Heated oxygen sensor 2
P0138	(bank 1) circuit high voltage	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>

[VQ37VHR]

< DTC/CIR	CUIT DIAGNOSIS >			[VQ37VHR]
DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
	Heated oxygen sensor 2	A)	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted)     Heated oxygen sensor 2
P0158	(bank 2) circuit high voltage	B)	The minimum voltage from the sensor is not reached to the specified voltage.	Harness or connectors     (The sensor circuit is open or shorted)     Heated oxygen sensor 2     Fuel pressure     Fuel injector
	FIRMATION PROCE NDITIONING	EDU	RE	
efore cond . Turn ig . Turn ig	nfirmation Procedure ducting the next test. nition switch OFF and nition switch ON. nition switch OFF and	wait		s perform the following procedure
	GO TO 2. RM DTC CONFIRMAT	ION	PROCEDURE FOR MALFUNCTION	N A
Turn ig. Turn ig. Start er. Let eng. Check Stat trip D YES >> NO-1 >>	nition switch OFF and nition switch ON. nition switch OFF and ngine and keep the engine idle for 2 minutes. 1st trip DTC.  TC detected?  Go to EC-247, "Diag." With CONSULT: GO.	wait gine nosis	at least 10 seconds. speed between 3,500 and 4,000 rpm seconds. Seconds 2,500 and 4,000 rpm seconds. Seconds 2,500 and 4,000 rpm seconds 2,500 and 4,000 and	n for at least 1 minute under no load.
.PERFO	RM DTC CONFIRMAT	TON	PROCEDURE FOR MALFUNCTION	N B
Select Start er Turn ig Turn ig Turn ig Start er Let eng Make s	"DATA MONITOR" mongine and warm it up to the nition switch OFF and nition switch ON. If and the nition switch OFF and the sure that "COOLAN TEWARM up engine and governed the sure the sure that "COOLAN TEWARM up engine and governed the sure that the sur	ode we to the wait wait gine	e normal operating temperature. at least 10 seconds.	n for at least 1 minute under no load.
0. Select "DTC V 1. Start er <b>NOTE:</b>	VORK SUPPORT" mongine and follow the in	de w strud	DTC P0138) or "HO2S2 (B2) P116 vith CONSULT. ction of CONSULT display.  il "COMPLETED" is displayed.	6" (for DTC P0158) of "HO2S2" in
2. Touch ' Vhich is dis OK >> NG >>	SELF-DIAG RESULT splayed on CONSULT INSPECTION END Go to EC-247, "Diag BE DIAGNOSED>>0	S". scre	een? s Procedure".	

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).

Revision: 2013 March **EC-245** 2014 QX50

2. Perform DTC confirmation procedure again.

>> GO TO 3.

## ${f 5.}$ PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

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:0000000009064027

## 1. PERFORM COMPONENT FUNCTION CHECK-I

#### **♥Without CONSULT**

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

		ECM			
DTC	Connector	+	_	Condition	Voltage
	Connector	Terminal	Terminal		
P0138	F102	76	84	Revving up to 4,000 rpm under no load at	The voltage should be below 0.18 V at
P0158	1 102	80	04	least 10 times	least once during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

## 2.PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

		ECM			
DTC	Connector	+	_	Condition	Voltage
	Connector	Terminal	Terminal		
P0138	F102	76	84	Keeping engine at idle for 10 minutes	The voltage should be below 0.18 V at
P0158	1 102	80	04	reeping engine at fale for 10 minutes	least once during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

## 3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

		ECM				
DTC	Connector	+	_	Condition	Voltage	
	Connector	Terminal	Terminal			
P0138	F102	76	84	Coasting from 80 km/h (50 MPH) in D po-	The voltage should be below 0.18 V at	
P0158	1 102	80	04	sition	least once during this procedure.	

### P0138, P0158 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-247, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000009064028

## 1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-244, "DTC Logic".

Which malfunction is detected?

Α >> GO TO 2

В >> GO TO 9.

## 2.CHECK GROUND CONNECTION

Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

## 3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 2. Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC		HO2S2		ECM		Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F54	1	F102	84	Existed
P0158	2	F53	1	1 102	04	LXISIEU

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

>> GO TO 4. YES

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			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F54	4	F102	76	Existed
P0158	2	F53	4	1 102	80	LAISIGU

Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC		HO2S2		Ground	Continuity
ыс	Bank	Connector	Terminal	Oloulia	Continuity
P0138	1	F54	4	Ground	Not existed
P0158	2	F53	4	Giodila	NOT EXISTED

DTC		ECM	Ground	Continuity	
ыс	Bank	Connector	Terminal	Giodila	Continuity
P0138	1	F102	76	Ground	Not existed
P0158	2	1 102	80	Ground	Not existed

Revision: 2013 March 2014 QX50

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**EC-247** 

#### < DTC/CIRCUIT DIAGNOSIS >

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.

### ${f 5.}$ CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

#### Water should not exist.

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace harness or connectors.

#### 6. CHECK HEATED OXYGEN SENSOR 2

#### Refer to EC-249, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

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# 7.REPLACE HEATED OXYGEN SENSOR 2

# Replace malfunctioning heated oxygen sensor 2. Refer to <u>EM-33, "Exploded View"</u>. CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

#### >> INSPECTION END

## 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## 9. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace ground connection.

## 10.clear the mixture ratio self-learning value

- Clear the mixture ratio self-learning value. Refer to <u>EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement"</u>.
- 2. Run engine for at least 10 minutes at idle speed.

#### Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to <u>EC-269</u>, "DTC Logic".

NO >> GO TO 11.

## 11. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 harness connector.
- Disconnect ECM harness connector.
- 4. Check the continuity between HO2S2 harness connector and ECM harness connector.

		HO2S2		EC	CM	
DTC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F54	1	F102	84	Existed
P0158	2	F53	1	1 102	04	LAISIEU

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5. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

>> GO TO 12.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 12. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC		HO2S2		EC	CM	Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0138	1	F54	4	F102	76	Existed
P0158	2	F53	4	F102	80	Existed

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

DTC		HO2S2	ECM		Ground	Continuity	
ыс	Bank	Connector	Terminal	Connector	Terminal	Glodila	Continuity
P0138	1	F54	4	F102	76	Ground	Not existed
P0158	2	F53	4	1 102	80	Giodila	INOL EXISTED

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-246, "Component Function Check".

#### Is the inspection result normal?

>> GO TO 15. YES

NO >> GO TO 14.

## 14. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-33, "Exploded View".

#### **CAUTION:**

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

#### >> INSPECTION END

### 15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

## 1.INSPECTION START

**EC-249** Revision: 2013 March 2014 QX50

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INFOID:0000000009241940

#### < DTC/CIRCUIT DIAGNOSIS >

Do you have CONSULT?

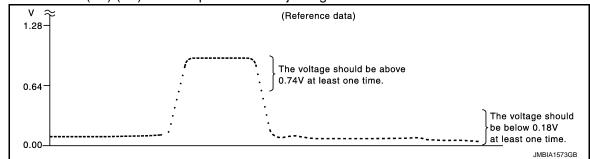
#### Do you have CONSULT?

YES >> GO TO 2. NO >> GO TO 3.

## 2.CHECK HEATED OXYGEN SENSOR 2

#### (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.
- Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
- 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.74 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

## 3.CHECK HEATED OXYGEN SENSOR 2-I

#### **⋈**Without CONSULT

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

	ECM				
Connector	+	_	Condition	Voltage	
Comilector	Connector Terminal				
F102	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at	The voltage should be above 0.74 V at least once during this procedure.	
1 102	80 [HO2S2 (bank 2)]	04	least 10 times	The voltage should be below 0.18 V at least once during this procedure.	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

## 4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following condition.

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	ECM				
Connector	+	_	Condition	Voltage	
Connector	Terminal	Terminal			
F102	76 [HO2S2 (bank 1)] F102		Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure.	
1 102	80 [HO2S2 (bank 2)]	04	resping engine at tale for 10 millitates	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
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	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. Refer to <a href="Maintain: Em-33">EM-33</a>, "Exploded View".

#### **CAUTION:**

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

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INFOID:0000000009064031

## P0139, P0159 HO2S2

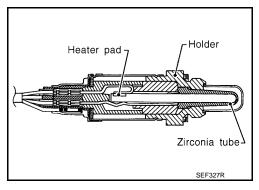
Description INFOID:000000000241939

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

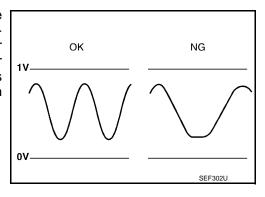
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



**DTC** Logic

## DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 (bank 1) circuit slow response	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more	Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 Fuel system EVAP system Intake air system
P0159	Heated oxygen sensor 2 (bank 2) circuit slow response	than the specified time computed by ECM.	

#### DTC CONFIRMATION PROCEDURE

## 1.INSPECTION START

Do you have CONSULT?

#### Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 7.

## 2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 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.

#### **TESTING CONDITION:**

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

# 3.perform dtc confirmation procedure

#### (P)With CONSULT

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 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)	CIVIFLI	
	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

- Open engine hood.
- Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
- 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

- Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- Perform DTC confirmation procedure again.

>> GO TO 3.

# **6.**PERFORM SELF-DIAGNOSIS

#### (P)With CONSULT

Perform ECM self-diagnosis.

#### Is DTC "P0139" or "P0159" detected?

YES >> Proceed to EC-255, "Diagnosis Procedure".

NO >> INSPECTION END

# / .PERFORM COMPONENT FUNCTION CHECK

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**EC-253** 

Revision: 2013 March

#### [VQ37VHR]

#### < DTC/CIRCUIT DIAGNOSIS >

Perform component function check. Refer to EC-254, "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 >> Proceed to <u>EC-255</u>, "<u>Diagnosis Procedure</u>".

## Component Function Check

INFOID:0000000009064032

# 1. PERFORM COMPONENT FUNCTION CHECK-I

### **⋈**Without CONSULT

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

		ECM			
DTC	Connector	+	_	Condition	Voltage
	Connector	Terminal	Terminal		
P0139	F102	76	84	Revving up to 4,000 rpm under no load at	
P0159	1 102	80	04	least 10 times	0.96 V for 1 second during this procedure.

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

		ECM			
DTC	Connector	+	_	Condition	Voltage
	Connector	Terminal	Terminal		
P0139	F102	76	84	Keeping engine at idle for 10 minutes	A change of voltage should be more than
P0159	1 102	80	04	Reeping engine at the for 10 minutes	0.96 V for 1 second during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

# 3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

		ECM			
DTC	Connector	+	-	Condition	Voltage
	Connector	Terminal	nal Terminal		
P0139	F102	76	84	Coasting from 80 km/h (50 MPH) in D po-	A change of voltage should be more than
P0159	1 102	80		sition	0.96 V for 1 second during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-255, "Diagnosis Procedure".

### P0139, P0159 HO2S2

#### < DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

[VQ37VHR]

INFOID:0000000009064033

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to <a href="EC-24">EC-24</a>, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- 2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-265, "DTC Logic"</u> or <u>EC-269, "DTC Logic"</u>.

NO >> GO TO 3.

# 3.check ho2s2 ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC		HO2S2		EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0139	1	F54	1	F102	84	Existed
P0159	2	F53	1	1 102	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.

## f 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC		HO2S2		ECM		Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0139	1	F54	4	F102	76	Existed
P0159	2	F53	4	1 102	80	LXISIEU

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC		HO2S2		Ground	Continuity
ыс	Bank	Connector	Terminal	Giodila	Continuity
P0139	1	F54	4	Ground	Not existed
P0159	2	F53	4	Giouna	NOI EXISTED

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DTC		ECM		Ground	Continuity
DIC	Bank	Connector	Terminal	Giodila	Continuity
P0139	1	F102	76	Ground	Not existed
P0159	2	1102	80	Giodila	NOT EXISTED

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-256, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

# 6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-33. "Exploded View".

#### **CAUTION:**

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

#### >> INSPECTION END

# 7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000009241941

# 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

### (P)With CONSULT

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.

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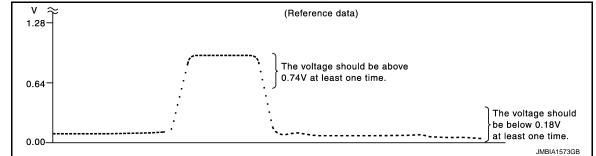
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7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.74 V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

# 3.CHECK HEATED OXYGEN SENSOR 2-I

#### **®Without CONSULT**

- 1. Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

	ECM				
Connector	+	_	Condition	Voltage	
Connector	Terminal	Terminal			
F102	76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

### 4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector 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 0.74 V at least once during this procedure.
1 102	80 [HO2S2 (bank 2)]	04	Reeping engine at idie for 10 minutes	The voltage should be below 0.18 V at least once during this procedure.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

### **5.**CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

	ECM				
Connector	+	_	Condition	Voltage	
Connector	Terminal Termina				
E102	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D po-	The voltage should be above 0.74 V at least once during this procedure.	
1 102	F102 80 [HO2S2 (bank 2)]		sition	The voltage should be below 0.18 V at least once during this procedure.	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

# 6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EM-33, "Exploded View"</u>.

- 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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR

DTC Logic

#### DTC DETECTION LOGIC

To judge malfunctions, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause		
P014C	Air fuel ratio (A/F) sensor 1 (bank 1)				
P014D	circuit slow response				
P015A	Air fuel ratio (A/F) sensor 1 (bank 1)	• The response time of a A/E can	<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	The response time of a A/F sensor 1 signal delays more than the specified time computed by ECM.			
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.

- Turn ignition 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

#### (P)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 1minute under no load.
- 6. Let engine idle for 1 minute.
- 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-230, "Component Function Check".

Revision: 2013 March **EC-259** 2014 QX50

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< DTC/CIRCUIT DIAGNOSIS >

DTC	Data monitor item	Status
<ul><li>P014C</li><li>P014D</li><li>P015A</li><li>P015B</li></ul>	A/F SEN1 DIAG3 (B1)	PRSNT
<ul><li>P014E</li><li>P014F</li><li>P015C</li><li>P015D</li></ul>	A/F SEN1 DIAG3 (B2)	FIXONI

#### Is "PRSNT" displayed on CONSULT screen?

YES >> GO TO 4. >> GO TO 3. NO

# 3.perform dtc confirmation procedure-2 $\,$

#### (P)With CONSULT

Perform DTC confirmation procedure-1 again.

#### Is "PRSNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> Refer to EC-230, "Component Function Check".

# f 4 .PERFORM DTC CONFIRMATION PROCEDURE-2

#### (P)With CONSULT

- 1. Wait for about 20 seconds at idle.
- 2. Check the items status of "DATA MONITOR" as follows.

If "CMPLT" changed to "INCMP", refer to EC-230, "Component Function Check".

DTC	Data monitor item	Status
• P014C	A/F SEN1 DIAG1 (B1)	
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	A/F SEN1 DIAG2 (B1)	CMPLT
• P014E	A/F SEN1 DIAG1 (B2)	CIVIPLI
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>	A/F SEN1 DIAG2 (B2)	

#### Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Refer to EC-230, "Component Function Check".

## 5. PERFORM SELF-DIAGNOSIS

#### (P)With CONSULT

Check the "SELF-DIAG RESULT".

#### Is any DTC detected?

>> Proceed to EC-261, "Diagnosis Procedure". YES

NO >> INSPECTION END

## 6.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

#### With GST

- 1. Start engine and warm it up to normal operating temperature.
- Select Service \$01 with GST.
- Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.

#### Is the total percentage within $\pm 15\%$ ?

YES >> GO TO 8. NO >> GO TO 7.

#### < DTC/CIRCUIT DIAGNOSIS >

# 7. DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- · Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

# 8. PERFORM DTC CONFIRMATION PROCEDURE

- 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.
- 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.
- Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
- Fully release accelerator pedal and then let engine idle for about 1 minute.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

>> Proceed to EC-261, "Diagnosis Procedure". YES

NO >> INSPECTION END

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.RETIGHTEN A/F SENSOR 1

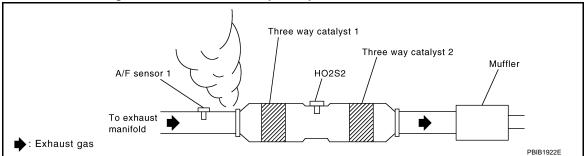
Loosen and retighten the A/F sensor 1. Refer to EM-33, "Exploded View".

>> 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.



#### Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

**EC-261** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

### 4.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

#### Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 5.

# 5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to <u>EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement"</u>.
- 2. Run engine for at least 10 minutes at idle speed.

#### Is the 1st trip DTC P0171, 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-265, "DTC Logic"</u> or <u>EC-269, "DTC Logic"</u>.

NO >> GO TO 6.

# 6.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect A/F sensor 1 harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
DIC	Bank	Connector	Terminal	Giodila	voltage
<ul><li>P014C</li><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1	F3	4	Ground	Dettermine
<ul><li>P014E</li><li>P014F</li><li>P015C</li><li>P015D</li></ul>	2	F20	4		Battery voltage

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

# 7.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

### >> Repair or replace harness or connectors.

# 8.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

< DTC/CIRCUIT DIAGNOSIS >

	A/F sensor 1			EC	0	
DTC -	Bank	Connector	Terminal	Connector	Terminal	Continuity
• P014C		1 F3 2 F8	57			
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1		2	F0	61	Existed
• P014E	P014E P014F P015C P015D P015D	1	го	65	LXISIEU	
• P015C		F20	2		66	

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			Craund	Continuity
DIC	Bank	Connector	Terminal	Ground	Continuity
• P014C			1		Not existed
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1	F3	2	Cround	
• P014E			1	Ground	
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>	2	F20	2		

DTC	ECM			Ground	Continuity
DIC	Bank	nk Connector Terminal		Giodila	Continuity
• P014C		- F102	57	Ground	Not existed
<ul><li>P014D</li><li>P015A</li><li>P015B</li></ul>	1		61		
• P014E			65		
<ul><li>P014F</li><li>P015C</li><li>P015D</li></ul>	5C <sup>2</sup>	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.

### $\mathbf{9}.$ CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 10.

>> GO TO 13. NO

# 10. CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2).

Refer to EC-190, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning mass air flow sensor. Refer to EM-26, "Exploded View".

# 11. CHECK PCV VALVE

Refer to EC-528, "Component Inspection".

#### Is the inspection result normal?

**EC-263** Revision: 2013 March 2014 QX50

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< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 12.

NO >> Repair or replace PCV valve. Refer to EM-46, "Exploded View".

12. CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace.

13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-33, "Exploded View". **CAUTION:** 

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic INFOID:0000000009064037

#### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171	Fuel injection system too lean (bank 1)		Intake air leaks     A/F sensor 1
P0174	Fuel injection system too lean (bank 2)	Fuel injection system does not operate properly.     The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	<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.
- Turn ignition switch ON.
- 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 EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- Start engine.

### Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

# 3.restart engine

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

#### NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

### Does engine start?

YFS >> Go to EC-266, "Diagnosis Procedure".

NO >> Check exhaust and intake air leak visually.

# 4. PERFORM DTC CONFIRMATION PROCEDURE-II

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- Keep engine idle for at least 5 minutes.
- Check 1st trip DTC.

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is 1st trip DTC detected?

YES >> Go to EC-266, "Diagnosis Procedure".

NO >> GO TO 5.

# 5. PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.

2. Start engine.

3. Maintain the following conditions for at least 10 consecutive minutes.

Hold the accelerator pedal as steady as possible.

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50 - 120 km/h (31 - 75 MPH)

#### **CAUTION:**

### Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-266, "Diagnosis Procedure".

NO >> INSPECTION END

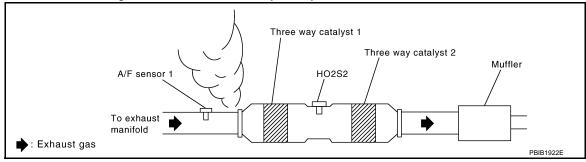
# Diagnosis Procedure

INFOID:0000000009064038

# 1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

2. Listen for an exhaust gas leak before three way catalyst 1.



### Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

# 2.CHECK FOR INTAKE AIR LEAK

- Listen for an intake air leak after the mass air flow sensor.
- Check PCV hose connection.

#### Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

# ${f 3.}$ CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect corresponding A/F sensor 1 harness connector.
- 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		
Ban		Connector	Terminal	Connector	Terminal	Continuity	
P0171	1	F3	1		57		
FUITI	P0171 1	13	2	F102	61	Existed	
P0174	2	F20	1		65	LAISIGU	
F0174	0174 2 F20	2		66			

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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
ыс	Bank	ank Connector Termina		Giodila	Continuity
P0171	1	F3	1		
PUITI	'	гэ	2	Ground	Not existed
D0174	P0174 2 F20	E20	1	Giouna	Not existed
F0174		2			

DTC	ECM			Ground	Continuity
DIC	Bank	Connector	Terminal	Giodila	Continuity
P0171	1		57		Not existed
P0171	ı	F102	61	Ground	
D0174	P0174 2	1102	65		
F0174			66		

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

- Release fuel pressure to zero. Refer to <a>EC-631</a>, "Inspection".
- 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.

# ${f 5}.$ DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

#### Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to FL-6, "Removal and Installation".

NO >> Repair or replace.

### 6.CHECK MASS AIR FLOW SENSOR

#### (P)With CONSULT

- 1. Install all removed parts.
- Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT. For specification, refer to EC-634, "Mass Air Flow Sensor".

#### 

- 1. Install all removed parts.
- Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to EC-634, "Mass Air Flow Sensor".

### Is the measurement value within the specification?

YES >> GO TO 7.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-195, "Diagnosis Procedure".

# 7.CHECK FUNCTION OF FUEL INJECTOR

#### (P)With CONSULT

Start engine.

**EC-267** Revision: 2013 March 2014 QX50

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- Make sure that each circuit produces a momentary engine speed drop.

#### **♥Without CONSULT**

- 1. Start engine and let it idle.
- Listen to each fuel injector operating sound.

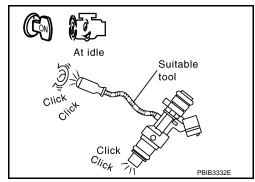
#### Clicking sound should be heard.

#### Is the inspection result normal?

YES >> GO TO 8.

NO

>> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-507, "Diagnosis Procedure".

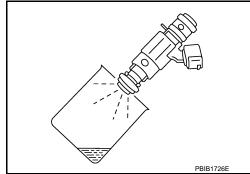


# 8. CHECK FUEL INJECTOR

- Turn ignition switch OFF.
- Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- Disconnect all fuel injector harness connectors.
- Remove fuel tube assembly. Refer to EM-36, "Removal and Installation". Keep fuel hose and all fuel injectors connected to fuel tube.
- For DTC P0171, reconnect fuel injector harness connectors on bank 1. For DTC P0174, reconnect fuel injector harness connectors on bank 2.
- Disconnect all ignition coil harness connectors.
- 7. Prepare pans or saucers under each fuel injector.
- 8. Crank engine for about 3 seconds.

For DTC P0171, make sure that fuel sprays out from fuel injectors on bank 1.

For DTC P0174, make sure that fuel sprays out from fuel injectors on bank 2.



#### Fuel should be sprayed evenly for each fuel injector.

### Is the inspection result normal?

YES >> GO TO 9.

NO

>> Replace fuel injectors from which fuel does not spray out. (Refer to EM-36, "Removal and Installation".) Always replace O-ring with new ones.

# 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic INFOID:0000000009064039

### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator	
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector	

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172	Fuel injection system too rich (bank 1)	Fuel injection system does not operate properly.	A/F sensor 1     Fuel injector
P0175	Fuel injection system too rich (bank 2)	The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	<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.
- Turn ignition switch ON.
- 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 EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement".
- Start engine.

#### Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

### 3.restart engine

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

### NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

#### Does engine start?

YES >> Go to EC-270, "Diagnosis Procedure".

NO >> Remove spark plugs and check for fouling, etc. Refer to EM-46, "Exploded View".

### f 4 . PERFORM DTC CONFIRMATION PROCEDURE-II

- Keep engine idle for at least 10 minutes.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-270, "Diagnosis Procedure".

>> GO TO 5. NO

Revision: 2013 March

**EC-269** 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 5. PERFORM DTC CONFIRMATION PROCEDURE-III

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine.
- 3. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

VHCL SPEED SE

50 - 120 km/h (31 - 75 MPH)

#### **CAUTION:**

### Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-270, "Diagnosis Procedure".

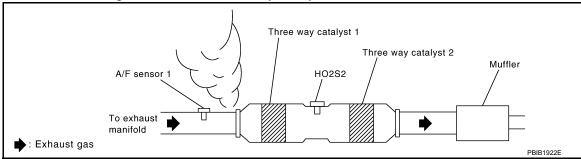
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064040

# 1. CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- Listen for an exhaust gas leak before three way catalyst 1.



#### Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

# 2.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

#### Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

# 3.check a/f sensor 1 input signal circuit

- 1. Turn ignition switch OFF.
- 2. Disconnect corresponding A/F sensor 1 harness connector.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC		A/F sensor	1	EC	CM	Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0172	1	F3	1	F102	57	
FUITZ	Į.		2		61	Existed
P0175	2	E20	1	1 102	65	LAISIEU
F0173	5 2 F20		2		66	

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

	A/F senso	r 1			
DTC Bank		Terminal	Ground	Continuity	
Bain		1			
P0172 1	F3	2			
P0175 2	F20	1 2	Ground	Not existed	
			I.		
DTC	ECM		Ground	Continuity	
Bank	Connector	Terminal		,	
P0172 1		57			
	F102	61	Ground	Not existed	
P0175 2		65			
		66			
Also check		•	ower.		
the inspection		nal?			
YES >> GO NO >> Rep		cuit short	to around	or short to	ower in harness or connectors.
.CHECK FUE	•	•	io ground	טו אוטונ וט ן	wei in namess of connectors.
				004	
Release fue	l pressure t	o zero. Re	eter to EC-	631 "Inspe	
					<u>ion"</u> . er to <u>EC-631, "Inspection"</u> .
Install fuel p	ressure gau	ige and ch	neck fuel p		er to EC-631, "Inspection".
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#### < DTC/CIRCUIT DIAGNOSIS >

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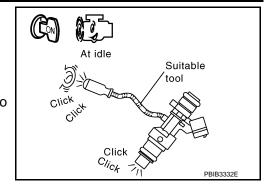
Listen to each fuel injector operating sound.

#### Clicking sound should be heard.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-507, "Diagnosis Procedure".



# 7. CHECK FUEL INJECTOR

- Remove fuel injector assembly. Refer to <u>EM-36, "Removal and Installation"</u>. Keep fuel hose and all fuel injectors connected to fuel tube.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- 4. Disconnect all ignition coil harness connectors.
- 5. Prepare pans or saucers under each fuel injector.
- Crank engine for about 3 seconds.Make sure fuel that does not drip from fuel injector.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace the fuel injectors from which fuel is dripping. (Refer to EM-36, "Removal and Installation".) Always replace O-ring with new one.

# 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

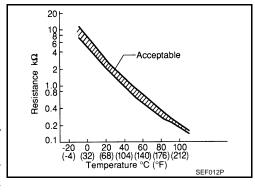
#### [VQ37VHR]

### P0181 FTT SENSOR

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

#### <Reference data>

Fluid temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90



<sup>\*:</sup> These data are reference values and are measured between ECM terminals 106 (Fuel tank temperature sensor) and 128 (ECM ground).

DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
	FTT SENSOR	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor.	Harness or connectors     (The FTT sensor circuit is open or shorted)     FTT sensor
P0181	[Fuel tank temperature (FTT) sensor circuit range/ performance]	B)	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul> <li>Harness or connectors (High or low resistance in the FTT sensor circuit)</li> <li>FTT sensor</li> </ul>

#### 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.
- 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.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-275, "Diagnosis Procedure".

Revision: 2013 March **EC-273** 2014 QX50

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NO >> GO TO 4.

# 4. CHECK ENGINE COOLANT TEMPERATURE

- 1. Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT.
- 2. Check "COOLAN TEMP/S" value.

### "COOLAN TEMP/S" less than 60°C (140°F)?

YES >> INSPECTION END

NO >> GO TO 5.

# 5. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
- Wait at least 10 seconds.
- 3. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-275, "Diagnosis Procedure".

NO >> GO TO 6.

### 6.PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to EC-275, "Component Function Check".

#### NOTE:

Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-275, "Diagnosis Procedure".

### 7. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TEST CONDITION:**

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 8.

# 8. PERFORM DTC CONFIRMATION PROCEDURE B

- 1. Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place.

#### NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

#### **CAUTION:**

#### Never turn ignition switch ON during soaking.

#### NOTE:

The vehicle must be cooled with the food open.

4. Start engine and let it idle for 5 minutes or more.

#### **CAUTION:**

#### Never turn ignition switch OFF during idling.

Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to EC-275, "Diagnosis Procedure".

NO >> INSPECTION END

### P0181 FTT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

# Component Function Check

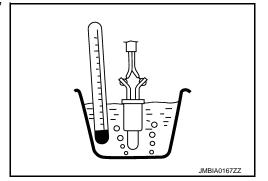
# [VQ37VHR]

#### INFOID:0000000009064043

# 1. CHECK FUEL TANK TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (k $\Omega$ )	
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
4 and 5	remperature [ C ( 1 )]	50 (122)	0.79 - 0.90



#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to <u>EC-275</u>, "<u>Diagnosis Procedure</u>".

# 2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to <u>EC-275</u>, "<u>Diagnosis Procedure</u>".

# Diagnosis Procedure

#### INFOID:0000000009064044

### 1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-273, "DTC Logic".

### Which malfunction is detected?

YES >> GO TO 2.

NO >> GO TO 7.

### 2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to MWI-58, "Component Function Check".

# ${f 3.}$ CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

	nsor unit and pump	Ground	Voltage (V)
Connector	Terminal		
B22	4	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

# 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M7, B1
- Harness for open or short between ECM and "fuel level sensor unit and fuel pump"

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Revision: 2013 March EC-275 2014 QX50

>> Repair open circuit, short to ground or short to power in harness or connector.

# 5.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect "unified meter and A/C amp." harness connector.
- Check the continuity between "fuel level sensor unit and fuel pump" harness connector and "unified meter and A/C amp." harness connector.

Fuel level sensor unit and fuel pump		Unified me	Continuity	
Connector	Terminal	Connector	Terminal	
B22	5	M67	58	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

# 6.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M7, B1
- Harness for open or short between "fuel level sensor unit and fuel pump" and "unified meter and A/C amp."
  - >> Repair open circuit, short to ground or short to power in harness or connector.

### 7. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-276, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6, "Removal and Installation".

### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000009064045

# 1. CHECK FUEL TANK TEMPERATURE SENSOR

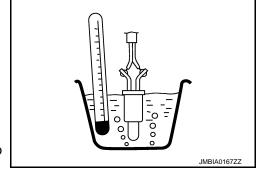
- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (kΩ)	
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
4 and 5	remperature [ O ( 1 )]	50 (122)	0.79 - 0.90

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6. "Removal and Installation".



[VQ37VHR]

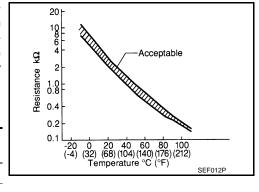
# P0182, P0183 FTT SENSOR

Description INFOID:000000000241942

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

#### <Reference data>

Fluid temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90



<sup>\*:</sup> These data are reference values and are measured between ECM terminals 106 (Fuel tank temperature sensor) and 128 (ECM ground).

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)
P0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

#### 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.
- 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.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-277, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

## 1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-273, "DTC Logic".

Which malfunction is detected?

YES >> GO TO 2.

NO >> GO TO 7.

# 2. CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

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#### < DTC/CIRCUIT DIAGNOSIS >

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to MWI-58, "Component Function Check".

# 3.check fuel tank temperature sensor power supply circuit

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

	nsor unit and pump	Ground	Voltage (V)
Connector	Terminal		
B22	4	Ground	Approx. 5

### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

### 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M7, B1
- · Harness for open or short between ECM and "fuel level sensor unit and fuel pump"
  - >> Repair open circuit, short to ground or short to power in harness or connector.

# 5. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect "unified meter and A/C amp." harness connector.
- 3. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and "unified meter and A/C amp." harness connector.

	Fuel level sensor unit and fuel pump		Unified meter and A/C amp.	
Connector	Terminal	Connector Terminal		
B22	5	M67 58		Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

## 6. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M7, B1
- Harness for open or short between "fuel level sensor unit and fuel pump" and "unified meter and A/C amp."
  - >> Repair open circuit, short to ground or short to power in harness or connector.

### 7. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-279, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6, "Removal and Installation".

### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000009241944

# 1.CHECK FUEL TANK TEMPERATURE SENSOR

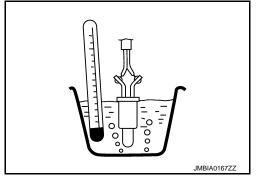
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (kΩ)	
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
4 and 5	remperature [ O ( 1 )]	50 (122)	0.79 - 0.90

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6, "Removal and Installation".



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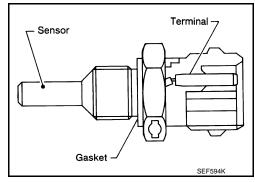
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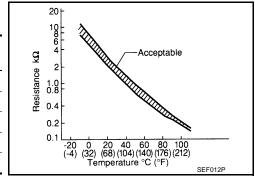
### P0196 EOT SENSOR

The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



#### <Reference data>

Engine oil temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153



<sup>\*:</sup> 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 <a href="EC-284">EC-284</a>, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
	EOT SENSOR	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	Harness or connectors     (The EOT sensor circuit is open or shorted)     EOT sensor
P0196	[Engine oil temperature (EOT) sensor range/performance	В)	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the EOT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	Harness or connectors (High or low resistance in the EOT sensor circuit)     EOT sensor

#### DTC CONFIRMATION PROCEDURE

### 1.INSPECTION START

### Is it necessary to erase permanent DTC?

YES >> GO TO 6. NO >> GO TO 2.

# 2.PRECONDITIONING

[VQ37VHR] < 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.
- Turn ignition switch ON.
- 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

- Start engine and warm it up to normal operating temperature.
- 2. 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.
- 5. Start engine and let it idle for 5 minutes and 10 seconds.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

>> EC-283, "Diagnosis Procedure". YES

NO >> GO TO 4.

# 4. PERFORM DTC CONFIRMATION PROCEDURE-II

- Select "DATA MONITOR" mode with CONSULT.
- 2. 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.

- Turn ignition switch OFF and soak the vehicle in a cool place.
- 4. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- 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.

#### NOTE:

- 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-283, "Diagnosis Procedure".

NO >> GO TO 5.

# $oldsymbol{5}$ .PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to EC-282, "Component Function Check".

#### NOTE:

Use the component function check to check the overall function of the EOT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

**EC-281** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

NO >> Proceed to EC-283, "Diagnosis Procedure".

# 6.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

#### **TEST CONDITION:**

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 7.

# 7.PERFORM DTC CONFIRMATION PROCEDURE B

- 1. Start engine and let it idle for 60 minutes.
- 2. Move the vehicle to a cool place.

#### NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

#### CAUTION:

### Never turn ignition switch ON during soaking.

#### NOTE:

The vehicle must be cooled with the food open.

4. Start engine and let it idle for 5 minutes or more.

#### **CAUTION:**

#### Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to EC-283, "Diagnosis Procedure".

NO >> INSPECTION END

# Component Function Check

INFOID:00000000009064052

# 1. CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

- 1. Turn ignition switch OFF.
- Disconnect EOT sensor harness connector.
- 3. Remove EOT sensor. Refer to EM-42, "Exploded View".
- 4. Check resistance between EOT sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (kΩ)	
	Temperature [°C (°F)]	20 (68)	2.1 - 2.9
1 and 2		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

# Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-283, "Diagnosis Procedure".

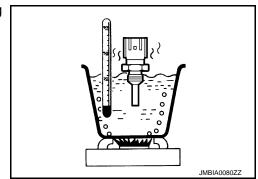
# 2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-283, "Diagnosis Procedure".



### **P0196 EOT SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

#### [VQ37VHR]

INFOID:0000000009064053

### **Diagnosis Procedure**

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK ENGINE OIL TEMPERATURE SENSOR

### Refer to EC-283, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine oil temperature sensor. Refer to EM-42, "Exploded View".

# 3. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009064054

# 1. CHECK ENGINE OIL TEMPERATURE SENSOR

- Turn ignition switch OFF.
- Disconnect engine oil temperature sensor harness connector.
- Remove engine oil temperature sensor. Refer to <u>EM-42</u>, "<u>Exploded View</u>".
- Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

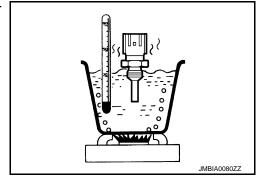
Terminals	Condition	Resistance (kΩ)	
1 and 2	Temperature [°C (°F)]	20 (68)	2.1 - 2.9
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

#### Is the inspection result normal?

YES >> INSPECTION END

NO

>> Replace engine oil temperature sensor. Refer to EM-42. "Exploded View".



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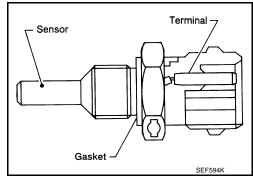
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# P0197, P0198 EOT SENSOR

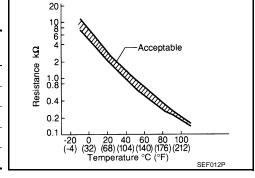
Description INFOID:000000009241945

The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



#### <Reference data>

Engine oil temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153



<sup>\*:</sup> These data are reference values and are measured between ECM terminals 78 (Engine oil temperature sensor) and 84 (Sensor ground).

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0197	Engine oil tempera- ture sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)
P0198	Engine oil tempera- ture sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Engine oil temperature sensor

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 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 wait at least 5 seconds.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

### **P0197, P0198 EOT SENSOR**

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > YES >> Go to EC-285, "Diagnosis Procedure". NO >> INSPECTION END Α Diagnosis Procedure INFOID:0000000009064057 EC CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection". Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. D 2.CHECK EOT SENSOR POWER SUPPLY CIRCUIT Disconnect engine oil temperature (EOT) sensor harness connector. Е Turn ignition switch ON. Check the voltage between EOT sensor harness connector and ground. EOT sensor Ground Voltage (V) Connector **Terminal** F38 Ground Approx. 5 Is the inspection result normal? YFS >> GO TO 3. NO >> Repair open circuit, short to ground or short to power in harness or connectors. Н 3.check eot sensor ground circuit for open and short Turn ignition switch OFF. 2. Disconnect ECM harness connector. Check the continuity between EOT sensor harness connector and ECM harness connector. EOT sensor **ECM** Continuity Connector Connector **Terminal** Terminal F38 2 F102 84 Existed Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. f 4.CHECK ENGINE OIL TEMPERATURE SENSOR Refer to EC-285, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. N NO >> Replace engine oil temperature sensor. Refer to EM-42, "Exploded View".  ${f 5}.$ CHECK INTERMITTENT INCIDENT Refer to GI-42, "Intermittent Incident". >> INSPECTION END Component Inspection INFOID:0000000009241946  ${f 1}$  .CHECK ENGINE OIL TEMPERATURE SENSOR 1. Turn ignition switch OFF. 2. Disconnect engine oil temperature sensor harness connector.

Remove engine oil temperature sensor. Refer to EM-42, "Exploded View".

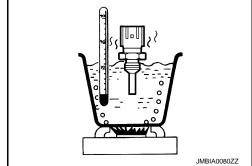
# **P0197, P0198 EOT SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition		Resistance (kΩ)
		20 (68)	2.1 - 2.9
1 and 2	Temperature [°C (°F)]	50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260



### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor. Refer to <u>EM-42.</u> "<u>Exploded View"</u>.

[VQ37VHR]

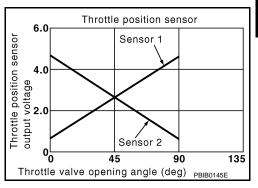
INFOID:00000000009064060

# P0222, P0223, P2132, P2133 TP SENSOR

Description INFOID:0000000009241947

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls throttle valve opening angle in response to driving conditions via the throttle control motor.



**DTC Logic** 

#### DTC DETECTION LOGIC

NOTE:

If DTC P0222, P0223, P2132 or P2133 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0222	Throttle position sensor 1 (bank 1) circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.		
P0223	Throttle position sensor 1 (bank 1) circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	Harness or connectors     (TP sensor 1 circuit is open or shorted.)	
P2132	Throttle position sensor 1 (bank 2) circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	Electric throttle control actuator (TP sensor 1)	
P2133	Throttle position sensor 1 (bank 2) circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.		

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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.

**EC-287** 

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

#### Is DTC detected?

>> Go to EC-288, "Diagnosis Procedure". YES

NO >> INSPECTION END EC

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#### < DTC/CIRCUIT DIAGNOSIS >

## **Diagnosis Procedure**

INFOID:0000000009064061

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between electric throttle control actuator harness connector and ground.

DTC	Electric throttle control actuator			Ground	\/altaga (\/\)
	Bank	Connector	Terminal	Ground	Voltage (V)
P0222, P0223	1	F6	6	Ground	Approx. 5
P2132, P2133	2	F27	1	Ground	дриох. 3

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

# 3. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0222, P0223	1	F6	3	F101	40	Existed
P2132, P2133	2	F27	4		48	

<sup>4.</sup> Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

# 4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0222, P0223	1	F6	4	F101	30	Existed
P2132, P2133	2	F27	2		31	

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

### CHECK THROTTLE POSITION SENSOR

Refer to EC-289, "Component Inspection".

### P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### 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-28, "Removal and Installation".

Go to EC-289, "Special Repair Requirement".

>> INSPECTION END

## 7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

1. CHECK THROTTLE POSITION SENSOR

- Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".
- Turn ignition switch ON.
- Set selector lever to D position.
- Check the voltage between ECM harness connector terminals under the following conditions.

ECM					
Connector	+	_	Condition		Voltage (V)
Connector	Terminal	Terminal			
	30 [TP sensor 1 (bank 1)]	40		Fully released	More than 0.36
	30 [TF SellSOLT (Dalik T)]	40	Accelerator pedal	Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36
F101				Fully depressed	Less than 4.75
FIUI	34 [TP sensor 2 (bank 1)]	40		Fully released	Less than 4.75
				Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48		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-28, "Removal and Installation".
- Go to EC-289, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# 2.PERFORM IDLE AIR VOLUME LEARNING

**EC-289** Revision: 2013 March 2014 QX50

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# P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic INFOID:0000000009064064

### 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.

Two Trip Detection Logic (Exhaust quality deterioration)

For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.

A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300	Multiple cylinder misfires detected	Multiple cylinders misfire.	Improper spark plug
P0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	Insufficient compression     Incorrect fuel pressure
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	The fuel injector circuit is open or shorted
P0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	Fuel injector     Intake air leak
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	The ignition signal circuit is open or shorted
P0305	No. 5 cylinder misfire detected	No. 5 cylinder misfires.	Lack of fuel     Signal plate
P0306	No. 6 cylinder misfire detected	No. 6 cylinder misfires.	A/F sensor 1     Incorrect PCV hose connection

### 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

#### >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- 3. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Restart engine and let it idle for about 15 minutes.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

**EC-291** Revision: 2013 March 2014 QX50

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### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> Go to EC-292, "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 in the freeze frame data $\pm$ 400 rpm	
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
Base fuel schedule	Base fuel schedule in the freeze frame data $\times$ (1 $\pm$ 0.1)
Engine coolant temperature (T)	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
condition	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).

Driving time varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

### Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-292, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009064065

# 1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- 1. Start engine and run it at idle speed.
- Listen for the sound of the intake air leak.
- Check PCV hose connection.

### Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 2.

## 2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

### Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 3.

YES-2 >> Without CONSULT: GO TO 4.

NO >> Repair or replace it.

# 3.perform power balance test

#### (P)With CONSULT

- Start engine.
- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.

Revision: 2013 March **EC-292** 2014 QX50

# < DTC/CIRCUIT DIAGNOSIS >

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

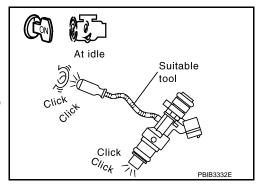
- 1. Start engine and let it idle.
- 2. Listen to each fuel injector operation sound.

### Clicking sound should be heard.

### Is the inspection result normal?

YES >> GO TO 5.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-507, "Diagnosis Procedure".



### ${f 5.}$ 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.

- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

### Spark should be generated.

#### CAUTION:

- Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

### Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 6. Q Q JMBIA0021ZZ

13 - 17 mm (0.52-0.66 in) Grounded metal portion (Cylinder head, cylinder block, etc.)

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# 6. CHECK FUNCTION OF IGNITION COIL-II

- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

### Spark should be generated.

### Is the inspection result normal?

YES >> GO TO 7.

NO >> Check ignition coil, power transistor and their circuits. Refer to EC-517, "Diagnosis Procedure".

## 7.CHECK SPARK PLUG

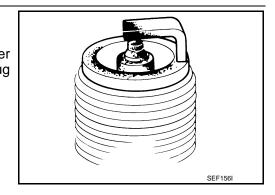
Check the initial spark plug for fouling, etc.

### Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). (Refer to EM-22, "Removal and Installation".) For spark plug

type, refer to <u>EM-23, "Inspection"</u>.

NO >> Repair or clean spark plug. Then GO TO 8.



# 8. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- 2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

#### Spark should be generated.

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace spark plug(s) with standard type one(s). (Refer to <u>EM-22, "Removal and Installation"</u>.) For spark plug type, refer to <u>EM-23, "Inspection"</u>.

## 9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-15, "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

- Install all removed parts.
- Release fuel pressure to zero. Refer to <u>EC-631, "Inspection"</u>.
- Install fuel pressure gauge and check fuel pressure. Refer to <u>EC-631, "Inspection"</u>.

## 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". Refer to FL-6, "Removal and Installation".

NO >> Repair or replace.

Revision: 2013 March **EC-294** 2014 QX50

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 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.

>> Follow the EC-14, "BASIC INSPECTION: Special Repair Requirement". NO

# 13. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect corresponding A/F sensor 1 harness connector.
- Disconnect ECM harness connector. 3.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

A/F sensor 1			EC	Continuity	
Bank	Connector	Terminal	Connector	Terminal	Continuity
1	F3	1		57	
Į.	гэ	2	F102	61	Existed
2	F20	1	1102	65	LXISIEU
2	F2U	2		66	

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

	A/F sensor 1			Continuity	
Bank	Connector	Terminal	Ground	Continuity	
1	F3	1			
ļ	13	2	Ground	Not existed	
2	F20	1	Giodila	Not existed	
	1 20	2			

ECM			Ground	Continuity	
Bank	Connector	Connector Terminal		Continuity	
1		57			
'	F102	61	Ground	Not existed	
2	F102	65	Giodila		
2		66			

Also check harness for short to power.

### Is the inspection result normal?

YES >> GO TO 14.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 14.CHECK A/F SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 15.

>> Replace (malfunctioning) A/F sensor 1. Refer to EM-33, "Exploded View". NO

# 15. CHECK MASS AIR FLOW SENSOR

### (P)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

**EC-295** Revision: 2013 March 2014 QX50

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Check mass air flow sensor signal in Service \$01 with GST.

For specification, refer to EC-634, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 16.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-195, "Diagnosis Procedure".

# 16. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in EC-619, "Symptom Table".

### Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or replace.

# 17. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to <u>EC-143</u>, "On Board Diagnosis Function" or <u>EC-146</u>, "CONSULT Function".

>> GO TO 18.

# 18. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

### P0327, P0328, P0332, P0333 KS

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P0327, P0328, P0332, P0333 KS

Description INFOID:0000000009064066

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

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DTC Logic

#### INFOID:0000000009064067

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detected condition	Possible cause
P0327	Knock sensor (bank 1) circuit low input	An excessively low voltage from the sensor is sent to ECM.	
P0328	Knock sensor (bank 1) circuit high input	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)
P0332	Knock sensor (bank 2) circuit low input	An excessively low voltage from the sensor is sent to ECM.	Knock sensor
P0333	Knock sensor (bank 2) circuit high input	An excessively high voltage from the sensor is sent to ECM.	

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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

- Start engine and run it for at least 5 seconds at idle speed.
- Check 1st trip DTC. 2.

#### Is 1st trip DTC detected?

YFS >> Go to EC-297, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

>> GO TO 2. YES

NO >> Repair or replace ground connection.

# 2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Disconnect knock sensor harness connector and ECM harness connector.
- Check the continuity between knock sensor harness connector and ECM harness connector.

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**EC-297** Revision: 2013 March 2014 QX50

DTC		Knock sens	or	EC	CM	Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0327, P0328	1	F203	2	F102	72	Existed
P0332, P0333	2	F202	2	1 102	12	LXISIGU

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	
ы	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0327, P0328	1	F203	1	F102	73	Existed
P0332, P0333	2	F202	1	F 102	69	Existed

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-298, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning knock sensor. Refer to <a href="EM-120">EM-120</a>, "Exploded View".

### .CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000009064069

# 1. CHECK KNOCK SENSOR

- Turn ignition switch OFF.
- 2. Disconnect knock sensor harness connector.
- Check resistance between knock sensor terminals as per the following.NOTE:

## P0327, P0328, P0332, P0333 KS

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

It is necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .

Terminals	Resistance (k $\Omega$ )
1 and 2	Approx. 532 - 588 [at 20°C (68°F)]

### **CAUTION:**

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal? YES >> INSPECTION END

NO >> Replace malfunctioning knock sensor. Refer to EM-120, "Exploded View". EC

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# P0335 CKP SENSOR (POS)

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.

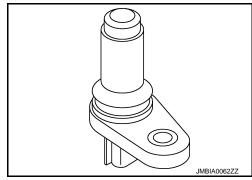
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

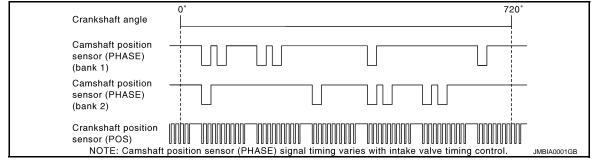
The changing gap causes the magnetic field near the sensor to change.

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

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sensor (POS) circuit	<ul> <li>The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.</li> <li>The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.</li> <li>The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.</li> </ul>	Harness or connectors     [CKP sensor (POS) circuit is open or shorted.]     (APP sensor 2 circuit is shorted.)     (EVAP control system pressure sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     (Brake booster pressure sensor circuit is shorted.)     Crankshaft position sensor (POS)     Accelerator pedal position sensor     EVAP control system pressure sensor     Refrigerant pressure sensor     Brake booster pressure sensor.     Signal plate

### 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 10.5 V with ignition switch ON.

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>> GO TO 2.

# 2.perform dtc confirmation procedure

Start engine and let it idle for at least 5 seconds.
 If engine does not start, crank engine for at least 2 seconds.

Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-301, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

- 1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between CKP sensor (POS) harness connector and ground.

CKP sen	sor (POS)	Ground	Voltage (V)	
Connector	Connector Terminal		voltage (v)	
F2	1	Ground	Approx. 5	

### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

# 3.check crankshaft position (ckp) sensor (pos) power supply circuit-ii

- Turn ignition switch ON.
- Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	or (POS)	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F2	1	F101	46	Existed

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit.

### 4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101 45		Brake booster pressure sensor	E48	1
F101	46	CKP sensor (POS)	F2	ı

### [VQ37VHR]

#### < DTC/CIRCUIT DIAGNOSIS >

ECM		Sensor				
Connector	Terminal	Name	Connector	Terminal		
	103	APP sensor	E112 (Without ICC)	6		
M107	105 /	AFF SCHSUI	E116 (With ICC)	3		
	107	EVAP control system pressure sensor	B252	3		
	107	Refrigerant pressure sensor	E77	3		

#### Is the inspection result normal?

YES >> GO TO 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-378, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-337, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-530</u>, "<u>Diagnosis Procedure</u>".)

### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

### 6.CHECK APP SENSOR

### Refer to EC-485, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

# 7.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- 2. Go to EC-486, "Special Repair Requirement".

### >> INSPECTION END

# $8.\mathsf{CHECK}$ CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	or (POS)	EC	Continuity	
Connector	Terminal	Connector Terminal		Continuity
F2	2	F101	47	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## ${f 9.}$ 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 sens	or (POS)	EC	Continuity	
Connector	Terminal	Terminal Connector Terminal		Continuity
F2	3	F101	37	Existed

2. Also check harness for short to ground and short to power.

## P0335 CKP SENSOR (POS)

# < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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### 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 CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-303, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace crankshaft position sensor (POS). Refer to EM-120, "Exploded View".

# 11. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

### Is the inspection result normal?

YES >> GO TO 12.

>> Replace the signal plate. Refer to EM-120, "Exploded View". NO

# 12. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

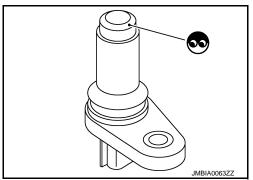
1. CHECK CRANKSHAFT POSITION SENSOR (POS)-I

- Turn ignition switch OFF.
- Loosen the fixing bolt of the sensor.
- 3. Disconnect crankshaft position sensor (POS) harness connector.
- 4. Remove the sensor. Refer to EM-120, "Exploded View".
- 5. Visually check the sensor for chipping.

#### Is the inspection result normal?

YES >> GO TO 2.

>> Replace crankshaft position sensor (POS). Refer to EM-NO 120, "Exploded View".



# 2.CHECK CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as follows.

Terminals (Polarity)	Resistance (Ω)
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞ [at 25°C (77°F)]
2 (+) - 3 (-)	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS). Refer to EM-120, "Exploded View".

**EC-303** Revision: 2013 March 2014 QX50

# P0340, P0345 CMP SENSOR (PHASE)

The camshaft position sensor (PHASE) senses the retraction of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

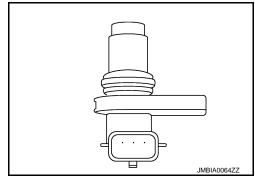
The sensor consists of a permanent magnet and Hall IC.

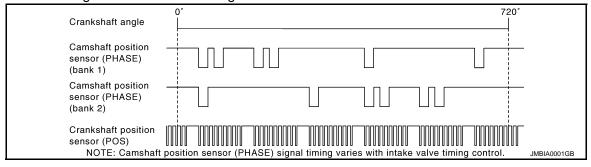
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

ECM receives the signals as shown in the figure.





DTC Logic

### DTC DETECTION LOGIC

### NOTE:

If DTC P0340 or P0345 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

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 sent to ECM</li> </ul>	Harness or connectors [CMP sensor (PHASE) (bank 1) circuit is open or shorted.] Camshaft position sensor (PHASE) (bank 1) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery
P0345	Camshaft position 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>	Harness or connectors     [CMP sensor (PHASE) (bank 2) circuit is open or shorted.]     Camshaft position sensor (PHASE) (bank 2)     Camshaft (INT)     Starter motor     Starting system circuit     Dead (Weak) battery

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

### P0340, P0345 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

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>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-305, "Diagnosis Procedure".

NO >> GO TO 3.

# ${f 3.}$ PERFORM DTC CONFIRMATION PROCEDURE-II

- Maintaining engine speed at more than 800 rpm for at least 5 seconds.
- 2. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-305, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009064076

# 1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.

>> Check starting system. (Refer to EC-9, "Work Flow".) NO

# 2.CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

>> GO TO 3. YES

>> Repair or replace ground connection. NO

# 3.check camshaft position (cmp) sensor (phase) power supply circuit

- Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between CMP sensor (PHASE) harness connector and ground.

DTC	С	CMP sensor (PHASE)			Voltage (V)	
DIC	Bank	Connector	Terminal	Ground	voitage (v)	
P0340	1	F5	1	Ground	Approx. 5	
P0345	2	F18	1	Glound	дрргох. 3	

#### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors F109, F110
- Harness for open or short between CMP sensor (PHASE) and ECM

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>> Repair open circuit, short to ground or short to power in harness or connectors.

# ${f 5.}$ CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

DTC	CI	CMP sensor (PHASE) EC		CM	Continuity	
БТО	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0340	1	F5	2	F102	96	Existed
P0345	2	F18	2	F102	92	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

### 6. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors F109, F110
- Harness for open or short between CMP sensor (PHASE) and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 7.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

DTC	CI	CMP sensor (PHASE)		ECM		Continuity
ыс	Bank	Connector	Terminal	Connector	Terminal	Continuity
P0340	1	F5	3	F102	59	Existed
P0345	2	F18	3	1 102	63	LXISIGU

2. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

# 8. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors F109, F110
- Harness for open or short between CMP sensor (PHASE) and ECM
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

# 9. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-307, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-49, "Exploded View".

# 10. CHECK CAMSHAFT (INTAKE)

Check the following.

## P0340, P0345 CMP SENSOR (PHASE)

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

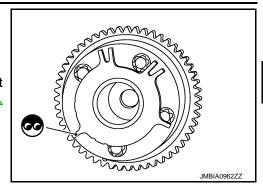
- Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end

### Is the inspection result normal?

YES >> GO TO 11.

NO

>> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to <a href="EM-49">EM-49</a>, <a href=""Exploded View"</a>.



# 11. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000009064077

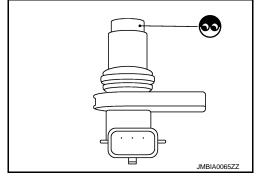
# 1. CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

- Turn ignition switch OFF.
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor (PHASE) harness connector.
- 4. Remove the sensor. Refer to <a>EM-49</a>, "Exploded View"</a>.
- 5. Visually check the sensor for chipping.

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-49, "Exploded View".



# 2. CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

Terminals (Polarity)	Resistance (Ω)
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or ∞ [at 25°C (77°F)]
2 (+) - 3 (-)	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-49, "Exploded View".

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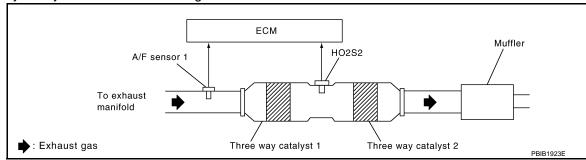
## P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

#### DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2. A three way catalyst 1 with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst 1 malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420	Catalyst system efficiency below threshold (bank 1)	Three way catalyst (manifold) does not op-	Three way catalyst (manifold)     Exhaust tube
P0430	Catalyst system efficiency below threshold (bank 2)	erate properly.  Three way catalyst (manifold) does not have enough oxygen storage capacity.	<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.
- 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

#### (P)With CONSULT

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to the normal operating temperature.
- 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] < DTC/CIRCUIT DIAGNOSIS > 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). Α Open engine hood. 10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT. 11. Rev engine up to about 2,000 rpm and hold it for 3 consecutive minutes then release the accelerator EC pedal completely. 12. Check the indication of "CATALYST". Which is displayed on CONSULT screen? CMPLT>> GO TO 6. INCMP >> GO TO 4. 4.PERFORM DTC CONFIRMATION PROCEDURE-II D Wait 5 seconds at idle. 2. Rev engine up to about 2,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes). Е Does the indication change to "CMPLT"? YES >> GO TO 6. NO >> GO TO 5. F  $oldsymbol{5}$  .PERFORM DTC CONFIRMATION PROCEDURE AGAIN Stop engine and cool it down to less than 70°C (158°F). Perform DTC CONFIRMATION PROCEDURE again. >> GO TO 3. Н 6.PERFORM DTC CONFIRMATION PROCEDURE-III Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-310, "Diagnosis Procedure". NO >> INSPECTION END / .PERFORM COMPONENT FUNCTION CHECK Perform component function check. Refer to EC-309, "Component Function Check". NOTE: Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed. Is the inspection result normal? L YES >> INSPECTION END NO >> Go to EC-310, "Diagnosis Procedure". Component Function Check INFOID:0000000009064079 1. PERFORM COMPONENT FUNCTION CHECK **♥Without CONSULT** Ν 1. Start engine and warm it up to the normal operating temperature. Turn ignition switch OFF and wait at least 10 seconds. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. Let engine idle for 1 minute. Open engine hood. Check the voltage between ECM harness connector terminals under the following condition. Р

### P0420, P0430 THREE WAY CATALYST FUNCTION

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000009064080

		ECM			
DTC	Connector	+	_	Condition	Voltage
	Connector	Terminal	Terminal		
P0420	F102	76 [HO2S2 (bank 1)]	84	Keeping engine speed at 2,500 rpm	The voltage fluctuation cycle takes more than 5 seconds.
P0430	1 102	80 [HO2S2 (bank 2)]	04	constant under no load	• 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-310, "Diagnosis Procedure".

## Diagnosis Procedure

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dents.

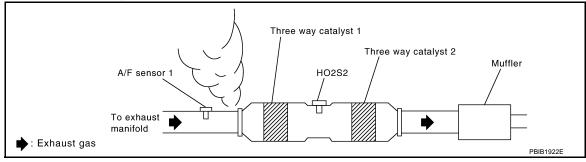
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

# 2. CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 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 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 5.

NO >> Follow the EC-14, "BASIC INSPECTION: Special Repair Requirement".

# 5. CHECK FUEL INJECTORS

- Stop engine and then turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

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	+	-	_	Voltage
Connector	Terminal	Connector	Terminal	
	81			
	82			
F102	85	M107	128	Pottory voltage
F102	86		Battery voltage	
	89			
	90			

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform <u>EC-507</u>, "<u>Diagnosis Procedure</u>".

6.CHECK FUNCTION OF IGNITION COIL-I

#### **CAUTION:**

Perform the following procedure in a place where with no combustible objects and good ventilation.

Turn ignition switch OFF.

2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

#### NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-22, "Removal and Installation".
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

### Spark should be generated.

#### **CAUTION:**

Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.

• It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

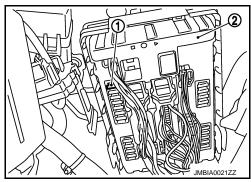
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

### Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 7.

7.CHECK FUNCTION OF IGNITION COIL-II

Turn ignition switch OFF.



13 - 17 mm (0.52-0.66 in) Grounded metal portion (Cylinder head, cylinder block, etc.)

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Revision: 2013 March **EC-311** 2014 QX50

### P0420, P0430 THREE WAY CATALYST FUNCTION

### PU420, PU430 THREE WAT CATALIST FUNCTION

- 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?

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 8.

NO >> Check ignition coil, power transistor and their circuits. Refer to <u>EC-517</u>, "Diagnosis Procedure".

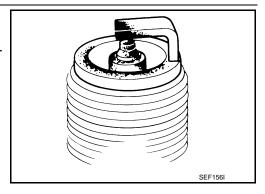
### 8.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

#### Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <a href="EM-23">EM-23</a>, "Inspection".

NO >> Repair or clean spark plug. Then GO TO 9.



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## 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 <a href="EM-22">EM-22</a>, "Removal and Installation".

# 10. CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- Remove fuel injector assembly.

Refer to EM-36, "Removal and Installation".

Keep fuel hose and all fuel injectors connected to fuel tube.

- 3. Disconnect all ignition coil harness connectors.
- 4. Reconnect all fuel injector harness connectors disconnected.
- 5. Turn ignition switch ON.
- 6. Check that fuel does not drip from fuel injector.

### Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping. Refer to <u>EM-36</u>, "<u>Removal and Installation</u>".

NO >> GO TO 11.

# 11. CHECK INTERMITTENT INCIDENT

### Refer to GI-42, "Intermittent Incident".

### Is the inspection result normal?

YES >> Replace three way catalyst assembly. Refer to <a href="EM-33">EM-33</a>, "Removal and Installation".

NO >> Repair or replace harness or connector.

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## P0441 EVAP CONTROL SYSTEM

**DTC** Logic INFOID:00000000009064081

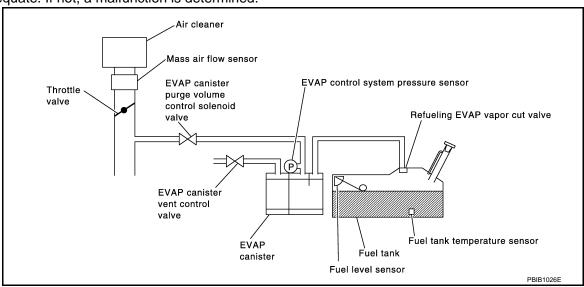
#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	<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.

Turn ignition switch OFF and wait at least 10 seconds.

**EC-313** Revision: 2013 March 2014 QX50

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- 2. Turn ignition switch ON.
- 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

### (P)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.
- Start engine and let it idle for at least 70 seconds.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CON-SULT.
- 7. Touch "START".

### Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> GO TO 4.

## 4. PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

Selector lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 mph)
ENG SPEED	500 - 3,000 rpm
B/FUEL SCHDL	1.3 - 9.0 msec
COOLAN TEMP/S	More than 0°C (32°F)

### **CAUTION:**

### Always drive vehicle at a safe speed.

#### Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3.

# 5. PERFORM DTC CONFIRMATION PROCEDURE-III

Touch "SELF-DIAG RESULTS".

#### Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Go to EC-315, "Diagnosis Procedure".

## 6.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-314, "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-315, "Diagnosis Procedure".

### Component Function Check

INFOID:0000000009064082

# 1. PERFORM COMPONENT FUNCTION CHECK

### **⊗Without CONSULT**

1. Lift up drive wheels.

### P0441 EVAP CONTROL SYSTEM

# < DTC/CIRCUIT DIAGNOSIS >

2.	Start engine	(VDC switch	OFF) and	I warm it up to	o normal	operating	temperature.
----	--------------	-------------	----------	-----------------	----------	-----------	--------------

- 3. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and wait at least 70 seconds.
- 7. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM			
Connector	+	-	
Connector	Terminal	Terminal	
M107	102 (EVAP control system pressure sensor signal)	112	

- 8. Check EVAP control system pressure sensor value at idle speed and note it.
- 9. Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than P, N or R

10. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 8) for at least 1 second.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-315, "Diagnosis Procedure".

## Diagnosis Procedure

# 1. CHECK EVAP CANISTER

- Turn ignition switch OFF.
- Check EVAP canister for cracks.

### Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 2.

YES-2 >> Without CONSULT: GO TO 3.

>> Replace EVAP canister. Refer to FL-16, "Removal and Installation".

## 2.CHECK PURGE FLOW

#### (P)With CONSULT

- 1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine and let it idle.
- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
- Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check vacuum existence.

PURG VOL C/V	Vacuum
100%	Existed
0%	Not existed

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

# $oldsymbol{3}.$ CHECK PURGE FLOW

### ₩ Without CONSULT

**EC-315** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

- Start engine and warm it up to normal operating temperature.
- Stop engine.
- 3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to <a href="EC-97">EC-97</a>. "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.

## f 4.CHECK EVAP PURGE LINE

- 1. Turn ignition switch OFF.
- 2. Check EVAP purge line for improper connection or disconnection. Refer to <u>EC-97</u>, "System Diagram".

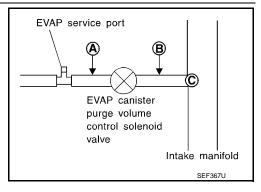
#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair it.

## ${f 5.}$ CHECK EVAP PURGE HOSE AND PURGE PORT

- Disconnect purge hoses connected to EVAP service port A and EVAP canister purge volume control solenoid valve B.
- 2. Blow air into each hose and EVAP purge port C.



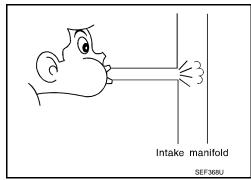
3. Check that air flows freely.

### 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

### (P)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.

# **P0441 EVAP CONTROL SYSTEM**

< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]
NO >> GO TO 7.	
7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	Α
Refer to EC-321, "Component Inspection".	
Is the inspection result normal?	EC
YES >> GO TO 8.	P 1 01
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to <u>FL-14</u> , " <u>Hydr</u>	aulic Layout".
8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR	C
<ol> <li>Disconnect EVAP control system pressure sensor harness connector.</li> <li>Check connectors for water.</li> </ol>	Г
Water should not exist.	
Is the inspection result normal?	_
YES >> GO TO 9.	Е
NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u> .	
9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION	F
Refer to EC-338, "DTC Logic" for DTC P0452, EC-343, "DTC Logic" for DTC P0453.	
Is the inspection result normal?	
YES >> GO TO 10.	G
NO >> Replace EVAP control system pressure sensor. Refer to <u>FL-15, "Exploded View"</u> .	
10. CHECK RUBBER TUBE FOR CLOGGING	
Disconnect rubber tube connected to EVAP canister vent control valve.	
2. Check the rubber tube for clogging.	
Is the inspection result normal?  YES >> GO TO 11.	I
NO >> Clean the rubber tube using an air blower.	
11. CHECK EVAP CANISTER VENT CONTROL VALVE	ſ
Refer to EC-328, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 12.	K
NO >> Replace EVAP canister vent control valve. Refer to <u>FL-15, "Exploded View"</u> .	
12. CHECK EVAP PURGE LINE	1
Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.	
Refer to EC-97, "System Diagram".	
Is the inspection result normal?  YES >> GO TO 13.	N
YES >> GO TO 13. NO >> Replace it.	
13.CLEAN EVAP PURGE LINE	N
Clean EVAP purge line (pipe and rubber tube) using air blower.	
>> GO TO 14.	C
14. CHECK INTERMITTENT INCIDENT	
Refer to GI-42, "Intermittent Incident".	

>> INSPECTION END

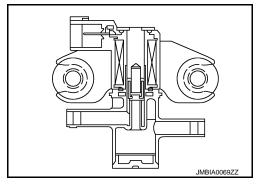
< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:00000000009064085

# P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0443	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	EVAP control system pressure sensor     EVAP canister purge volume control solenoid valve     (The valve is stuck open.)     EVAP canister vent control valve     EVAP canister     Hoses     (Hoses are connected incorrectly or clogged.)

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

### **TESTING CONDITION:**

Always perform test at a temperature of 5°C (41°F) or more.

### Do you have CONSULT

YES >> GO TO 2.

NO >> GO TO 3.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

### (P)With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Turn ignition switch ON.
- Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 7. Touch "START".
- Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take approximately 10 seconds.)

If "TESTING" is not displayed after 5 minutes, retry from step 2.

Touch "SELF-DIAG RESULTS".

### Which is displayed on CONSULT screen?

# < DTC/CIRCUIT DIAGNOSIS >

OK >> INSPECTION END

NG >> Go to EC-319, "Diagnosis Procedure".

## 3.PERFORM DTC CONFIRMATION PROCEDURE

### 

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and let it idle for at least 20 seconds.
- Check 1st trip DTC.

### Is 1st trip DTC displayed?

YES >> Go to EC-319, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

# ${f 1}$ .CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge volum	Ground	Voltage	
Connector	Terminal	Orodria	voltage
F7	1	Ground	Battery voltage

### Is the inspection result normal?

YFS >> GO TO 3.

NO >> GO TO 2.

### 2.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 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	Continuity
F7	2	F101	21	Existed

Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

## f 4.DETECT MALFUNCTIONING PART

Check the following.

**EC-319** Revision: 2013 March 2014 QX50

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< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

- Harness connectors F104, F105
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

# 5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check connectors for water.

#### Water should not exist.

### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

### 6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

### Refer to EC-337, "Component Inspection".

#### Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 7.

YES-2 >> Without CONSULT: GO TO 8.

NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

## 7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### (P)With CONSULT

- Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies
  according to the valve opening.

#### Does engine speed vary according to the valve opening?

YES >> GO TO 9.

NO >> GO TO 8.

## 8.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

### Refer to EC-321, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

## CHECK RUBBER TUBE FOR CLOGGING

- 1. Disconnect rubber tube connected to EVAP canister vent control valve.
- 2. Check the rubber tube for clogging.

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Clean the rubber tube using an air blower.

# 10.CHECK EVAP CANISTER VENT CONTROL VALVE

### Refer to EC-328, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-15, "Exploded View"</u>.

# 11. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-16</u>, "Removal and Installation".

< DTC/CIRCUIT DIAGNOSIS >

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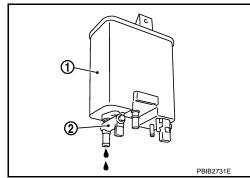
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- Check if water will drain from EVAP canister (1).
  - 2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 12. NO >> GO TO 14.



# 12. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

# 14. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

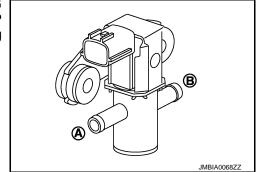
# Component Inspection

 ${f 1}$  .CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

## (P)With CONSULT

- 1. Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Turn ignition switch ON.
- 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**

- Turn ignition switch OFF.
- Disconnect EVAP canister purge volume control solenoid valve harness connector.
- Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.

**EC-321** 

2014 QX50

Revision: 2013 March

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

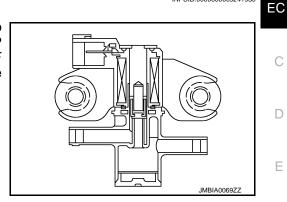
< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description INFOID:0000000009241950

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



**DTC** Logic INFOID:00000000009064089

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	Harness or connectors     (The solenoid valve circuit is open or shorted.)     EVAP canister purge volume control solenoid valve
P0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	Harness or connectors     (The solenoid valve circuit is shorted.)     EVAP canister purge volume control solenoid valve

### DTC CONFIRMATION PROCEDURE

### 1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

### **TESTING CONDITION:**

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 13 seconds.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-323, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

# 1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect EVAP canister purge volume control solenoid valve harness connector.
- Turn ignition switch ON.

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### < DTC/CIRCUIT DIAGNOSIS >

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4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge vol- ume control solenoid valve		Ground	Voltage	
Connector	Terminal			
F7	1	Ground	Battery voltage	

#### Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 2.

# 2. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

# 3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

	/AP canister purge volue control solenoid valve		ECM	
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

#### (P)With CONSULT

- Reconnect all harness connectors disconnected.
- 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-325, "Component Inspection".

# P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### < DTC/CIRCUIT DIAGNOSIS >

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#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

# 7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

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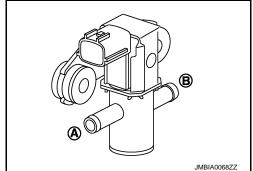
## Component Inspection

# 1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### (P)With CONSULT

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Turn ignition switch ON.
- 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.
- Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

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Revision: 2013 March **EC-325** 2014 QX50

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# P0447 EVAP CANISTER VENT CONTROL VALVE

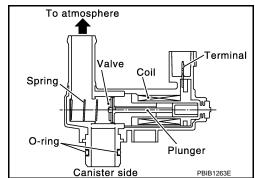
Description INFOID:0000000009064092

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



DTC Logic INFOID:0000000009064093

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	Harness or connectors     (The valve circuit is open or shorted.)     EVAP canister vent control valve

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and wait at least 8 seconds.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-326, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009064094

# 1.INSPECTION START

Do you have CONSULT?

#### Do you have CONSULT?

YES >> GO TO 2. NO >> GO TO 3.

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

#### (P)With CONSULT

- Turn ignition switch OFF and then ON.
- Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

**EC-326** Revision: 2013 March 2014 QX50

#### P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

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- Touch "ON/OFF" on CONSULT screen.
- Check for operating sound of the valve.

## Clicking sound should be heard.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

# 3.check evap canister vent control valve power supply circuit

- Turn ignition switch OFF.
- Disconnect EVAP canister vent control valve harness connector. 2.
- Turn ignition switch ON. 3.
- Check the voltage between EVAP canister vent control valve harness connector and ground.

EVAP canister vent control valve		Ground	Voltage
Connector	Terminal		
B253	1	Ground	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness connectors F103, M116
- Harness connectors M117, B201
- Harness for open or short between EVAP canister vent control valve and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

# ${f 5}$ .CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between EVAP canister vent control valve harness connector and ECM harness connector.

EVAP can control		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B253	2	M107	121	Existed

Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

#### 6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B201, M117
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

#### .CHECK RUBBER TUBE FOR CLOGGING

- Disconnect rubber tube connected to EVAP canister vent control valve.
- Check the rubber tube for clogging.

**EC-327** Revision: 2013 March 2014 QX50

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#### P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

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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-328, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP canister vent control valve. Refer to <u>FL-16</u>, "Removal and Installation".

9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000009064095

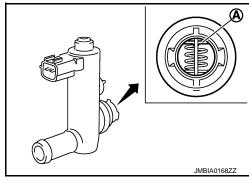
# 1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- Turn ignition switch OFF.
- Remove EVAP canister vent control valve from EVAP canister. Refer to <u>FL-16</u>, "Removal and Installation"
- 3. Check portion (A) of EVAP canister vent control valve for rust.

#### Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to <u>FL-16</u>, "Removal and Installation".

NO >> GO TO 2.



# $2.\mathsf{CHECK}$ EVAP CANISTER VENT CONTROL VALVE-II

#### (P)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 i	s installed	properly.
--	-----------	----------	----------	-------------	-----------

Condition VENT CONT/V	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

#### **⊗**Without CONSULT

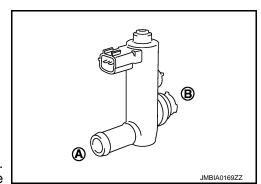
- 1. Disconnect EVAP canister vent control valve harness connector.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.





#### P0447 EVAP CANISTER VENT CONTROL VALVE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

#### (I) 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.
- Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

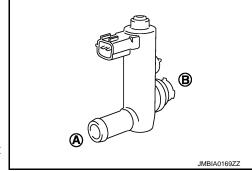
Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".



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[VQ37VHR]

# P0448 EVAP CANISTER VENT CONTROL VALVE

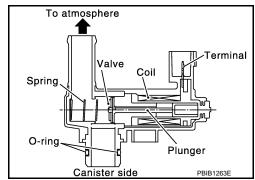
Description INFOID:000000009241952

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0448	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	<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.

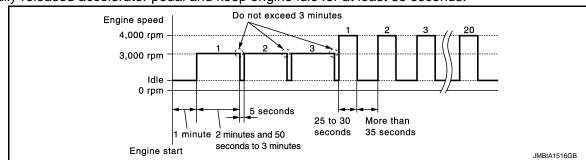
- Fully released accelerator pedal and keep engine idle for about 5 seconds.
- Repeat next procedure 27 times.
- Quickly increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 25 to 30 seconds.

#### P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Fully released accelerator pedal and keep engine idle for at least 35 seconds.



Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-331, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

1. CHECK RUBBER TUBE

- 1. Turn ignition switch OFF.
- 2. Disconnect rubber tube connected to EVAP canister vent control valve.
- 3. Check the rubber tube for clogging.

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Clean rubber tube using an air blower.

# 2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-332, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

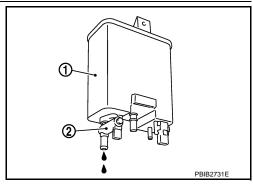
# 3.check if evap canister is saturated with water

- Remove EVAP canister with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached. Refer to FL-15, "Exploded View".
- 2. Check if water will drain from the EVAP canister (1).

#### Does water drain from EVAP canister?

YES >> GO TO 4.

NO >> GO TO 6.



# 4. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

#### The weight should be less than 2.2 kg (4.9 lb).

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

# 5. DETECT MALFUNCTIONING PART

#### Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

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#### P0448 EVAP CANISTER VENT CONTROL VALVE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

# **6.**CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- 1. Disconnect EVAP control system pressure sensor harness connector.
- Check connectors for water.

#### Water should not exist.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

# 7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

# 8.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009241953

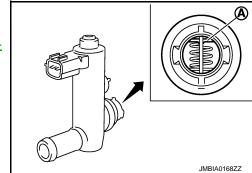
# 1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- Remove EVAP canister vent control valve from EVAP canister. Refer to FL-16, "Removal and Installation".
- 3. Check portion (A) of EVAP canister vent control valve for rust.

#### Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to <u>FL-16</u>, "Removal and Installation".

NO >> GO TO 2.



# 2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

#### (II) With CONSULT

- 1. Reconnect harness connectors disconnected.
- Turn ignition switch ON.
- Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- Check air passage continuity and operation delay time.
   Make sure that new O-ring is installed properly.

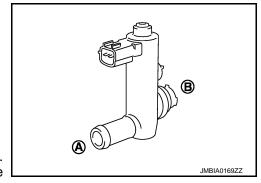
Condition VENT CONT/V	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

#### **Without CONSULT**

- 1. Disconnect EVAP canister vent control valve harness connector.
- Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.



#### P0448 EVAP CANISTER VENT CONTROL VALVE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

# 3.CHECK EVAP CANISTER VENT CONTROL VALVE-III

#### (I) 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.
- 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.
- Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

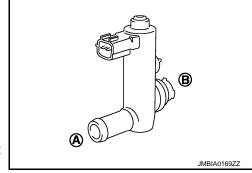
Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".



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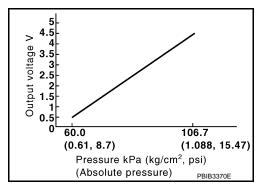
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[VQ37VHR]

INFOID:00000000009064101

# P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



**DTC** Logic

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0451	EVAP control system pressure sensor performance	ECM detects a sloshing signal from the EVAP control system pressure sensor	Harness or connectors     (EVAP control system pressure sensor circuit is shorted.)     [CKP sensor (POS) circuit is shorted.]     (APP sensor 2 circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     (Brake booster pressure sensor circuit is shorted)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor     Brake booster pressure sensor

#### DTC CONFIRMATION PROCEDURE

#### NOTE:

Never remove fuel filler cap during DTC confirmation procedure.

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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

#### (P) With CONSULT

1. Start engine and let it idle for at least 40 seconds.

#### NOTE:

Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to EC-335, "Diagnosis Procedure".

NO >> GO TO 3.

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > 3.perform dtc confirmation procedure-2  $\,$ Α (P) With CONSULT Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE". Let it idle until "OFF" of "EVAP DIAG READY" changes to "ON". EC It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON". Turn ignition switch OFF and wait at least 90 minutes. NOTE: Never turn ignition switch ON during 90 minutes. 4. Turn ignition switch ON. 5. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ECM". 6. Check that "EVAP LEAK DIAG" indication. Which is displayed on CONSULT? CMPLT>> GO TO 4. >> 1. Perform DTC CONFIRMATION PROCEDURE again. GO TO 1. 4. PERFORM DTC CONFIRMATION PROCEDURE-3 With CONSULT Check 1st trip DTC. Is 1st trip DTC detected? >> Proceed to EC-335, "Diagnosis Procedure". NO >> INSPECTION END Н 5.PERFORM DTC CONFIRMATION PROCEDURE-4 With GST 1. Start engine and let it idle for at least 40 seconds. NOTE: Do not depress accelerator pedal even slightly. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Proceed to EC-335, "Diagnosis Procedure". NO >> GO TO 6. K 6.PERFORM DTC CONFIRMATION PROCEDURE-5 With GST Let it idle for at least 2 hours. Turn ignition switch OFF and wait at least 90 minutes. NOTE: Never turn ignition switch ON during 90 minutes. 3. Turn ignition switch ON. Check 1st trip DTC. Is 1st trip DTC detected? N >> Proceed to EC-335, "Diagnosis Procedure". YES NO >> INSPECTION END Diagnosis Procedure INFOID:0000000009064102 1. CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER Disconnect EVAP control system pressure sensor harness connector.

Revision: 2013 March **EC-335** 2014 QX50

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

- Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector Terminal			
B252	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
103 M107	103	APP sensor	E112 (Without ICC)	6
	103		E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
		107	Refrigerant pressure sensor	E77

#### 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-303, "Component Inspection".)
- Brake booster pressure sensor (Refer to <u>EC-378, "Component Inspection".)</u>
- Refrigerant pressure sensor (Refer to EC-530, "Diagnosis Procedure".)

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

#### 6.CHECK APP SENSOR

#### Refer to EC-485, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 7.

# 7. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- 2. Go to EC-486, "Special Repair Requirement".

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:00000000009064103

>> INSPECTION END

# 8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

9. CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

>> INSPECTION END

# Component Inspection

# 1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- Turn ignition switch OFF.
- 2. Remove EVAP control system pressure sensor with its harness connector. Refer to FL-15, "Exploded View".

#### Always replace O-ring with a new one.

- 3. Install a vacuum pump to EVAP control system pressure sensor.
- 4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

	ECM		Condition		
Connector	+	_	Condition [Applied vacuum kPa (kg/cm <sup>2</sup> , psi)]	Voltage (V)	
Connector	Terminal	Terminal	[rippiiou racaaiii iii a (iig/ciii , poi/j		
M107	107 102 112		Not applied	1.8 - 4.8	
W107 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. Refer to FL-15, "Exploded View".

**EC-337** Revision: 2013 March 2014 QX50

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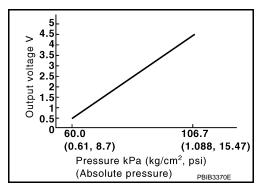
< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description INFOID:000000009241954

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



**DTC** Logic

INFOID:0000000009064105

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (EVAP control system pressure sensor circuit is open or shorted.)     [CKP sensor (POS) circuit is shorted.]     (APP sensor 2 circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     (Brake booster pressure sensor circuit is shorted)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor     Brake booster pressure sensor

#### DTC CONFIRMATION PROCEDURE

#### 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.
- 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

#### (P)With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- 6. Select "DATA MONITOR" mode with CONSULT.
- 7. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- 8. Start engine and wait at least 20 seconds.
- 9. Check 1st trip DTC.

< DTC/	CIRCUIT	DIAGNOSIS	>
<u></u>			

[VQ37VHR]

#### ∰With GST

- Start engine and warm it up to normal operating temperature.
- Set voltmeter probes to ECM harness connector terminals as per the following.

ECM			
Connector	+	_	
Connector	Terminal	Terminal	
M107	106 (Fuel tank temperature sensor signal)	128 (ECM ground)	

- Make sure that the voltage is less than 4.2 V.
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and wait at least 20 seconds.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-339, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- Check sensor harness connector for water.

#### Water should not exist.

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

# 3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

- Turn ignition switch ON.
- Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector Terminal			
B252	3	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 4.

# f 4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

**EC-339** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

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	EVAP control system pressure sensor		ECM	
Connector	Terminal	Connector Terminal		
B252	3	M107 107		Existed

#### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

# 5.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors M117, B201
- Harness for open between ECM and EVAP control system pressure sensor

#### >> Repair open circuit.

## 6. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

E	CM	Sensor			
Connector	Terminal	Name	Connector	Terminal	
F101	45	Brake booster pressure sensor	E48	1	
46		CKP sensor (POS)	F2	1	
103 M107	103	APP sensor	E112 (Without ICC)	6	
	AFF SCHSUI	E116 (With ICC)	3		
	107	EVAP control system pressure sensor	B252	3	
	107	Refrigerant pressure sensor	E77	3	

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair short to ground or short to power in harness or connectors.

## 7. CHECK COMPONENTS

#### Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-303. "Component Inspection"</u>.)
- Brake booster pressure sensor (Refer to EC-378, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-530, "Diagnosis Procedure"</u>.)

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

# 8. CHECK APP SENSOR

#### Refer to EC-485, "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-3, "Removal and Installation".
- Go to EC-486, "Special Repair Requirement".

#### >> INSPECTION END

# 10.check evap control system pressure sensor ground circuit for open and

< DTC/CIRCUIT DIAGNOSIS >

**SHORT** 

Turn ignition switch OFF.

- Disconnect ECM harness connector.
- 3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

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	EVAP control system pressure sensor		ECM	
Connector	Terminal	Connector Terminal		
B252	1	M107 112		Existed

Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 11.

# 11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 12. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector Terminal		
B252	2	M107	102	Existed

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 14.

>> GO TO 13. NO

# 13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 14. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-342, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

# 15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

# >> INSPECTION END

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**EC-341** Revision: 2013 March 2014 QX50

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# Component Inspection

INFOID:0000000009241956

# 1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Remove EVAP control system pressure sensor with its harness connector. Refer to FL-15, "Exploded View".

#### 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         + -           Terminal         Terminal		Condition	Voltage (V)	
Connector			Condition [Applied vacuum kPa (kg/cm², psi)]		
Connector			[rippiiou racaaiii iii a (iig/ciii , poi/j		
M107	102	112	Not applied	1.8 - 4.8	
IVI 107	102	112	-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value	

#### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/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. Refer to FL-15, "Exploded View".

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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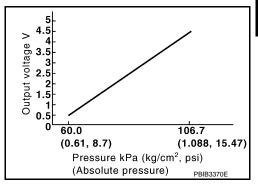
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# P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description INFOID:0000000009241955

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



**DTC Logic** 

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (EVAP control system pressure sensor circuit is open or shorted.)     [CKP sensor (POS) circuit is shorted.]     (APP sensor 2 circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)     (Brake booster pressure sensor circuit is shorted)     EVAP control system pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     Refrigerant pressure sensor     Brake booster pressure sensor     EVAP canister vent control valve     EVAP canister     Rubber hose from EVAP canister vent control valve to vehicle frame

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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

#### (P)With CONSULT

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON. 3.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT.

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INFOID:0000000009064109

**EC-343** Revision: 2013 March 2014 QX50

[VQ37VHR]

INFOID:0000000009064110

# < DTC/CIRCUIT DIAGNOSIS >

- Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
- 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.
- Set voltmeter probes to ECM harness connector terminals as per the following.

ECM				
Connector	+	_		
Connector	Terminal	Terminal		
M107	106 (Fuel tank temperature sensor signal)	128 (ECM ground)		

- 3. Make sure that the voltage is less than 4.2 V.
- 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-344, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

 ${f 1}$  .CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK CONNECTOR

- 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

- Turn ignition switch ON.
- Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control syster	Ground	Voltage (V)	
Connector	Orodria	voilage (v)	
B252	3	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 4.

# 4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.

**EC-344** Revision: 2013 March 2014 QX50

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control syster	EC	М	Continuity	
Connector	Terminal	Connector Terminal		Continuity
B252	3	M107	107	Existed

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#### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

# 5.DETECT MALFUNCTIONING PART

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## Check the following.

- Harness connectors M117, B201
- · Harness for open between ECM and EVAP control system pressure sensor

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>> Repair open circuit.

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#### 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
1 101	46	CKP sensor (POS)	F2	1
103 M107	103	APP sensor	E112 (Without ICC)	6
	All Selison	E116 (With ICC)	3	
	107	EVAP control system pressure sensor	B252	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-303, "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-378, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-530, "Diagnosis Procedure".)

#### Is the inspection result normal?

YES >> GO TO 8.

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NO >> Replace malfunctioning component.

#### 8. CHECK APP SENSOR

Refer to EC-485, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 20. NO >> GO TO 9. Р

# 9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- Go to <u>EC-486</u>, "Special Repair Requirement".

>> INSPECTION END

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 10.check evap control system pressure sensor ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control syster	EC	M	Continuity	
Connector	Terminal	Connector Terminal		Continuity
B252	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 B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 12.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

 Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
B252	2	M107	102	Existed	

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 13.

# 13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 14.CHECK RUBBER TUBE

- 1. Disconnect rubber tube connected to EVAP canister vent control valve.
- 2. Check the rubber tube for clogging.

#### Is the inspection result normal?

YES >> GO TO 15.

NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

# 15. CHECK EVAP CANISTER VENT CONTROL VALVE

#### Refer to EC-328, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-347, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 17.

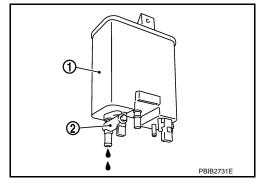
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

# 17. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-16</u>. "<u>Removal and Installation</u>".
- 2. Check if water will drain from the EVAP canister (1).
  - 2 : EVAP canister vent control valve

#### Does water drain from EVAP canister?

YES >> GO TO 18. NO >> GO TO 20.



# 18. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 20. NO >> GO TO 19.

# 19. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

# 20.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Remove EVAP control system pressure sensor with its harness connector. Refer to FL-15, "Exploded View".

Always replace O-ring with a new one.

- 3. Install a vacuum pump to EVAP control system pressure sensor.
- Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

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Revision: 2013 March EC-347 2014 QX50

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

ECM			Condition	
Connector	+	_	Condition [Applied vacuum kPa (kg/cm², psi)]	Voltage (V)
	Terminal	Terminal		
M107	102	112	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

#### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm<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. Refer to <u>FL-15, "Exploded View"</u>.

[VQ37VHR]

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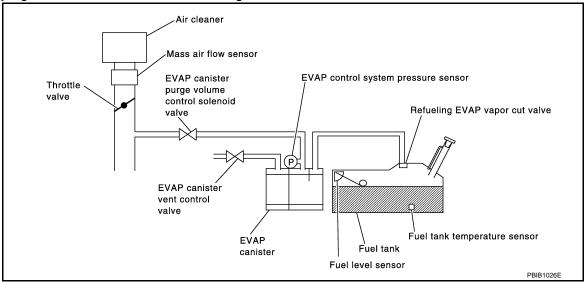
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# P0456 EVAP CONTROL SYSTEM

#### DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.

If ECM judges that there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456	Evaporative emission control system very small leak (negative pressure check)	EVAP system has a very small leak.     EVAP system does not operate properly.	Incorrect fuel tank vacuum relief valve Incorrect fuel filler cap used Fuel filler cap remains open or fails to close. Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. Foreign matter or fuel tank leaks EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line rubber tube bent Loose or disconnected rubber tube EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit Fuel tank temperature sensor O-ring of EVAP canister vent control valve is missing or damaged EVAP canister is saturated with water EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks Fuel level sensor and the circuit Foreign matter caught in EVAP canister purge volume control solenoid valve

#### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

#### DTC CONFIRMATION PROCEDURE

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 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.
- Turn ignition switch OFF and wait at least 10 seconds.

#### Do you have CONSULT?

YES >> GO TO 2. NO >> GO TO 4.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

#### With CONSULT

- 1. Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode with CONSULT.
- 2. Start engine and wait at idle until "OFF" of "EVAP DIAG READY" changes to "ON".

#### NOTE:

It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".

3. Turn ignition switch OFF and wait at least 90 minutes.

#### NOTE:

Never turn ignition switch ON during 90 minutes.

- 4. Turn ignition switch ON and select "EVAP LEAK DIAG" in "DATA MONITOR" mode with CONSULT.
- 5. Check that "EVAP LEAK DIAG" indication.

#### Which is displayed on CONSULT?

CMPLT>> GO TO 3.

YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

# 3.perform component function check-ii

#### Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-350, "Diagnosis Procedure".

NO >> INSPECTION END

# 4. PERFORM DTC CONFIRMATION PROCEDURE

#### **With GST**

- 1. Start engine and wait engine idle for at least 2 hours.
- 2. Turn ignition switch OFF and wait at least 90 minutes.

#### NOTE:

Never turn ignition switch ON during 90 minutes.

- 3. Turn ignition switch ON.
- 4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-350, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064113

# 1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

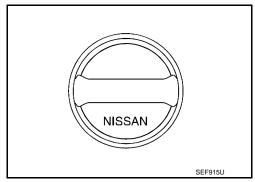
Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replac

>> Replace with genuine NISSAN fuel filler cap. Refer to FL-11, "Exploded View".



2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten until ratcheting sound is heard.

3.CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-526, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one. Refer to FL-11, "Exploded View".

**5.**CHECK FOR EVAP LEAK

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.

EVAP canister vent control valve is installed properly.

Refer to FL-16, "Removal and Installation".

EVAP canister vent control valve.

Refer to FL-16, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to FL-16, "Removal and Installation".

7 .CHECK IF EVAP CANISTER IS SATURATED WITH WATER

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#### < DTC/CIRCUIT DIAGNOSIS >

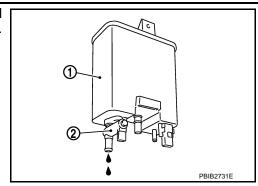
[VQ37VHR]

- Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached. Refer to FL-16, "Removal and Installation".
- 2. Check if water will drain from EVAP canister.

#### Does water drain from the EVAP canister?

YES >> GO TO 8.

NO-1 >> With CONSULT: GO TO 10. NO-2 >> Without CONSULT: GO TO 11.



## 8. CHECK EVAP CANISTER

Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

#### The weight should be less than 2.2 kg (4.9 lb).

#### Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 10.

YES-2 >> Without CONSULT: GO TO 11.

NO >> GO TO 9.

## 9. DETECT MALFUNCTIONING PART

#### Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

# 10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### (P)With CONSULT

- Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
- Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- 4. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
- 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.
- Stop engine.
- Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
- 4. Start engine and let it idle for at least 80 seconds.
- 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

#### Vacuum should exist.

#### Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

# 12. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-97, "System Diagram".

<pre></pre>	[VQ37VHR]
Is the inspection result normal?	
YES >> GO TO 13.	
NO >> Repair or reconnect the hose.	
13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to EC-321, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 14.  NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "	Hydraulic Layout"
14. CHECK FUEL TANK TEMPERATURE SENSOR	Trydradiic Layout.
Refer to EC-276, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 15.	
NO >> Replace fuel level sensor unit. Refer to FL-6, "Removal and Installation".	
15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR	
Refer to EC-337, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 16. NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded Vie	w".
16.check evap purge line	<u></u> .
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or impressed to EC-97, "System Diagram".	oper connection.
Is the inspection result normal?	
YES >> GO TO 17.	
NO >> Repair or reconnect the hose.	
17.clean evap purge line	
Clean EVAP purge line (pipe and rubber tube) using air blower.	
>> GO TO 18.	
18.CHECK EVAP/ORVR LINE	
Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, loose	ness and improper
connection. For location, refer to <u>EC-523, "Description"</u> .	ness and improper
Is the inspection result normal?	
YES >> GO TO 19.	
NO >> Repair or replace hoses and tubes.	
19.check recirculation line	
Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracimproper connection.	ks, looseness and
Is the inspection result normal?	
YES >> GO TO 20.	
NO >> Repair or replace hose, tube or filler tube.	
20. CHECK REFUELING EVAP VAPOR CUT VALVE	
Refer to EC-526, "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-60, "Component Inspection".	

Revision: 2013 March **EC-353** 2014 QX50

Is the inspection result normal?

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 22.

NO >> Replace fuel level sensor unit. Refer to FL-6, "Removal and Installation".

## 22. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

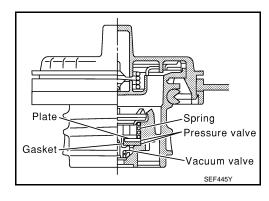
#### >> INSPECTION END

### Component Inspection

INFOID:0000000009064114

# 1. CHECK FUEL TANK VACUUM RELIEF VALVE

- 1. Turn ignition switch OFF.
- Remove fuel filler cap. Refer to <u>FL-11</u>, "Exploded View".
- 3. Wipe clean valve housing.



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.

# Fuel filler cap adapter Vacuum/Pressure gauge Vacuum/ Pressure pump One-way valve SEF943S

# 2. REPLACE FUEL FILLER CAP

Replace fuel filler cap. Refer to <u>FL-11</u>, "Exploded View". CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

#### P0460 FUEL LEVEL SENSOR

Description INFOID:0000000009064115

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the "unified meter and A/C amp.". The "unified meter and A/C amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

**DTC Logic** INFOID:0000000009064116

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-384, "DTC Logic".

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

	DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	G
ı	P0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	<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>Unified meter and A/C amp.</li> <li>Fuel level sensor</li> </ul>	Н

#### 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and wait maximum of 2 consecutive minutes.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

>> Go to EC-355, "Diagnosis Procedure". YES

NO >> INSPECTION END

# Diagnosis Procedure

#### 1. CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to MWI-58, "Component Function Check".

## 2.CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

**EC-355** Revision: 2013 March 2014 QX50

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INFOID:0000000009064117

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

#### P0461 FUEL LEVEL SENSOR

Description INFOID:0000000009241958

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the "unified meter and A/C amp.". The "unified meter and A/C amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic INFOID:0000000009064119

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-384, "DTC Logic".

Driving long distances naturally affect fuel gauge level.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	G
P0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	Harness or connectors     (The CAN communication line is open or shorted)     Harness or connectors     (The sensor circuit is open or shorted)     Unified meter and A/C amp.     Fuel level sensor	Н

#### DTC CONFIRMATION PROCEDURE

# 1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-357, "Component Function Check".

Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-358, "Diagnosis Procedure".

# Component Function Check

#### 1.PRECONDITIONING

When performing the following procedure, always observe the handling of the fuel. Refer to FL-6, "Removal and Installation".

#### **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

#### (P)With CONSULT

#### NOTE:

Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/ 8 Imp gal) in advance.

Prepare a fuel container and a spare hose.

**EC-357** Revision: 2013 March 2014 QX50

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#### P0461 FUEL LEVEL SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 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. Refer to FL-6, "Removal and Installation".
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- 5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
- 6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT.
- 7. Check "FUEL LEVEL SE" output voltage and note it.
- 8. Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
- 9. Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
- 10. Check "FUEL LEVEL SE" output voltage and note it.
- 11. Fill fuel into the fuel tank for 30  $\ell$  (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 0.03V during step 7 to 10 and 10 to 12.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-358, "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.
- Release fuel pressure from fuel line. Refer to <u>EC-631</u>, "Inspection".
- 3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-6. "Removal and Installation".
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- 5. Turn ignition switch ON.
- 6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
- 7. Confirm that the fuel gauge indication varies.
- 8. Fill fuel into the fuel tank for 30  $\ell$  (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-358, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000009241960

# 1. CHECK DTC WITH "UNIFIED METER AND A/C AMP."

## Refer to MWI-42, "CONSULT Function (METER/M&A)".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to MWI-58, "Component Function Check".

# 2. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P0462, P0463 FUEL LEVEL SENSOR

Description INFOID:0000000009241959

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the "unified meter and A/C amp.". The "unified meter and A/C amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

**DTC Logic** INFOID:00000000009064123

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.Refer to EC-384, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462	Fuel level sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (The CAN communication line is open or shorted)     Harness or connectors     (The sensor circuit is open or shorted)     Unified meter and A/C amp.     Fuel level sensor
P0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11 V at ignition switch ON.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-359, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

1. CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to MWI-58, "Component Function Check".

#### 2.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

**EC-359** Revision: 2013 March 2014 QX50

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INFOID:0000000009241961

# P0462, P0463 FUEL LEVEL SENSOR

[VQ37VHR]

>> INSPECTION END

INFOID:00000000009064126

## P0500 VSS

Description INFOID:0000000000004125

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

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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-384</u>, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0500	VEH SPEED SEN/CIRC (Vehicle speed sensor)	At 20 km/h (13 MPH), ECM detects the following status continuously for 5 seconds or more: The difference between a vehicle speed calculated by a output speed sensor transmitted from TCM to ECM via CAN communication and the vehicle speed indicated on the combination 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>

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

# 2.perform dtc confirmation procedure

- 1. Start engine.
- 2. Shift the selector lever to D range and wait at least for 2 seconds.
- Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.

#### **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 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Proceed to <u>EC-361</u>, "<u>Diagnosis Procedure</u>"

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:00000000009064127

# 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

# 2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to BRC-31, "CONSULT Function".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble shooting relevant to DTC indicated.

# 3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to MWI-42, "CONSULT Function (METER/M&A)".

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform trouble shooting relevant to DTC indicated.

## 4. CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to TM-83, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace or replace error-detected parts.

# 5. CHECK WHEEL SENSOR

Check wheel sensor. Refer to BRC-50, "Diagnosis Procedure".

#### Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-42, "Intermittent Incident".

NO >> Replace or replace error-detected parts.

## P0506 ISC SYSTEM

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

### DTC DETECTION LOGIC

#### NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0506	Idle speed control sys- tem RPM lower than ex- pected	The idle speed is less than the target idle speed by 100 rpm or more.	Electric throttle control actuator     Intake air leak	

#### DTC CONFIRMATION PROCEDURE

## 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform <a href="EC-21">EC-21</a>, "IDLE AIR VOLUME LEARNING: Special Repair Requirement", before conducting DTC Confirmation Procedure.

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.
- Always perform the test at a temperature above –10°C(14°F).

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-363, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

## 1.CHECK INTAKE AIR LEAK

- Start engine and let it idle.
- 2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

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INFOID:0000000009064130

## **P0506 ISC SYSTEM**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> Discover air leak location and repair.

NO >> GO TO 2.

# 2.REPLACE ECM

- 1. Stop engine.
- Replace ECM. Refer to <u>EC-39</u>, "<u>Component Parts Location</u>".
   Go to <u>EC-17</u>, "<u>ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM)</u>: <u>Special Repair</u> Requirement".

>> INSPECTION END

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INFOID:0000000009064133

## P0507 ISC SYSTEM

Description INFOID:000000000243806

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 DETECTION LOGIC

#### NOTE:

If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507	Idle speed control sys- tem RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	Electric throttle control actuator     Intake air leak     PCV system

## DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform <u>EC-21</u>, <u>"IDLE AIR VOLUME LEARNING : Special Repair Requirement"</u>, before conducting DTC Confirmation Procedure.

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.
- Always perform the test at a temperature above –10°C(14°F).

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-365, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

# 1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.

Revision: 2013 March

EC-365 2014 QX50

## **P0507 ISC SYSTEM**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Repair or replace.

# 2. CHECK INTAKE AIR LEAK

- Start engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

### Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> GO TO 3.

# 3. REPLACE ECM

- Stop engine.
- Replace ECM. Refer to <u>EC-39</u>, "<u>Component Parts Location</u>".
   Go to <u>EC-17</u>, "<u>ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM)</u>: <u>Special Repair</u> Requirement".

>> INSPECTION END

### P050A, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P050A, P050E COLD START CONTROL

Description INFOID:0000000009064134

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.

INFOID:00000000009064135

# DTC Logic

## DTC DETECTION LOGIC

NOTE:

If DTC P050A or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P050A	Cold start idle air control system performance	ECM does not control engine idle speed properly when engine is started with pre-warming up condition.	Lack of intake air volume
P050E	Cold start engine exhaust temperature too low	The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition.	Fuel injection system     ECM

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

# 2 PERFORM DTC CONFIRMATION PROCEDURE-I

#### (P)With CONSULT

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT.
- Check the indication of "COOLAN TEMP/S".

#### 

Follow the procedure "With CONSULT" above.

#### Is the value of "COOLAN TEMP/S" between 4°C (39°F) and 36°C (97°F)?

>> GO TO 3.

NO-1 [If it is below 15°C (59°F)]>>Warm up the engine until the value of "COOLAN TEMP/S" reaches 15°C (59°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

## 3.PERFORM DTC CONFIRMATION PROCEDURE-II

#### (P)With CONSULT

- Set the select lever in N range.
- Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between -10°C (14°F) and 40°C (104°F) for more than 15 seconds.
- 3. Check 1st trip DTC.

#### 

Follow the procedure "With CONSULT" above.

#### Is 1st trip DTC detected?

YES >> Go to EC-368, "Diagnosis Procedure".

NO >> INSPECTION END

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## P050A, P050E COLD START CONTROL

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## **Diagnosis Procedure**

INFOID:0000000009064136

# 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

# 3.check fuel injection system function

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-265, "DTC Logic".

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to EC-266, "Diagnosis Procedure" for DTC P0171, P0174.

# 4. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure.

See EC-367, "DTC Logic".

#### Is the 1st trip DTC P050A or P050E displayed again?

YES >> GO TO 5.

NO >> INSPECTION END

## 5.REPLACE ECM

- Replace ECM. Refer to <u>EC-39</u>, "Component Parts Location".
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement".

#### >> INSPECTION END

### P0524 ENGINE OIL PRESSURE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P0524 ENGINE OIL PRESSURE

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0524 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to <a href="EC-185">EC-185</a>, "DTC Logic"</a>

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0524	Engine oil pressure too low	Engine oil pressure is low because there is a gap between angle of target and phase-control angle.	Engine oil pressure or level too low     Crankshaft position sensor (POS)     Camshaft position sensor (PHASE)     Intake valve control solenoid valve     Accumulation of debris to the signal pick-up portion of the camshaft     Timing chain installation     Foreign matter caught in the oil groove for intake valve timing control

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING-I

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

## 2.PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-7, "Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to LU-7, "Inspection".

# 3.PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode with CONSULT.
- 2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	More than 1,700 rpm
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

#### **CAUTION:**

#### Always drive at a safe speed.

Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-370, "Diagnosis Procedure"

NO >> INSPECTION END

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## Diagnosis Procedure

INFOID:0000000009064138

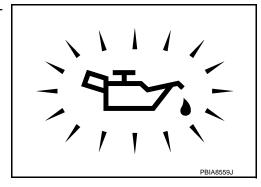
# 1. CHECK OIL PRESSURE WARNING LAMP

- 1. Start engine.
- 2. Check oil pressure warning lamp and confirm it is not illuminated.

## Is oil pressure warning lamp illuminated?

YES >> Go to <u>LU-7</u>, "Inspection".

NO >> GO TO 2.



# 2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-177, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to <a href="EM-49">EM-49</a>, "Exploded View".

# 3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-303, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS). Refer to EM-120, "Exploded View".

# 4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-307, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to <u>EM-49</u>, "<u>Exploded View</u>".

# 5. CHECK CAMSHAFT (INTAKE)

### Check the following.

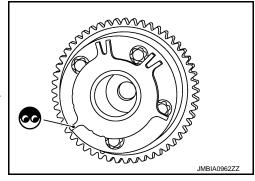
- Accumulation of debris to the signal plate of camshaft front end
- · Chipping signal plate of camshaft front end

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Remove

>> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to <u>EM-49</u>. "Exploded View".



# 6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

#### Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-50, "Removal and Installation".

NO >> GO TO 7.

## 7.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-103, "Inspection".

### P0524 ENGINE OIL PRESSURE

#### < DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

# 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

# ${f 1}$ .CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

- Turn ignition switch OFF.
- 2. Disconnect intake valve timing control solenoid valve harness connector.
- Check resistance between intake valve timing control solenoid valve terminals as per the following.

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. Refer to EM-49, "Exploded View".

# 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- Remove intake valve timing control solenoid valve. Refer to EM-49, "Exploded View".
- 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:**

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

#### NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

#### Is the inspection result normal?

YES >> INSPECTION END

>> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-49, "Exploded NO View".

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#### < DTC/CIRCUIT DIAGNOSIS >

## P0550 PSP SENSOR

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

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted)     Power steering pressure sensor	

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 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.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 5 seconds.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-372, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009064142

# CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CHECK 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	Glound		
F35	3	Ground	Approx. 5	

### P0550 PSP SENSOR

## < DTC/CIRCUIT DIAGNOSIS > Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

# 3.CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Check the continuity between PSP sensor harness connector and ECM harness connector.

PSP s	ensor	EC	Continuity	
Connector	Terminal	Connector Terminal		
F35	1	F102	96	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground short to power in harness or connectors.

### f 4.CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between PSP sensor harness connector and ECM harness connector.

PSP s	ensor	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F35	2	F102	87	Existed

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## CHECK PSP SENSOR

Refer to EC-373, "Component Inspection".

### Is the inspection result normal?

>> GO TO 6. YES

NO

>> Replace PSP sensor. Refer to ST-51, "2WD: Exploded View" (2WD models) or ST-52, "AWD: Exploded View" (AWD models).

## 6. CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

# 1. CHECK POWER STEERING PRESSURE SENSOR

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Start engine and let it idle.
- 4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM						
Connector	+	_	Condition		Voltage (V)	
Connector	Terminal	Terminal				
F102	87	96	Stooring whool	Being turned	0.5 - 4.5	
1 102	07	90	Steering wheel	Not being turned	0.4 - 0.8	

**EC-373** Revision: 2013 March 2014 QX50

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## **P0550 PSP SENSOR**

< DTC/CIRCUIT DIAGNOSIS >

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### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace power steering pressure sensor. Refer to <u>ST-51, "2WD : Exploded View"</u> (2WD models) or <u>ST-52, "AWD : Exploded View"</u> (AWD models).

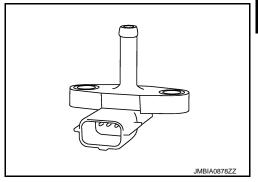
< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P0555 BRAKE BOOSTER PRESSURE SENSOR

Description INFOID:0000000009064144

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** INFOID:00000000009064145

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0555	Brake booster pressure sensor circuit	An excessively low voltage from the sensor is sent to ECM.     An excessively high voltage from the sensor is sent to ECM.	Harness or connectors     (The sensor circuit is open or shorted.)     [CKP sensor (POS) circuit is shorted.]     (APP sensor 2 circuit is shorted)     (EVAP control system pressure sensor circuit is shorted.)     (Refrigerant pressure sensor circuit is shorted.)      Brake booster pressure sensor     Crankshaft position sensor (POS)     Accelerator pedal position sensor     EVAP control system pressure sensor     Refrigerant pressure sensor

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 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.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 10 seconds.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-375, "Diagnosis Procedure".

>> INSPECTION END NO

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

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#### < DTC/CIRCUIT DIAGNOSIS >

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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	oressure sensor	Ground	Voltage (V)
Connector Terminal		Giodila	voltage (v)
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		ECM		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 F40, E13
- 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	
FIUI	46	CKP sensor (POS)	F2	1	
M107	103	APP sensor	E112 (Without ICC)	6	
	103	ALL SCHOOL	E116 (With ICC)	3	
	107	EVAP control system pressure sensor	B252	3	
		Refrigerant pressure sensor	E77	3	

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

## 6. CHECK COMPONENTS

# < DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-303, "Component Inspection"</u>.)
- EVAP control system pressure sensor (Refer to EC-337, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-530, "Component Function Check".)

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning component.

## 7.CHECK APP SENSOR

Refer to EC-485, "Component Inspection".

## Is the inspection result normal?

YES >> GO TO 14.

NO >> GO TO 8.

## 8.REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- Go to EC-486, "Special Repair Requirement".

#### >> INSPECTION END

# 9.check brake booster pressure sensor ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between brake booster pressure sensor harness connector and ECM harness connector.

Brake booster	pressure sensor	E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E48	3	F101	36	Existed

Also check harness for short to ground and power.

### Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

# 10.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between brake booster pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 11.CHECK BRAKE BOOSTER PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between brake booster pressure sensor harness connector and ECM harness connector.

Brake booster pressure sensor			ECM		Continuity
	Connector	Terminal	Connector	Terminal	Continuity
•	E48	2	F101	39	Existed

Also check harness for short to ground and power.

#### Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

# 12.DETECT MALFUNCTIONING PART

Check the following.

Revision: 2013 March

**EC-377** 2014 QX50 EC

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< DTC/CIRCUIT DIAGNOSIS >

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- Harness connectors F40, E13
- 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-378, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace brake booster pressure sensor. Refer to <u>BR-32</u>, "Removal and Installation".

# 14. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

INFOID:0000000009064147

# 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:

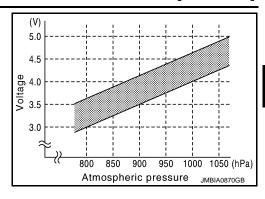
As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

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.

### < DTC/CIRCUIT DIAGNOSIS >

Voltage (V)
3.1 – 3.7
3.3 – 3.9
3.5 – 4.1
3.8 – 4.3
4.0 – 4.6
4.2 - 4.8



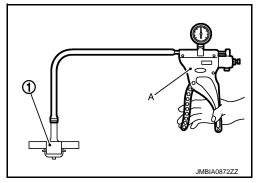
#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace brake booster pressure sensor. Refer to <u>BR-32, "Removal and Installation"</u>.

# 2.CHECK BRAKE BOOSTER PRESSURE SENSOR-II

- 1. Turn ignition switch OFF.
- 2. Remove brake booster pressure sensor with its harness connected. Refer to <u>BR-32</u>, "Removal and Installation".
- 3. Connect the hose of vacuum pump (A) to brake booster pressure sensor (1).
- 4. Turn ignition switch ON.



Check the voltage between ECM harness connector terminals as per the following.

ECM			
+			_
Connector Terminal		Connector	Terminal
F101 39		F101	36

6. Check that the difference of the voltage when engine is stopped and that when negative pressure is applied with vacuum pump is within the following limits.

Vacuum	Voltage difference (V)
-40kPa (-300mmHg)	1.5 – 2.0
-53.3kPa (-400mmHg)	2.0 – 2.6
-66.7kPa (-500mmHg)	2.6 – 3.2
-80kPa (-600mmHg)	3.2 – 3.8

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace brake booster pressure sensor. Refer to BR-32, "Removal and Installation".

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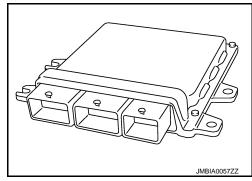
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Revision: 2013 March EC-379 2014 QX50

## P0603 ECM POWER SUPPLY

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.	Harness or connectors     [ECM power supply (back up) circuit is open or shorted.]     ECM

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

# 2.perform dtc confirmation procedure

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Turn ignition switch OFF and wait at least 5 minutes.
- 3. Turn ignition switch ON and wait at least 10 seconds.
- Repeat steps 2 and 3 for five times.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-380, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064150

# 1. CHECK ECM POWER SUPPLY

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the voltage between ECM harness connector terminals as per the following.

## **P0603 ECM POWER SUPPLY**

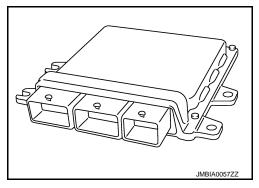
< DTC/CIRCUIT DIAGNOSIS >

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	+		_	Voltage	-	
Connector	Terminal	Connector	Terminal			EC
F102	93	M107	128	Battery voltage		
Is the inspe						
	GO TO 3. GO TO 2.					С
2.DETECT		CTIONING	DADT			
		CHOMING	ran i			D
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• 15 A fuse	(No. 50)					_
<ul><li>IPDM E/F</li><li>Harness f</li></ul>				nd hattary		Е
· Halliess i	or open or	SHOIL DELWE	CII LOIVI AI	id battery		
>>	Repair or	replace har	ness or con	nectors.		F
<b>3.</b> CHECK	-	-				
Refer to GI						
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4.PERFO	RM DTC C	ONFIRMAT	ION PROC	EDURE		
	nition switc	h ON.				
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	C-380, "DTO		roccaure	•		
Is the 1st tr	ip DTC P06	603 displaye	ed again?			J
	GO TO 5.	ION END				
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	e ECM.		SEDVICE	WHEN DEDIA	CING CONTROL UNIT (ECM) : Special Repair	
Require	<u>ement"</u> .	DITIONAL	SERVICE	WIILN KLFLA	CING CONTROL ONT (ECIVI) . Special Repail	L
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## P0605 ECM

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.



DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 Engine control module		A)	ECM calculation function is malfunctioning.	
	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.
- Check 1st trip DTC.

## Is 1st trip DTC detected?

YES >> Go to EC-383, "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.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-383, "Diagnosis Procedure".

NO >> GO TO 4.

# 4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- Repeat step 2 for 32 times.
- 4. Check 1st trip DTC.

## Is 1st trip DTC detected?

## **P0605 ECM**

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > YES >> Go to EC-383, "Diagnosis Procedure". NO >> INSPECTION END Α Diagnosis Procedure INFOID:0000000009064153 1. INSPECTION START EC Turn ignition switch ON. 2. Erase DTC. C 3. Perform DTC Confirmation Procedure. See EC-382, "DTC Logic". Is the 1st trip DTC P0605 displayed again? D YES >> GO TO 2. NO >> INSPECTION END 2.REPLACE ECM Е Replace ECM. Refer to EC-39, "Component Parts Location". 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement". F >> INSPECTION END Н K L M Ν 0 Р

Revision: 2013 March **EC-383** 2014 QX50

## P0607 ECM

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0607	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

#### DTC CONFIRMATION PROCEDURE

# 1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-384, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064156

# 1. INSPECTION START

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure.

See EC-384, "DTC Logic".

4. Check DTC.

#### Is the DTC P0607 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

# 2.REPLACE ECM

- 1. Replace ECM. Refer to EC-39, "Component Parts Location".
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement".

>> INSPECTION END

### P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P0643 SENSOR POWER SUPPLY

DTC Logic INFOID:0000000009064157

### DTC DETECTION LOGIC

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DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0643	Sensor power supply circuit short	ECM detects that the voltage of power source for sensor is excessively low or high.	Harness or connectors     (APP sensor 1 circuit is shorted.)     (TP sensor circuit is shorted.)     [CMP sensor (PHASE) (bank 1) circuit is shorted.]     [Manifold absolute pressure (MAP) sensor circuit is shorted.]     (PSP sensor circuit is shorted.)     [CMP sensor (PHASE) (bank 2) circuit is shorted.]     [Battery current sensor circuit is shorted.]      Accelerator pedal position sensor     Throttle position sensor     Camshaft position sensor (PHASE) (bank 1)     Manifold absolute pressure (MAP) sensor     Power steering pressure sensor     Camshaft position sensor (PHASE) (bank 2)     Battery current sensor	C D

### 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.
- Turn ignition switch ON.
- 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

- Start engine and let it idle for 1 second.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-385, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

## Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- 2.
- Check the voltage between APP sensor harness connector and ground.

Disconnect accelerator pedal position (APP) sensor harness connector. Turn ignition switch ON.

**EC-385** Revision: 2013 March 2014 QX50

#### < DTC/CIRCUIT DIAGNOSIS >

APP se	ensor	Ground	\/oltogo (\/)	
Connector	Terminal		Voltage (V)	
E112 (Without ICC) E116 (With ICC)	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	
1 101	44	Electric throttle control actuator (bank 1)	F6	6	
F102		CMP sensor (PHASE) (bank 1)	F5	1	
	60	Manifold absolute pressure (MAP) sensor	F50	1	
		PSP sensor	F35	3	
	64	CMP sensor (PHASE) (bank 2)	F18	1	
		Battery current sensor	E21	1	
M107	99	APP sensor	E112 (Without ICC) E116 (With ICC)	5	

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

#### 4. CHECK COMPONENTS

### Check the following.

- Camshaft position sensor (PHASE) (bank 1) (Refer to EC-307, "Component Inspection".)
- Manifold absolute pressure (MAP) sensor (Refer to EC-201, "Component Inspection".)
- Power steering pressure sensor (Refer to EC-373, "Component Inspection".)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-307, "Component Inspection".)
- Battery current sensor (Refer to EC-434, "Component Inspection".)

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

## **5.**CHECK TP SENSOR

### Refer to EC-218, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 6.

# 6.replace electric throttle control actuator

- 1. Replace electric throttle control actuator. Refer to EM-28, "Removal and Installation".
- 2. Go to EC-218, "Special Repair Requirement".

#### >> INSPECTION END

P0643 SENSOR POWER SUPPLY		
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]	
7.CHECK APP SENSOR	^	Д
Refer to EC-485, "Component Inspection".		~\
Is the inspection result normal?		
YES >> GO TO 9. NO >> GO TO 8.	EC	С
8. REPLACE ACCELERATOR PEDAL ASSEMBLY		
<ol> <li>Replace accelerator pedal assembly. Refer to <u>ACC-3, "Removal and Installation"</u>.</li> <li>Go to <u>EC-486, "Special Repair Requirement"</u>.</li> </ol>		)
>> INSPECTION END		D
9.check intermittent incident		
Refer to GI-42, "Intermittent Incident".	E	Ξ
>> INSPECTION END		
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EC-387 Revision: 2013 March 2014 QX50

# P0850 PNP SWITCH

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM. ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850	Park/neutral position switch	The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started.	Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.]     TCM

#### DTC CONFIRMATION PROCEDURE

# 1. INSPECTION START

Do you have CONSULT?

## Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 5.

# 2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

# 3. CHECK PNP SIGNAL

#### (P)With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

Position (Selector lever)	Known-good signal
N or P position	ON
Except above position	OFF

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to EC-389, "Diagnosis Procedure".

# 4. PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode with CONSULT.
- 2. Start engine and warm it up to normal operating temperature.
- Maintain the following conditions for at least 50 consecutive seconds.

  CAUTION:

#### Always drive vehicle at a safe speed.

ENG SPEED	1,400 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)

### P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

B/FUEL SCHDL	2.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 mph)
Selector lever	Suitable position

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Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-389, "Diagnosis Procedure".

NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to <a>EC-389</a>. "Component Function Check"</a>.

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-389, "Diagnosis Procedure".

# Component Function Check

1. PERFORM COMPONENT FUNCTION CHECK

Turn ignition switch ON.

2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM						
Connector	+	1	Condition		Voltage (V)	
Connector	Terminal	Terminal			l	
M107	109	128 S	Selector lever	P or N	Battery voltage	
WITO	109	120		Except above	Approx. 0	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-389, "Diagnosis Procedure".

## Diagnosis Procedure

1. CHECK DTC WITH TCM

Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.

Revision: 2013 March

NO >> Check DTC with BCM. Refer to <u>BCS-39</u>, "<u>SIGNAL BUFFER</u>: <u>CONSULT Function (BCM - SIGNAL BUFFER</u>)".

# ${f 3.}$ CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect A/T assembly harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between A/T assembly harness connector and ECM harness connector.

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EC-389

A/T assembly		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F51	9	M107	109	Existed

5. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

# 4. DETECT MALFUNCTIONING PART

## Check the following.

- Harness connectors F40, E13
- Harness connectors E106, M6
- Harness for open or short between A/T assembly and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 5.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

## P100A, P100B VVEL SYSTEM

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

# P100A, P100B VVEL SYSTEM

**DTC** Logic INFOID:0000000009064163

#### 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 EC-404, "DTC Logic".
- If DTC P100A or P100B is displayed with DTC P0101 or P010B, first perform the trouble diagnosis for DTC P0101 or P010B. Refer to EC-188, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P100A	VVEL response malfunction (bank 1)	Actual event response to target is poor.	Harness or connectors     (VVEL actuator motor circuit is open or shorted.)	
P100B	VVEL response malfunction (bank 2)		<ul><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.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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

- 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.
- Repeat steps 2 to 3 for three times.
- Check 1st trip DTC.

#### Is DTC detected?

YES >> Go to EC-391, "Diagnosis Procedure".

>> INSPECTION END NO

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

>> GO TO 2. YES

>> Repair or replace ground connection. NO

# 2.VVEL ACTUATOR MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Disconnect VVEL control module harness connector.
- 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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DTC No.	VVEL control module		VVEL actuator motor		Continuity	
	Bank	Connector	Terminal	Connector	Terminal	Continuity
P100A	1	E14	12	- F48	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P100B	2		2	- F49	1	Existed
					2	Not existed
			15		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 F40, E13
- Harness for open or short between VVEL actuator motor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 4. CHECK VVEL ACTUATOR MOTOR

Refer to EC-393, "Component Inspection (VVEL ACTUATOR MOTOR)".

### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

# REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View".
- 2. Go to EC-394, "Special Repair Requirement".

#### >> INSPECTION END

## 6. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace.

# 7. REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
- 2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE): Special Repair Requirement".

>> GO TO 8.

# 8. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC.
- Perform DTC Confirmation Procedure. See <u>EC-391, "DTC Logic"</u>.

#### Is the DTC P100A or P100B displayed again?

YES >> GO TO 9.

## P100A, P100B VVEL SYSTEM

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > NO >> INSPECTION END Α 9. CHECK VVEL ACTUATOR SUB ASSEMBLY Refer to EC-393, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)". Is the inspection result normal? EC YES >> GO TO 11. NO >> GO TO 10. 10.replace vvel actuator sub assembly Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View". 2. Go to EC-394, "Special Repair Requirement". D >> INSPECTION END 11. CHECK VVEL LADDER ASSEMBLY Е Refer to EM-103, "Inspection". Is the inspection result normal? YES >> GO TO 13. NO >> GO TO 12. 12.replace cylinder head, vvel ladder assembly and vvel actuator sub assembly Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly. Refer to EM-111, "Disassembly and Assembly and EM-93, "Exploded View". 2. Go to EC-394, "Special Repair Requirement". Н >> INSPECTION END 13. CHECK INTERMITTENT INCIDENT Refer to GI-42, "Intermittent Incident". >> INSPECTION END Component Inspection (VVEL ACTUATOR MOTOR) INFOID:00000000009064165 1. CHECK VVEL ACTUATOR MOTOR Turn ignition switch OFF. Disconnect VVEL actuator motor harness connector. Check resistance between VVEL actuator motor terminals as follows. VVEL actuator motor Resistance **Terminal** 1 and 2 16  $\Omega$  or less N Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View". 2. Go to EC-394, "Special Repair Requirement". Р >> INSPECTION END Component Inspection (VVEL ACTUATOR SUB ASSEMBLY) INFOID:00000000009064166  ${f 1}$  .CHECK VVEL ACTUATOR SUB ASSEMBLY Turn ignition switch OFF.

Revision: 2013 March **EC-393** 2014 QX50

## P100A, P100B VVEL SYSTEM

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 2. Remove VVEL actuator sub assembly. Refer to EM-93, "Exploded View".
- 3. Turn the ball screw shaft to check that it works smoothly.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View".
- 2. Go to EC-394, "Special Repair Requirement".

#### >> INSPECTION END

# Special Repair Requirement

INFOID:0000000009064167

# 1. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT: Special Repair Requirement".

>> GO TO 2.

# 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

## **P1087, P1088 VVEL SYSTEM**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 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-400, "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
P1088	VVEL small event angle malfunction (bank 2)	The event angle of VVEL control shaft is always small.	<ul> <li>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>

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## P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

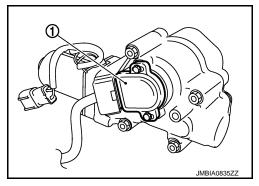
## P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

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.



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 EC-472, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1089	VVEL control shaft position sensor (bank 1) circuit	An excessively low voltage from the sensor is sent to VVEL control module.		
P1092	VVEL control shaft position sensor (bank 2) circuit	<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 position 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

- Start engine and let it idle for 1 second.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-396, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064171

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.vvel control shaft position sensor power supply circuit

- Disconnect VVEL control shaft position sensor harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between VVEL control shaft position sensor harness connector and ground.

DTC No.	VVEL co	ontrol shaft position	Ground	Voltage (V)	
DIC No.	Bank	Connector Terminal			Ground
P1089	1	F46	3		
F 1009	•	1 40	6	Ground	Approx 5
P1092	2	F47	3	Ground	Approx. 5
F 1092	2	Г47	6		

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# ${f 3.}$ DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

# f 4.CHECK VVEL CONTROL SHAFT POSITION SENSOR GROUND 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.

DTC No.	VVEL control shaft position sensor		VVEL control module		Continuity		
DIC No.	Bank	Connector	Terminal	Connector	Terminal	Continuity	
P1089	1	F46	2		4		
F1009	1	F40	140	5	E14	17	Existed
P1092	2	F47	2	E14	6	Existed	
F 1092	2	1 47	5		19		

Also check harness for short to ground and power.

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

### DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

# $oldsymbol{6}$ . VVEL CONTROL SHAFT POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

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DTC No.	VVEL co	VEL control shaft position sensor		VVEL control module		Continuity
DIC No.	Bank	Connector	Terminal	Connector	Terminal	Continuity
P1089	1	F46	1		3	
F1009	1 F46	F40	4	E14	16	Existed
D1002	2	E47	1	C14	5	Existed
F 1092	P1092 2 F47 –		4		18	

2. Also check harness for short to ground and power.

### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

## 7.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

## 9. REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module. Refer to <a href="EC-39">EC-39</a>, "Component Parts Location".
- 2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE): Special Repair Requirement".

>> GO TO 10.

# 10. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC.
- 3. Perform DTC Confirmation Procedure.

See EC-396, "DTC Logic".

### Is the DTC P1089 or P1092 displayed again?

YES >> GO TO 11.

NO >> INSPECTION END

# 11. REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View".
- 2. Go to EC-398, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000009243807

# 1. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT: Special Repair Requirement".

>> GO TO 2.

## P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

# 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

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### P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P1090, P1093 VVEL ACTUATOR MOTOR

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 EC-404, "DTC Logic".

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.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-400, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:00000000009064175

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2. VVEL ACTUATOR MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect VVEL control module harness connector.
- Disconnect VVEL actuator motor harness connector.
- Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

[VQ37VHR]

DTON	\	VVEL control module		VVEL actuator motor		O control to
DTC No.	Bank	Connector	Terminal	Connector	Terminal	Continuity
			40		1	Existed
D1000	1		12	F48	2	Not existed
P1090	I		O.F.	F48	1	Not existed
		E14	25		2	Existed
		E14	2		1	Existed
P1093	2		2	F49	2	Not existed
F 1093	2		15	F49	1	Not existed
			15		2	Existed
Also ched	ck harness fo	r short to grour	nd and powe	r.		
he inspect	<u>ion result nor</u>	<u>mal?</u>				
	O TO 4.					
	30 TO 3.	o				
		ONING PART				
heck the fol		. 540				
	nnectors F40	), E13 rt between VVE	El actuator n	notor and \/\/F	L control mo	dule
1 10111033 101	open or sno	it between vvi	L actuator ii	iotor and vve	L control mo	duic
				_		
>> R	enair onen c	ricuit short to a	around or sho	ort to nower in	harness or o	connectors
	•	circuit, short to (	ground or sho	ort to power in	harness or o	connectors.
.CHECK V	VEL ACTUAT	TOR MOTOR				connectors.
••CHECK V'	VEL ACTUAT	TOR MOTOR				connectors.
•CHECK V' efer to <u>EC-4</u> the inspect	VEL ACTUATION 102, "Comportion result nor	TOR MOTOR				connectors.
efer to EC-4 the inspect	VEL ACTUATHO2, "Comporion result nor GO TO 6.	TOR MOTOR				connectors.
efer to EC-4 the inspect YES >> G NO >> G	VEL ACTUATE 102, "Comporion result nor 60 TO 6. GO TO 5.	FOR MOTOR nent Inspection mal?	(VVEL ACT			connectors.
efer to EC-4 the inspect YES >> G NO >> G	VEL ACTUATE  102, "Comportion result noresult no	FOR MOTOR  The inent Inspection The inent Inspectio	(VVEL ACT	UATOR MOTO	<u>DR)"</u> .	connectors.
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- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-400, "DTC Logic"</u>.

Is the DTC P1090 or P1093 displayed again?

### P1090, P1093 VVEL ACTUATOR MOTOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 9.

NO >> INSPECTION END

### 9. CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-402, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

### Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

# 10. REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly. Refer to EC-39, "Component Parts Location".
- Go to <u>EC-403</u>, "Special Repair Requirement".

#### >> INSPECTION END

## 11. CHECK VVEL LADDER ASSEMBLY

Refer to EM-103, "Inspection".

### Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

# 12.REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY

- Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly. Refer to <u>EM-111, "Disassembly and Assembly"</u> and <u>EM-93, "Exploded View"</u>.
- 2. Go to EC-403, "Special Repair Requirement".

#### >> INSPECTION END

# 13. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000009243808

# 1. CHECK VVEL ACTUATOR MOTOR

- Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor harness connector.
- Check resistance between VVEL actuator motor terminals as follows.

VVEL actuator motor	Resistance	
Terminal	1 Nesistative	
1 and 2	16 Ω or less	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

### 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View".
- 2. Go to EC-403, "Special Repair Requirement".

#### >> INSPECTION END

# Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:0000000009243809

# 1. CHECK VVEL ACTUATOR SUB ASSEMBLY

Revision: 2013 March **EC-402** 2014 QX50

### P1090, P1093 VVEL ACTUATOR MOTOR

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Turn ignition switch OFF. Remove VVEL actuator sub assembly. Refer to EM-93, "Exploded View". Α Turn the ball screw shaft to check that it works smoothly. Is the inspection result normal? YES >> INSPECTION END EC NO >> GO TO 2. 2.replace vvel actuator sub assembly Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View". Go to <u>EC-403</u>, "Special Repair Requirement". D >> INSPECTION END Special Repair Requirement INFOID:0000000009243810 Е 1. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT: Special Repair Require-F ment". >> GO TO 2. 2.PERFORM IDLE AIR VOLUME LEARNING Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement". Н >> END K M Ν Р

Revision: 2013 March **EC-403** 2014 QX50

[VQ37VHR]

## P1091 VVEL ACTUATOR MOTOR RELAY

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

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1091	VVEL actuator motor relay circuit	VVEL control module detects the VVEL actuator motor relay is stuck OFF. VVEL control module detects the VVEL actuator motor relay is stuck ON.	Harness or connectors     (VVEL actuator motor relay circuit is open or shorted.)     (Abort circuit is open or shorted.)      VVEL actuator motor relay      VVEL control module      ECM

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 seconds.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON and wait at least 1 seconds.
- 4. Check DTC.

#### Is DTC detected?

YES >> Go to EC-404, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064181

# 1. VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- Disconnect VVEL actuator motor relav.
- 3. Check the voltage between VVEL actuator motor relay harness connector and ground.

VVEL actuat	or motor relay	Ground	Voltago	
Connector	Connector Terminal		Voltage	
E16	1	Ground	Battery voltage	
LIO	5	Glound	Battery voltage	

### Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 2.

### P1091 VVEL ACTUATOR MOTOR RELAY

#### < DTC/CIRCUIT DIAGNOSIS >

**IVQ37VHR** 

# 2.DETECT MALFUNCTIONING PART

Check the following.

- 50 A fusible link (letter N)
- · Harness for open or short between VVEL actuator motor relay and battery

EC

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 3.vvel actuator motor relay power supply circuit-ii

- Disconnect VVEL control module harness connector.
- 2. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

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VVEL control module		VVEL actuat	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E14	23	E16	2	Existed

3. 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.VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

V	VVEL control module			VVEL actuator motor relay		
Bank	Connector	Terminal	Connector	Terminal	Continuity	
1	F14	13	E16	3	Existed	
2	LIT	1	210	3	Existed	

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-406. "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

NO

>> Replace VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".

#### $\mathsf{6}.$ CHECK ABORT CIRCUIT FOR OPEN AND SHORT

- Disconnect ECM harness connector.
- Check the continuity between VVEL control module harness connector and ECM harness connector.

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VVEL control module		E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E14	21	F101	28	Existed

Also check harness for short to ground and power.

### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

### .DETECT MALFUNCTIONING PART

Check the following.

**EC-405** Revision: 2013 March 2014 QX50

### P1091 VVEL ACTUATOR MOTOR RELAY

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Harness connector E13, F40
- Harness for open or short between ECM and VVEL control module
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

### 8.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

## 9. REPLACE VVEL CONTROL MODULE

- Replace VVEL control module. Refer to <u>EC-39</u>, "Component Parts Location".
- Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE): Special Repair Requirement".

>> GO TO 10.

# 10. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-404</u>, "<u>DTC Logic"</u>.

#### Is the DTC P1091 displayed again?

YES >> GO TO 11.

NO >> INSPECTION END

## 11.REPLACE ECM

- Replace ECM. Refer to <u>EC-39</u>, "Component Parts Location".
- 2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM): Special Repair Requirement".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009064182

# 1. CHECK VVEL ACTUATOR MOTOR RELAY

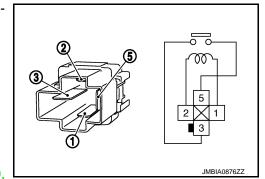
- 1. Turn ignition switch OFF.
- 2. Remove VVEL actuator motor relay. Refer to <a href="EC-39">EC-39</a>, "Component Parts Location".
- 3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.

Terminal	Condition	Continuity
3 and 5	12 V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace VVEL actuator motor relay. Refer to <u>EC-39</u>. "Component Parts Location".



## P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

### DTC DETECTION LOGIC

NOTE:

DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.

When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148	Closed loop control function (bank 1)	The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition.	Harness or connectors     (The A/F sensor 1 circuit is open or shorted.)
P1168	Closed loop control function (bank 2)	The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition.	A/F sensor 1     A/F sensor 1 heater

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INFOID:00000000009064186

### P1211 TCS CONTROL UNIT

Description INFOID:000000000064184

The malfunction information related to TCS is transferred via the CAN communication line from "ABS actuator and electric unit (control unit)" to ECM.

Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

#### DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1211	TCS control unit	ECM receives malfunction information from "ABS actuator and electric unit (control unit)".	ABS actuator and electric unit (control unit)     TCS related parts

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 60 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> EC-408, "Diagnosis Procedure"

NO >> INSPECTION END

### **Diagnosis Procedure**

Go to BRC-5, "Work Flow".

#### P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

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### P1212 TCS COMMUNICATION LINE

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 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-384</u>, "<u>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.	Harness or connectors     (The CAN communication line is open or shorted.)     ABS actuator and electric unit (control unit)     Dead (Weak) battery

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-409, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

Go to BRC-5, "Work Flow".

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Revision: 2013 March **EC-409** 2014 QX50

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### P1217 ENGINE OVER TEMPERATURE

DTC Logic INFOID:0000000009064190

#### DTC DETECTION LOGIC

#### NOTF:

- If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-384, "DTC Logic".

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over temperature (Overheat)	<ul> <li>Cooling fan does not operate properly (Overheat).</li> <li>Cooling fan system does not operate properly (Overheat).</li> <li>Engine coolant was not added to the system using the proper filling method.</li> <li>Engine coolant is not within the specified range.</li> </ul>	Harness or connectors (The cooling fan circuit is open or shorted.)  IPDM E/R Cooling fan control module Cooling fan motor Radiator hose Radiator Radiator cap Water pump Thermostat

#### **CAUTION:**

When a malfunction is indicated, always replace the coolant. Refer to CO-7, "Draining" and CO-8, "Refilling". Also, replace the engine oil. Refer to LU-9, "Draining" and LU-9, "Refilling".

- Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to MA-11, "Anti-Freeze Coolant Mixture Ratio".
- 2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

#### DTC CONFIRMATION PROCEDURE

## 1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-410, "Component Function Check".

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

#### Is the inspection result normal?

YES >> INSPECTION END

>> Go to EC-411, "Diagnosis Procedure".

### Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK-I

#### **WARNING:**

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

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Wrap a thick cloth around cap. Carefully remove the cap by turning it a guarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

#### < DTC/CIRCUIT DIAGNOSIS >

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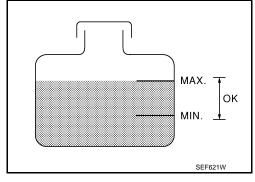
Check the coolant level in the reservoir tank and radiator.

Allow engine to cool before checking coolant level.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

>> Go to EC-411, "Diagnosis Procedure". YES

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-411, "Diagnosis Procedure".

NO >> GO TO 3.

# 3.perform component function check-iii

(P)With CONSULT

- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT

Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-411, "Diagnosis Procedure".

# Diagnosis Procedure

# 1. CHECK COOLING FAN OPERATION

# (II) With CONSULT

- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.
- Make sure that cooling fan speed varies according to the percentage.

### **Without CONSULT**

- 1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description".
- Make sure that cooling fan operates.

Is the inspection result normal?

YFS >> GO TO 2.

NO >> Go to EC-501, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-7, "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

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#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

>> Repair or replace malfunctioning part.

### 4. CHECK RADIATOR TANK CAP

Check radiator cap. Refer to CO-11, "RADIATOR CAP: Inspection".

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator tank cap. Refer to CO-13, "Exploded View".

### 5. CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat. Refer to CO-22, "Removal and Installation".

### 6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-215, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor. Refer to <u>CO-24, "Exploded View"</u>.

### 7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	Blocked radiator     Blocked condenser     Blocked radiator grille     Blocked bumper	Visual	No blocking	_
	2	Coolant mixture	Coolant tester	MA-11, "Anti-Freeze Coola	int Mixture Ratio"
	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-7, "Inspection"
	4	Radiator cap	Pressure tester	107 kPa	CO-11, "RADIATOR CAP
				(1.1 kg/cm <sup>2</sup> , 16 psi) (Limit)	: Inspection"
ON* <sup>2</sup>	5	Coolant leaks	• Visual	No leaks	CO-7, "Inspection"
ON* <sup>2</sup>	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	CO-23, "Inspection"
ON*1	7	Cooling fan	• CONSULT	Operating	EC-501, "Component Function Check"
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON* <sup>3</sup>	9	Coolant temperature gauge	Visual	Gauge less than 3/4 when driving	_
		Coolant overflow to reservoir tank	Visual	No overflow during driving and idling	CO-7, "Inspection"
OFF* <sup>4</sup>	10	Coolant return from reservoir tank to radiator	Visual	Should be initial level in reservoir tank	CO-7, "Inspection"
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-116, "Inspection"
	12	Cylinder block and pistons	Visual	No scuffing on cylinder walls or piston	EM-129, "Inspection"

<sup>\*1:</sup> Turn the ignition switch ON.

<sup>\*2:</sup> Engine running at 3,000 rpm for 10 minutes.

<sup>\*3:</sup> Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

<sup>\*4:</sup> After 60 minutes of cool down time.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

For more information, refer to CO-5, "Troubleshooting Chart".

>> INSPECTION END

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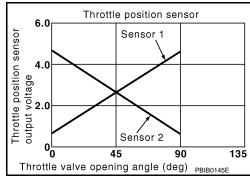
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INFOID:0000000009064194

## P1225, P1234 TP SENSOR

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.



**DTC** Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	Trouble diagnosis name DTC detecting condition	
P1225	Closed throttle position learning per- formance (bank 1)	Closed throttle position learning value	Electric throttle control actuator
P1234	Closed throttle position learning per- formance (bank 2)	is excessively low.	(TP sensor 1 and 2)

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-414, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009064195

# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF.
- Remove the intake air duct. Refer to <u>EM-26, "Removal and Installation"</u>.

### P1225, P1234 TP SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

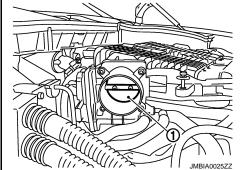
Check if foreign matter is caught between the throttle valve (1) and the housing.

#### Is the inspection result normal?

YES >> GO TO 2.

NO

>> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".



# 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation".
- 2. Go to EC-415, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

 ${f 1}$  . PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

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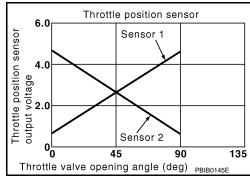
INFOID:00000000009064198

## P1226, P1235 TP SENSOR

Description INFOID:0000000009243811

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.



**DTC** Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	Trouble diagnosis name DTC detecting condition	
P1226	Closed throttle position learning performance (bank 1)	Closed throttle position learning is not performed	Electric throttle control actuator
P1235	Closed throttle position learning performance (bank 2)	successfully, repeatedly.	(TP sensor 1 and 2)

### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 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.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Repeat steps 2 and 3 for 32 times.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-422, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009243812

# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- Remove the intake air duct. Refer to EM-26, "Removal and Installation".

### P1226, P1235 TP SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:00000000009243813

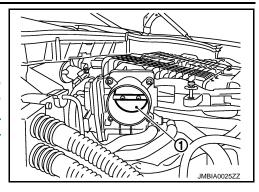
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

#### 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 <a href="EC-20">EC-20</a>, "THROTTLE <a href="YALVE CLOSED POSITION LEARNING">VALVE CLOSED POSITION LEARNING</a> : Special Repair Requirement".



# 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation".
- 2. Go to EC-417, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

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

#### 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 <a href="EC-425">EC-425</a>, "DTC Logic" or <a href="EC-430">EC-430</a>, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1233	Electric throttle control performance (bank 2)	Electric throttle control function does not oper-	Harness or connectors     (Throttle control motor circuit is open or
P2101	Electric throttle control performance (bank 1)	ate properly.	shorted)  • Electric throttle control actuator

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

>> GO TO 2.

# 2.perform dtc confirmation procedure

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-418, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009064203

## 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector terminals as per the following.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

	ECM														
DTC		+	-	-	Condition		Voltage (V)								
	Connector	Terminal	Connector	Terminal											
P1233	F102	52					OFF	Approx. 0							
1 1233		1102	1 102	1 102	1 102	1 102	1 102	1102	1102 02	M107	M107 128	400	Ignition switch	ON	Battery voltage
P2101		01 3	101107 120		120	ignition switch	OFF	Approx. 0							
F2101	1 101	3				ON	Battery voltage								

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#### Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 3. D

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# ${f 3.}$ CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector E7.
- Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		EC	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?

>> GO TO 5. YES >> GO TO 4. NO

# 4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

L

>> 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
ыс	Connector	Terminal	Connector	Terminal	Continuity
P1233	F7	54	F102	52	Existed
P2101	E1	34	F101	3	Existed

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Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

O. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 7. CHECK FUSE

- 1. Disconnect 15 A fuse (No. 51) from IPDM E/R.
- 2. Check 15 A fuse for blown.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace 15 A fuse.

### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace harness or connectors.

# 9.check throttle control motor output signal circuit for open or short

- 1. Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			EC	Continuity	
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity
			5		49	Existed
P1233	2	F27	3	F102	50	Not existed
F 1200	2	F21	6	1102	49	Not existed
					50	Existed
		F6	1	F101	2	Existed
P2101	1				4	Not existed
P2101	'		2	1 101	2	Not existed
					4	Existed

5. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace.

# 10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

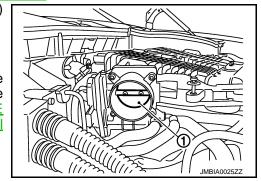
- 1. Remove the intake air duct. Refer to EM-26, "Removal and Installation".
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> Remove

>> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <a href="EC-20">EC-20</a>, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".



# 11. CHECK THROTTLE CONTROL MOTOR

Refer to EC-421, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 13.

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > 12. CHECK INTERMITTENT INCIDENT Refer to GI-42, "Intermittent Incident". Is the inspection result normal? YES >> GO TO 13. EC NO >> Repair or replace harness or connectors. 13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunction electric throttle control actuator. Refer to EM-28, "Removal and Installation". Go to EC-421, "Special Repair Requirement". D >> INSPECTION END Component Inspection INFOID:0000000009064204 Е 1. CHECK THROTTLE CONTROL MOTOR Turn ignition switch OFF. Disconnect electric throttle control actuator harness connector. F Check resistance between electric throttle control actuator terminals as per the following. Electric throttle control actuator Resistance ( $\Omega$ ) Bank **Terminals** 1 1 and 2 Approx. 1 - 15 [at 25°C (77°F)] 2 5 and 6 Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2.replace electric throttle control actuator Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation". Go to EC-421, "Special Repair Requirement". K >> INSPECTION END Special Repair Requirement INFOID:0000000009243814 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement" M >> GO TO 2. 2.PERFORM IDLE AIR VOLUME LEARNING Ν Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement" >> END

# P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P1236, P2118 THROTTLE CONTROL MOTOR

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

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1236	Throttle control motor (bank 2) circuit short	ECM detects short in both circuits between	Harness or connectors (Throttle control motor circuit is shorted.)	
P2118	Throttle control motor (bank 1) circuit short	ECM and throttle control motor.	Electric throttle control actuator (Throttle control motor)	

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

# 2.perform dtc confirmation procedure

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-422, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000009064208

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.check throttle control motor output signal circuit for open and short

- 1. Disconnect electric throttle control actuator harness connector.
- Disconnect ECM harness connector.
- 3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

### P1236, P2118 THROTTLE CONTROL MOTOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000009243817

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DTC						Continuity
	Bank	Connector	Terminal	Connector	Terminal	
			5		49	Existed
P1236 2		F27	3	F102	50	Not existed
P1230	2	F21		F102	49	Not existed
			6		50	Existed
			1		2	Existed
D0440	4	FC	!	F101	4	Not existed
P2118	1	F6	2	FIUI	2	Not existed
					4	Existed
YES >	>> GO	result norm FO 3. air or replac DTTLE COI	ce.	IOTOR		
Refer to E	C-423,	"Compone	ent Inspec	tion".		
Is the insp YES > NO >	ection >> GO -> GO	result norm ΓΟ 4.	nal?			
Refer to G	3I-42, "I	ntermittent	Incident".			
		result norm				
	-> GO	ΓO 5.	_			
NO >	- Dong	air or roplac	o harnes	c or conno	otoro	

NO >> Repair or replace harness or connectors.

# REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace malfunctioning electric throttle control actuator. Refer to <u>EM-28, "Removal and Installation"</u>.
- Go to EC-424, "Special Repair Requirement".

### >> INSPECTION END

# Component Inspection

# 1. CHECK THROTTLE CONTROL MOTOR

- Turn ignition switch OFF.
- Disconnect electric throttle control actuator harness connector.
- Check resistance between electric throttle control actuator terminals as per the following.

Resistance ( $\Omega$ )	Electric throttle control actuator		
11e3i3tarice (22)	Bank Terminals		
Approx. 1 - 15 [at 25°C (77°F)]	1 1 and 2		
Approx. 1 - 13 [at 25 6 (77 1)]	2 5 and 6		

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.replace electric throttle control actuator

- 1. Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation".
- Go to EC-424, "Special Repair Requirement".

### P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

>> INSPECTION END

Special Repair Requirement

INFOID:0000000009243818

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

### P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Description INFOID:0000000009064211

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The throttle position sensor detects the throttle valve position and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.

DTC Logic INFOID:00000000009064212

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause	
	Electric throttle control	A) Electric throttle control actuator does not function properly due to the return spring malfunction.			
P1238	actuator (bank 2)	B)	Throttle valve opening angle in fail-safe mode is not in specified range.		
		C) ECM detect the throttle valve is stuck open.		Electric throttle control actuator	
	Electric throttle control	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	- Cleans unothe control actuator	
P2119	actuator (bank 1)	B)	Throttle valve opening angle in fail-safe mode is not in specified range.		
		C)	ECM detect the throttle valve is stuck open.		

#### 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.
- Turn ignition switch OFF and wait at least 10 seconds.

#### >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- Turn ignition switch ON and wait at least 1 second.
- Shift selector lever to D position and wait at least 3 seconds. 2.
- Shift selector lever to P position.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and wait at least 1 second.
- Shift selector lever to D position and wait at least 3 seconds.
- Shift selector lever to P position.
- Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 9. Check DTC.

#### Is DTC detected?

YES >> Go to EC-426, "Diagnosis Procedure".

NO >> GO TO 3.

# 3.perform dtc confirmation procedure for malfunction c

- Turn ignition switch ON and wait at least 1 second.
- Shift selector lever to D position and wait at least 3 seconds. 2.
- 3.
- Start engine and let it idle for 3 seconds.

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Shift selector lever to P position.

**EC-425** Revision: 2013 March

## P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

5. Check DTC.

Is DTC detected?

YES >> Go to EC-426, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009243819

# 1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

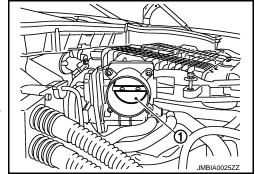
- Turn ignition switch OFF.
- Remove the intake air duct. Refer to <u>EM-26</u>, "Removal and Installation".
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

### Is the inspection result normal?

YES >> GO TO 2.

NO

>> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to <a href="EC-20">EC-20</a>, "THROTTLE <a href="VALVE CLOSED POSITION LEARNING">VALVE CLOSED POSITION LEARNING</a> : Special Repair Requirement".



# 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace malfunctioning electric throttle control actuator. Refer to <u>EM-28, "Removal and Installation"</u>.
- Go to EC-417, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000009243820

# 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

# 2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

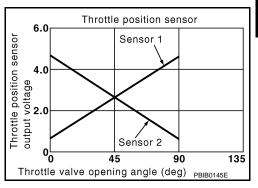
>> END

# P1239, P2135 TP SENSOR

Description INFOID:0000000009243821

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls throttle valve opening angle in response to driving conditions via the throttle control motor.



**DTC Logic** INFOID:00000000009064216

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1239 or P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1239	Throttle position sensor (bank 2) circuit range/ performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1	Harness or connector     (TP sensor 1 or 2 circuit is open or shorted.)
P2135	Throttle position sensor (bank 1) circuit range/ performance	and TP sensor 2.	Electric throttle control actuator (TP sensor 1 or 2)

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 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

- Start engine and let it idle for 1 second.
- Check DTC.

### Is DTC detected?

YES >> Go to EC-427, "Diagnosis Procedure".

>> INSPECTION END NO

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

**EC-427** Revision: 2013 March 2014 QX50

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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)		
	Bank	Connector	Terminal	Ground	voltage (v)	
P1239	2	F27	1	Ground	Approx. 5	
P2135	1	F6	6	Giodila		

#### 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			EC	Continuity		
DIC	Bank	Connector	Terminal	Connector	Terminal	Continuity	
P1239	2	F27	4	F101	48	Existed	
P2135	1	F6	3	FIUI	40	Existed	

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			EC	Continuity	
	Bank Connector		Terminal	Connector	Terminal	Continuity
P1239	2	F27	2		31	- Existed
F 1239	2	1 21	3	F101	35	
P2135	1	1 F6	4	1 101	30	
F 2 133	ı		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.

### ${f 5.}$ CHECK THROTTLE POSITION SENSOR

Refer to EC-429, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

#### 6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation".

### P1239, P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

EC-429, "Special Repair Requirement".

>> INSPECTION END

### 7. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

# 1. CHECK THROTTLE POSITION SENSOR

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".
- Turn ignition switch ON.
- Set selector lever to D position.
- Check the voltage between ECM harness connector terminals under the following conditions.

	ECM		Condition			
Connector	+	_			Voltage (V)	
Connector	Terminal	Terminal				
	30 [TP sensor 1 (bank 1)]	40		Fully released	More than 0.36	
	30 [TF Selisor I (Darik 1)]	40	A landan a - dal	Fully depressed	Less than 4.75	
	31 [TP sensor 1 (bank 2)]	40		Fully released	More than 0.36	
F101	31 [1F Selisor I (balik 2)]	48		Fully depressed	Less than 4.75	
FIUI	34 [TP sensor 2 (bank 1)]	40	Accelerator pedal	Fully released	Less than 4.75	
	34 [TF SellSUI 2 (Dalik 1)]	40		Fully depressed	More than 0.36	
	35 [TP sensor 2 (bank 2)]	48		Fully released	Less than 4.75	
	30 [1F Sensor 2 (bank 2)]			Fully depressed	More than 0.36	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2.replace electric throttle control actuator

- Replace malfunctioning electric throttle control actuator. Refer to EM-28, "Removal and Installation".
- Go to EC-429, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

 ${f 1}$  .PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement"

>> GO TO 2.

### 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement"

>> END

**EC-429** Revision: 2013 March 2014 QX50

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## P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1290	Throttle control motor relay circuit open (bank 2)	ECM detects a voltage of power source for	Harness or connectors     (Throttle control motor relay circuit is
P2100	Throttle control motor relay circuit open (bank 1)	throttle control motor is excessively low.	open)  Throttle control motor relay
P2103	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	Harness or connectors     (Throttle control motor relay circuit is shorted)     Throttle control motor relay

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V.

#### Which DTC is detected?

P1290. P2100>>GO TO 2.

P2103 >> GO TO 3.

# 2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1290 AND P2100

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- Check DTC.

#### Is DTC detected?

YES >> Go to EC-430, "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-430, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009064222

# 1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.

### P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 3. Disconnect IPDM E/R harness connector E7.
- Check the continuity between IPDM E/R harness connector and ECM harness connector.

 IPDM E/R
 ECM
 Continuity

 Connector
 Terminal
 Connector
 Terminal

 E7
 70
 F101
 25
 Existed

Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 2.

# 2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

# ${f 3.}$ CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Check the continuity between IPDM E/R sensor harness connector and ECM harness connector.

DTC	IPDM	E/R	EC	Continuity	
DIC	Connector	Terminal	Connector	Terminal	Continuity
P1290			F102	52	Existed
P2100	E7	54	F101	3	
P2103	L1		F101	3	
			F102	52	

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

### 4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 5. CHECK FUSE

- 1. Disconnect 15 A fuse (No. 51) from IPDM E/R.
- Check 15 A fuse for blown.

#### Is the inspection result normal?

YES >> GO TO 6.

Revision: 2013 March

NO >> Replace 15A fuse.

#### 6. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

### Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace harness or connectors.

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### P1550 BATTERY CURRENT SENSOR

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12. "System Description".

#### **CAUTION:**

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to <u>EC-385, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1550	Battery current sensor circuit range/performance	The output voltage of the battery current sensor remains within the specified range while engine is running.	Harness or connectors     (Battery current sensor circuit is open or shorted.)     Battery current sensor

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

## 2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and wait at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-432, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

INFOID:0000000009064225

#### P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 2.check battery current sensor power supply circuit-i

- 1. Disconnect battery current sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between battery current sensor harness connector and ground.

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Battery cur	rent sensor	Ground	Voltage (V)	
Connector	Terminal	Ground	voltage (v)	
E21	1	Ground	Approx. 5	

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

### f 4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E21	2	F102	95	Existed

Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E21	3	F102	91	Existed

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 F40, E13

**EC-433** Revision: 2013 March 2014 QX50

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### P1550 BATTERY CURRENT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

· Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 8. CHECK BATTERY CURRENT SENSOR

Refer to EC-434, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

### 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

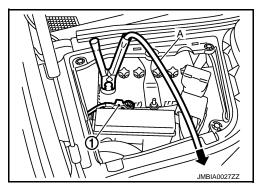
### Component Inspection

INFOID:0000000009064226

## 1. CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).
  - To body ground
- 4. Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

Connector	+	+ – Voltaç	
Connector	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3. "How to Handle Battery".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

### P1551, P1552 BATTERY CURRENT SENSOR

Description INFOID:000000000243826

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12. "System Description".

#### **CAUTION:**

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No. Trouble diagnosis name DTC detecting condition Possible cause Battery current sensor circuit An excessively low voltage from the sen-· Harness or connectors P1551 low input sor is sent to ECM. (Battery current sensor circuit is open or shorted.) An excessively high voltage from the sen-Battery current sensor circuit P1552 Battery current sensor sor is sent to ECM. high input

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V with ignition switch ON

>> GO TO 2.

### 2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-435, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

## 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

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### P1551, P1552 BATTERY CURRENT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Repair or replace ground connection.

## 2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

Battery cur	rent sensor	Ground	Voltage (V)
Connector	Terminal	Glound	voltage (v)
E21	1	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

### 3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

## 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery curr	ent sensor	sensor ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E21	2	F102	95	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

### DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- · Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E21	3	F102	91	Existed

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

### 7.DETECT MALFUNCTIONING PART

Check the following.

### P1551, P1552 BATTERY CURRENT SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

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- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 8. CHECK BATTERY CURRENT SENSOR

Refer to EC-443, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

### 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

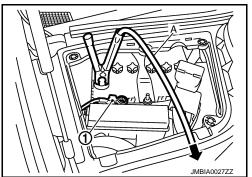
### Component Inspection

INFOID:0000000009243830

### 1. CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).
  - To body ground
- Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

Connector	+	_	Voltage (V)
Connector	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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Revision: 2013 March **EC-437** 2014 QX50

### P1553 BATTERY CURRENT SENSOR

Description INFOID:000000009243827

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12, "System Description".

#### **CAUTION:**

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to <u>EC-385, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1553	Battery current sensor performance	The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation.	Harness or connectors     (Battery current sensor circuit is open or shorted.)     Battery current sensor

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and wait at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to EC-438, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009243831

### 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

#### P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

# 2.check battery current sensor power supply circuit-i

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

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Battery cur	rent sensor	Ground	Voltage (V)
Connector	Terminal	Glodila	voltage (v)
E21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- · Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

### 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		nsor ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E21	2	F102	95	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

### DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 6.check battery current sensor input signal circuit for open and short

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery curr	ent sensor ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity
E21	3	F102	91	Existed

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

### 7. DETECT MALFUNCTIONING PART

#### Check the following.

Harness connectors F40, E13

Revision: 2013 March **EC-439** 2014 QX50

### P1553 BATTERY CURRENT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

· Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 8. CHECK BATTERY CURRENT SENSOR

Refer to EC-443, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

### 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

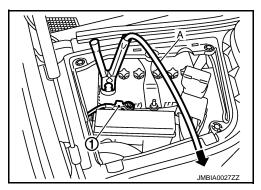
### Component Inspection

INFOID:0000000009243832

## 1. CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable (1).
  - To body ground
- 4. Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

Connector	+ -		Voltage (V)
Connector	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

### P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### P1554 BATTERY CURRENT SENSOR

Description INFOID:0000000009243828

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12. "System Description".

#### **CAUTION:**

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

**DTC Logic** INFOID:00000000009064236

#### DTC DETECTION LOGIC

If DTC P1554 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No. Trouble diagnosis name DTC detecting condition Possible cause Harness or connectors The output voltage of the battery current (Battery current sensor circuit is open Battery current sensor perfor-P1554 sensor is lower than the specified value mance or shorted.) while the battery voltage is high enough. Battery current sensor

### DTC CONFIRMATION PROCEDURE

### 1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-441, "Component Function Check".

#### NOTE:

Use component function check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-442, "Diagnosis Procedure".

### Component Function Check

### 1.PRECONDITIONING

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm that battery voltage is more than 12.8 V at idle.
- Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.

>> GO TO 2.

### 2.PERFORM COMPONENT FUNCTION CHECK

#### (P)With CONSULT

- 1. Start engine and let it idle.
- Select "BAT CUR SEN" in "DATA MONITOR" mode with CONSULT.
- Check "BAT CUR SEN" indication for 10 seconds.

"BAT CUR SEN" should be above 2,300 mV at least once.

#### 

Start engine and let it idle.

**EC-441** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

Check the voltage between ECM harness connector terminals as per the following.

	ECM		
Connector + -		_	Voltage (V)
Connector	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Above 2.3 at least once

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-442, "Diagnosis Procedure"

### Diagnosis Procedure

INFOID:0000000009243833

### 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

Battery cur	rent sensor	Ground	Voltage (V)
Connector	Connector Terminal		voltage (v)
E21	1	Ground	Approx. 5

### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

## 4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E21	2	F102	95	Existed

Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

### DETECT MALFUNCTIONING PART

Check the following.

### P1554 BATTERY CURRENT SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E21	3	F102	91	Existed

2. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

### 7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 8.CHECK BATTERY CURRENT SENSOR

Refer to EC-443. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

### 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000009243834

## 1. CHECK BATTERY CURRENT SENSOR

- Turn ignition switch OFF.
- Reconnect harness connectors disconnected.
- Disconnect battery negative cable (1).
  - To body ground
- 4. Install jumper cable (A) between battery negative terminal and body ground.
- Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

Connector	+	_	Voltage (V)
Connector	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5



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Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3. "How to Handle Battery".

### P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

### P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### P1564 ASCD STEERING SWITCH

Description INFOID:0000000009064240

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

Refer to EC-77, "System Description" for the ASCD function.

**DTC Logic** INFOID:0000000009064241

### DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".

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>	Harness or connectors     (The switch circuit is open or shorted.)     ASCD steering switch     ECM

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 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.

>> GO TO 2.

## 2.perform dtc confirmation procedure

- Turn ignition switch ON and wait at least 10 seconds.
- Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Check DTC.

### Is DTC detected?

YES >> Go to EC-445, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

### CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

>> GO TO 2. YES

NO >> Repair or replace ground connection.

## 2.CHECK ASCD STEERING SWITCH CIRCUIT

### (P) With CONSULT

**EC-445** Revision: 2013 March 2014 QX50

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#### P1564 ASCD STEERING SWITCH

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 1. Turn ignition switch ON.
- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT.
- 3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
MAIN SW	WAIN SWILCH	Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
CANCLL SW	CANCLE SWILLI	Released	OFF
RESUME/ACC SW	RESUME/ACCEL-	Pressed	ON
RESUME/ACC SW	ERATE switch	Released	OFF
SET SW	SET/COAST switch	Pressed	ON
SL1 SW	SET/COAST SWILLI	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		
		108	MAIN switch: Pressed	Approx. 0
	101 (ASCD steering switch signal)		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.

## 3.check ascd steering switch ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect combination switch harness connector M303.
- 4. Check the continuity between combination switch and ECM harness connector.

Combination switch	ECM		Continuity
Terminal	Connector Terminal		Continuity
16	M107	108	Existed

5. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

#### Check the following.

- Combination switch (spiral cable)
- · Harness for open and short between ECM and combination switch
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

### P1564 ASCD STEERING SWITCH

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## ${f 5.}$ CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between combination switch and ECM harness connector.

Combination switch	ECM		Continuity
Terminal	Connector Terminal		Continuity
13	M107	101	Existed

2. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

### $\mathsf{6}.\mathsf{DETECT}$ 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-447, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ASCD steering switch. Refer to ST-15, "Exploded View".

### 8.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:00000000009064243

### CHECK ASCD STEERING SWITCH

- Turn ignition switch OFF.
- 2. Disconnect combination switch (spiral cable) harness connector M303.
- Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance ( $\Omega$ )	
Connector	Terminals	Condition	116313ta1106 (12)	
		MAIN switch: Pressed	Approx. 0	
	•	CANCEL switch: Pressed	Approx. 250	
M303	13 and 16	SET/COAST switch: Pressed	Approx. 660	
		RESUME/ACCELERATE switch: Pressed	Approx. 1,480	
	•	All ASCD steering switches: Released	Approx. 4,000	

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch. Refer to ST-15, "Exploded View".

**EC-447** Revision: 2013 March 2014 QX50

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### P1564 ICC STEERING SWITCH

ICC steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

Refer to CCS-18, "System Description" for the ICC function.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1564	ICC steering switch	<ul> <li>An excessively high voltage signal from the ICC steering switch is sent to ECM.</li> <li>ECM detects that input signal from the ICC steering switch is out of the specified range.</li> <li>ECM detects that the ICC steering switch is stuck ON.</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.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

## 2.perform dtc confirmation procedure

- Turn ignition switch ON and wait at least 10 seconds.
- 2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 7. Press LDP/DCA switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 8. Check DTC.

#### Is DTC detected?

YES >> Go to EC-448, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009064246

### 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

### 2. CHECK ICC STEERING SWITCH CIRCUIT

### P1564 ICC STEERING SWITCH

## < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Turn ignition switch ON.

Check the voltage between ECM harness connector terminals as per the following.

ECM				_
Connector	+	_	Condition	Voltage (V)
Connector	Terminal Termi			
		108	MAIN switch: Pressed	Approx. 0
	101 (ICC steering switch signal)		LDP/DCA switch: Pressed	Approx. 0.8
			CANCEL switch: Pressed	Approx. 1.6
M107			DISTANCE switch: Pressed	Approx. 2.2
			SET/COAST switch: Pressed	Approx. 2.9
			RESUME/ACCELERATE switch: Pressed	Approx. 3.4
			All ICC steering switches: Released	Approx. 4.0

Is the inspection result normal?

>> GO TO 8. YES NO >> GO TO 3.

 ${f 3.}$ CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Disconnect combination switch harness connector M303.
- Check the continuity between combination switch and ECM harness connector.

Combination switch	EC	Continuity	
Terminal	Connector	Terminal	Continuity
16	M107	108	Existed

Also check harness for short to ground and short to power.

### Is the inspection result normal?

>> GO TO 5. YES NO >> GO TO 4.

### 4. DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

## ${f 5.}$ CHECK ICC STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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)

**EC-449** Revision: 2013 March 2014 QX50

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### P1564 ICC STEERING SWITCH

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- · Harness for open and short between ECM and combination switch
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

### 7. CHECK ICC STEERING SWITCH

Refer to EC-450, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ICC steering switch. Refer to <a href="CCS-177">CCS-177</a>, "Exploded View".

### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

INFOID:0000000009064247

### 1. CHECK ICC STEERING SWITCH

- 1. Turn ignition switch OFF.
- 2. Disconnect combination switch (spiral cable) harness connector M303.
- Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance (Ω)	
Connector	Terminals	Condition	ixesisiance (22)	
		MAIN switch: Pressed	Approx. 0	
	13 and 16	LDP/DCA switch: Pressed	Approx. 270	
		CANCEL switch: Pressed	Approx. 620	
M303		DISTANCE switch: Pressed	Approx. 1,100	
		SET/COAST switch: Pressed	Approx. 1,810	
		RESUME/ACCELERATE switch: Pressed	Approx. 2,990	
		All ICC steering switches: Released	Approx. 5,420	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC steering switch. Refer to <a href="CCS-177">CCS-177</a>, "Exploded View".

### P1568 ICC FUNCTION

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

### P1568 ICC FUNCTION

**DTC** Logic INFOID:0000000009064248

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P1568 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1568 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".
- If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-384, "DTC Logic".

-	DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P	1568	ICC function	ECM detects a difference between signals from ICC sensor integrated unit is out of specified range.	Harness or connectors     (The CAN communication line is open or shorted.)     ICC sensor integrated unit     ECM

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 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.

#### **TESTING CONDITION:**

Step 4 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

- Turn ignition switch ON.
- 2. Press MAIN switch on ICC steering switch.
- 3. Drive the vehicle at more than 40 km/h (25 MPH).

#### **CAUTION:**

Always drive vehicle at a safe speed.

- Press SET/COAST switch.
- 5. Check DTC.

#### Is DTC detected?

YES >> Go to EC-451, "Diagnosis Procedure".

>> INSPECTION END NO

### Diagnosis Procedure

### 1. REPLACE ICC SENSOR INTEGRATED UNIT

- Replace ICC sensor integrated unit. Refer to CCS-174, "Removal and Installation".
- 2. Perform CCS-12, "ACTION TEST: Special Repair Requirement (Vehicle-To-Vehicle Distance Control
- Check DTC of ICC sensor integrated unit. Refer to CCS-38, "Diagnosis Description".

>> INSPECTION END

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**EC-451** Revision: 2013 March 2014 QX50

### P1572 ASCD BRAKE SWITCH

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 <a href="EC-77">EC-77</a>, "System Description" for the ASCD function.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed.
   1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
		A)	When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time.	Harness or connectors     (The stop lamp switch circuit is shorted.)     Harness or connectors     (The ASCD brake switch circuit is shorted.)
P1572	ASCD brake switch	B)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle 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>

#### 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.

#### 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.
- 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	

Check 1st trip DTC.

### P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### Is 1st trip DTC detected?

YES >> Go to EC-453, "Diagnosis Procedure".

NO >> GO TO 3.

## 3. PERFORM DTC CONFIRMATION PROCEDURE

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.

Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-453, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

1. CHECK OVERALL FUNCTION-I

### (II) With CONSULT

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition	Indication	
BRAKE SW1	Brake pedal	Slightly depressed	OFF
DIVAILE OWI	Brake pedal	Fully released	ON

#### ₩ Without CONSULT

- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

ECM					
Connector	+	_	Condition		Voltage (V)
	Terminal	Terminal			
M107	126	128	Brake pedal	Slightly depressed	Approx. 0
WHO7	(ASCD brake switch signal)	120	Brake pedal	Fully released	Battery voltage

### Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

### 2.CHECK OVERALL FUNCTION-II

### (P) With CONSULT

Select "BRAKE SW2" and check indication under the following conditions.

Monitor item	(	Indication	
BRAKE SW2	SW2 Brake pedal	Slightly depressed	ON
BRARE 3W2		Fully released	OFF

**EC-453** Revision: 2013 March 2014 QX50

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#### < DTC/CIRCUIT DIAGNOSIS >

### **⋈** Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

	ECM				
Connector	+	_	Condition		Voltage (V)
Connector	Terminal	Terminal			
M107	122	128	Brake pedal	Slightly depressed	Battery voltage
IVITO7	(Stop lamp switch signal)	120	Diake pedai	Fully released	Approx. 0

#### Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 8.

## 3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD bra	ake switch	Ground	Voltage	
Connector Terminal		Glound	voltage	
E109	1	Ground	Battery voltage	

#### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

## 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- · Harness for open or short between ASCD brake switch and fuse
  - >> Repair open circuit or short to ground in harness or connectors.

## 5.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD bra	ake switch	E	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E109	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

### 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.

### .CHECK ASCD BRAKE SWITCH

#### P1572 ASCD BRAKE SWITCH

#### [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Refer to EC-456, "Component Inspection (ASCD Brake Switch)" Α Is the inspection result normal? YES >> GO TO 13. NO >> Replace ASCD brake switch. Refer to BR-18, "Exploded View". EC 8.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT Turn ignition switch OFF. Disconnect stop lamp switch harness connector. Check the voltage between stop lamp switch harness connector and ground. Stop lamp switch D Ground Voltage Connector **Terminal** F110 Ground Battery voltage Е Is the inspection result normal? YES >> GO TO 10. NO >> GO TO 9. F 9. DETECT MALFUNCTIONING PART Check the following. Fuse block (J/B) connector E103 10A fuse (No. 7) Harness for open or short between stop lamp switch and battery >> Repair open circuit, short to ground or short to power in harness or connectors. 10.check stop lamp switch input signal circuit for open and short Disconnect ECM harness connector. Check the continuity between stop lamp switch harness connector and ECM harness connector. **ECM** Stop lamp switch Continuity Connector Connector **Terminal Terminal** E110 2 M107 122 Existed Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 12. NO >> GO TO 11. 11. DETECT MALFUNCTIONING PART Check the following. Fuse block (J/B) connectors E103, M2 · Harness for open or short between ECM and stop lamp switch Ν >> Repair open circuit, short to ground or short to power in harness or connectors. 12. CHECK STOP LAMP SWITCH Refer to EC-456, "Component Inspection (Stop Lamp Switch)" Is the inspection result normal? >> GO TO 13. Р YES NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View". 13. CHECK INTERMITTENT INCIDENT Refer to GI-42, "Intermittent Incident".

Revision: 2013 March **EC-455** 2014 QX50

>> INSPECTION END

#### P1572 ASCD BRAKE SWITCH

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### Component Inspection (ASCD Brake Switch)

INFOID:00000000009064253

## 1. CHECK ASCD BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Existed
	brake pedar	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-19, "Inspection and Adjustment".
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brako podal	Fully released	Existed
	Brake pedal	Slightly depressed	Not existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to <u>BR-18</u>, "<u>Exploded View</u>".

### Component Inspection (Stop Lamp Switch)

INFOID:0000000009064254

## 1. CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
T dild 2	втаке редаг	Slightly depressed	Existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

### 2.CHECK STOP LAMP SWITCH-II

- Adjust stop lamp switch installation. Refer to <u>BR-19</u>, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
1 4114 2	Бтакс редаг	Slightly depressed	Existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to BR-18, "Exploded View".

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:00000000009064256

### P1572 ICC BRAKE SWITCH

**Description** 

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to <a href="#">CCS-18</a>, "System Description" for the ICC function.

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DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

 If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".

 This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed.
 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
		A)	ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time.	Harness or connectors     (The stop lamp switch circuit is shorted.)     Harness or connectors
P1572	ICC brake switch	В)	ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven	<ul> <li>(The ICC brake switch circuit is shorted.)</li> <li>Stop lamp switch</li> <li>ICC brake switch</li> <li>ICC brake hold relay</li> <li>Incorrect stop lamp switch installation</li> <li>Incorrect ICC brake switch installation</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.
- 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

- Start engine (VDC switch OFF).
- 2. Press MAIN switch and make sure that CRUISE lamp illuminates.
- 3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

#### < DTC/CIRCUIT DIAGNOSIS >

#### 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 EC-458, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009064257

### 1. CHECK OVERALL FUNCTION-I

### (II) With CONSULT

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition	Indication	
BRAKE SW1	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

#### **Without CONSULT**

- Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM					
Connector	+	_	Condition		Voltage (V)
	Terminal	Terminal			
M107	M107 126 128		Brake pedal	Slightly depressed	Approx. 0
IVI 107	(ICC brake switch signal)	120	Brake pedal	Fully released	Battery voltage

### Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

### 2.CHECK OVERALL FUNCTION-II

### (P) With CONSULT

Select "BRAKE SW2" and check indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW2	Brako podal	Slightly depressed	ON
	Бтаке рецаг	Fully released	OFF

#### P1572 ICC BRAKE SWITCH

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### (R) Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

	ECM					
Connector +		-		Condition	Voltage (V)	
Connector	Terminal	Terminal	]			
M107	122	128	Brake pedal	Slightly depressed	Battery voltage	
101107	(Stop lamp switch signal)	120	Diake pedal	Fully released	Approx. 0	

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### Is the inspection result normal?

YES >> GO TO 17. NO >> GO TO 11.

# 3.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between ICC brake switch harness connector and ground.

ICC brak	e switch	Ground	Voltage
Connector	Terminal	Oroana	voltage
E111	1	Ground	Battery voltage

### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 4.

### 4. CHECK ICC BRAKE HOLD RELAY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake hold relay harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake hold relay harness connector and ground.

ICC brake	hold relay	Ground	Voltage
Connector	Terminal	Giodila	voltage
E50	3	Ground	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

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### 5. DETECT MALFUNCTIONING PART

#### Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- · Harness for open or short between ICC brake hold relay and fuse

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>> Repair open circuit or short to ground in harness or connectors.

## 6.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

- 1. Turn ignition switch OFF.
- Check the continuity between ICC brake hold relay harness connector and ICC brake switch harness connector.

ICC brake	hold relay	ICC brake switch		Continuity
Connector	Terminal	Connector Terminal		Continuity
E50	4	E111	1	Existed

3. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit or short to ground in harness or connectors.

### 7. CHECK ICC BRAKE HOLD RELAY

Refer to EC-463, "Component Inspection (ICC Brake Hold Relay)".

#### Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace ICC brake hold relay. Refer to <a href="EC-39">EC-39</a>, "Component Parts Location".

## 8.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
E111	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 9.

## 9. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E106, M6
- · Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 10. CHECK ICC BRAKE SWITCH

Refer to EC-462, "Component Inspection (ICC Brake Switch)".

#### Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace ICC brake switch. Refer to <a href="BR-18">BR-18</a>, "Exploded View".

## 11. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Disconnect ICC brake hold relay harness connector.
- 4. Check the voltage between stop lamp switch harness connector and ground.

•	Stop lam	p switch	Ground	Voltage
	Connector	Terminal	Giodila	voltage
	E110	1	Ground	Battery voltage

5. Check the voltage between ICC brake hold relay harness connector and ground.

### P1572 ICC BRAKE SWITCH

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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ICC brake	hold relay		) / I		
Connector	Terminal	Ground	Voltage		_
E50	7	Ground	Battery volta	age	
Is the inspe	ction resu	ult norma	?		
	GO TO 1				
	GO TO 1				
12.dete	CT MALF	UNCTIO	NING PAR	Т	
Check the f			-100		
Fuse bloc 10 A fuse		nnector i	=103		
Harness f	or open o				op lamp switch
Harness f	or open c	or short be	etween bat	tery and IC	C brake hold relay
	Donois -	non sirs:	it or chout	o around!	harnoss or connectors
	•	-		•	h harness or connectors.
					L CIRCUIT FOR OPEN AND SHORT
			connector		harness connector and ECM harness connector.
Z. OHECK	uie contii	idity Detw	een stop ie	amp switci	namess connector and LOW namess connector.
Stop lamp	switch	E	CM		
Connector	Terminal	Connector	Terminal	Continuity	
E110	2	M107	122	Existed	
3. Check	the contir	nuity betw	een ICC b	rake hold r	elay harness connector and ECM harness connector.
		•			,
ICC brake h	nold relay	E	СМ	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
E50	6	M107	122	Existed	
1. Also ch	eck harne	ess for sh	ort to grou	nd and sho	ort to power.
s the inspe			<u> ?</u>		
	GO TO 1				
14. <sub>DETE</sub>				<del>-</del>	
		UNCTIO	NING PAR	1	
Check the for Fuse bloc		nnector I	=103 M2		
				M and stop	lamp switch
Harness f	or open c	or short be	etween EC	M and ICC	brake hold relay
	_	_		_	
				ground or	short to power in harness or connectors.
<b>15.</b> снес	K STOP	LAMP SV	VITCH		
Refer to EC	-462, "Co	mponent	Inspection	Stop Lar	np Switch)".
s the inspe			<u> ?</u>		
	GO TO 1		n awitah D	ofor to DD	19 "Evoloded View"
	•	-			-18, "Exploded View".
16.chec	K ICC BF	KAKE HO	LD KELAY		

Refer to EC-463, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace ICC brake hold relay. Refer to EC-39, "Component Parts Location".

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

### 17. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection (ICC Brake Switch)

INFOID:0000000009064258

### 1. CHECK ICC BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	1 and 2 Brake pedal	Fully released	Existed
i and z		Slightly depressed	Not existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

### 2.CHECK ICC BRAKE SWITCH-II

- 1. Adjust ICC brake switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	(	Continuity	
1 and 2 Brake pedal	Brako podal	Fully released	Existed
	Slightly depressed	Not existed	

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch. Refer to BR-18, "Exploded View".

### Component Inspection (Stop Lamp Switch)

INFOID:0000000009064259

### 1.CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	d 2 Brake pedal	Fully released	Not existed
r and z		Slightly depressed	Existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

### 2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity		
1 and 2	Brake pedal	Fully released	Not existed	
r and 2   Brake peda		Slightly depressed	Existed	

#### Is the inspection result normal?

### P1572 ICC BRAKE SWITCH

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View".

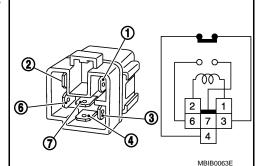
### Component Inspection (ICC Brake Hold Relay)

INFOID:0000000009064260

## 1. CHECK ICC BRAKE HOLD RELAY

- Turn ignition switch OFF.
- Remove ICC brake hold relay. Refer to <u>EC-39, "Component Parts Location"</u>.
- 3. Check the continuity between ICC brake hold relay terminals under the following conditions.

Terminals	Condition	Continuity
3 and 4	12V direct current supply between terminals 1 and 2	Not existed
	No current supply	Existed
6 and 7	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake hold relay. Refer to <a href="EC-39">EC-39</a>, "Component Parts Location".

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### P1574 ASCD VEHICLE SPEED SENSOR

The ECM receives two vehicle speed signals via the CAN communication line. One is sent from "unified meter and A/C amp.", and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to <a href="EC-77">EC-77</a>, "System Description" for ASCD functions.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-361, "DTC Logic".
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-384, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ASCD vehicle speed sensor	The difference between the two vehicle speed signals is out of the specified range.	Harness or connectors (The CAN communication line is open or shorted.) Unified meter and A/C amp. ABS actuator and electric unit (control unit) Wheel sensor TCM ECM

#### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine (VDC switch OFF).
- 2. Drive the vehicle at more than 40 km/h (25 MPH).

#### **CAUTION:**

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3. Check DTC.

#### Is DTC detected?

YES >> Go to EC-464, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009064263

### 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

P1574 ASCD VEHICLE SPEED SENSOR	
< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR	<u>1</u>
YES >> GO TO 2. NO >> Perform trouble shooting relevant to DTC indicated.	۸
2. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"	А
Refer to BRC-31, "CONSULT Function".	-
Is the inspection result normal?	EC
YES >> GO TO 3.	
NO >> Repair or replace.	С
3.CHECK DTC WITH "UNIFIED METER AND A/C AMP."	_
Refer to MWI-42, "CONSULT Function (METER/M&A)".	D
>> INSPECTION END	
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EC-465 Revision: 2013 March 2014 QX50

### P1574 ICC VEHICLE SPEED SENSOR

The ECM receives two vehicle speed signals via CAN communication line. One is sent from "unified meter and A/C amp.", and the other is from TCM (Transmission control module). The ECM uses these signals for ICC control. Refer to <a href="CCS-18">CCS-18</a>, "System Description" for ICC functions.

DTC Logic

#### DTC DETECTION LOGIC

#### NOTE:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-361, "DTC Logic".
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-382, "DTC Logic".
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-384, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ICC vehicle speed sensor	The difference between the two vehicle speed signals is out of the specified range.	<ul> <li>Harness or connectors (The CAN communication line is open or shorted.)</li> <li>Unified meter and A/C amp.</li> <li>ABS actuator and electric unit (control unit)</li> <li>Wheel sensor</li> <li>TCM</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. 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 EC-466, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:0000000009064266

### 1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

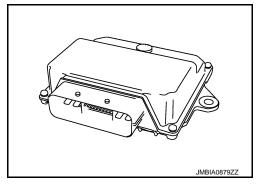
P1574 ICC VEHICLE SPEED SENSOR		
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]	
YES >> GO TO 2.  NO >> Perform trouble shooting relevant to DTC indicated.		А
2. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"		$\wedge$
Refer to BRC-31, "CONSULT Function".		
Is the inspection result normal?		EC
YES >> GO TO 3. NO >> Repair or replace.		
NO >> Repair or replace.  3. CHECK DTC WITH "UNIFIED METER AND A/C AMP."		С
Check combination meter function.		
Refer to MWI-42, "CONSULT Function (METER/M&A)".		D
>> INSPECTION END		Е
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**EC-467** Revision: 2013 March 2014 QX50

INFOID:0000000009064269

### P1606 VVEL CONTROL MODULE

The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.



DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1606	VVEL control module	VVEL control module calculation function is malfunctioning. VVEL EEP-ROM system is malfunctioning.	VVEL control module

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-468, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-468</u>, "<u>DTC Logic"</u>.

### Is the DTC P1606 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

### 2. REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".

Revision: 2013 March **EC-468** 2014 QX50

## P1606 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE): Special Repair Requirement".

>> INSPECTION END

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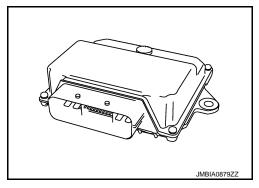
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# P1607 VVEL CONTROL MODULE

Description INFOID:000000009243835

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 control module is malfunctioning.	VVEL control module

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 1 second.
- 2. Check DTC.

### Is DTC detected?

YES >> Go to EC-470, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000009064272

# 1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC.
- 3. Perform DTC Confirmation Procedure. See EC-470, "DTC Logic".

### Is the DTC P1607 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

## 2. REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".

## **P1607 VVEL CONTROL MODULE**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE): Special Repair Requirement".

>> INSPECTION END

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## P1608 VVEL SENSOR POWER SUPPLY

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1608	VVEL sensor power supply circuit	VVEL control module detects a voltage of power source for sensor is excessively low or high.	Harness or connectors     (VVEL control shaft position sensor power supply circuit is open or shorted.)     VVEL control shaft position sensor     VVEL control module

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-472, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

INFOID:00000000009064274

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect VVEL control shaft position sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

VVEL	control shaft position	Ground	Voltage (V)	
Bank	Connector	Terminal	Giodila	voltage (v)
1	F46	3		Approx. 5
ı	1 40	6	Ground	
2	F47	3	Ground	
2	F47	6		

#### Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

### P1608 VVEL SENSOR POWER SUPPLY

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

3.check vvel control shaft position sensor power supply circuit for open and SHORT

- Turn ignition switch OFF.
- Disconnect VVEL control module harness connector.
- Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

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_	-

VVEL control shaft position sensor			VVEL control module		Continuity
Bank	Connector Terminal		Connector	Terminal	Continuity
1	1 F46			9	
•	F40	6	E14	22	Existed
2	F47	3		7	Existed
		6		20	

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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 F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 5. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

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- $\mathsf{6}.\mathsf{REPLACE}$  VVEL CONTROL MODULE
- Replace VVEL control module. Refer to <u>EC-39</u>, "Component Parts Location". Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MOD-ULE): Special Repair Requirement".

>> INSPECTION END

# 7.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace.

# f 8.REPLACE VVEL ACTUATOR SUB ASSEMBLY

- Replace VVEL actuator sub assembly. Refer to EM-93, "Exploded View".
- 2. Go to EC-473, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000009064275

 ${f 1}$  .PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

**EC-473** Revision: 2013 March 2014 QX50

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## **P1608 VVEL SENSOR POWER SUPPLY**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Refer to <u>EC-23</u>, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement".

>> GO TO 2.

# 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

### P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## P1805 BRAKE SWITCH

Description INFOID:0000000009064276

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.

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DTC Logic

#### INFOID:00000000009064277

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805	Brake switch	A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	(Stop Jamp switch circuit is open or sport-

### DTC CONFIRMATION PROCEDURE

# 1. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Fully depress the brake pedal for at least 5 seconds.
- Erase the DTC.
- Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to EC-475, "Diagnosis Procedure".

>> INSPECTION END NO

## Diagnosis Procedure

# INFOID:0000000009064278

# 1. CHECK STOP LAMP SWITCH CIRCUIT

- Turn ignition switch OFF.
- Check the stop lamp when depressing and releasing the brake pedal.

Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 2.

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# 2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- Disconnect stop lamp switch harness connector.
- Check the voltage between stop lamp switch harness connector and ground.

Stop lan	np switch	Ground	Voltage	
Connector Terminal		Glound	voltage	
E110	1	Ground	Battery voltage	

### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

# 3.DETECT MALFUNCTIONING PART

### Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)

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#### < 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.
- Disconnect ECM harness connector.
- Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E110	2	M107	122	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

## 5. DETECT MALFUNCTIONING PART

### Check the following.

- Fuse block (J/B) connector E103, M2
- · Harness for open or short between ECM and stop lamp switch
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

## 6. CHECK STOP LAMP SWITCH

Refer to EC-476, "Component Inspection (Stop Lamp Switch)".

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace stop lamp switch. Refer to <a href="mailto:BR-18">BR-18</a>, "Exploded View".

### 7. CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection (Stop Lamp Switch)

INFOID:0000000009243836

## 1. CHECK STOP LAMP SWITCH-I

- Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

## 2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

## P1805 BRAKE SWITCH

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
i aliu z	втаке редаг	Slightly depressed	Existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View".

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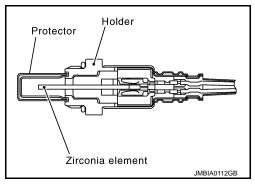
## P2096, P2097, P2098, P2099 A/F SENSOR 1

Description INFOID:000000009241937

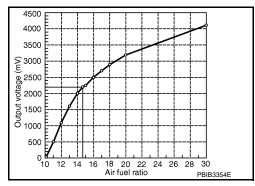
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P2096	POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too lean bank 1)	The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period.	A/F sensor 1 (bank 1)     A/F sensor 1 heater     Heated oxygen sensor 2 (bank 1)
P2097	POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too rich bank 1)	The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period.	<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.	A/F sensor 1 (bank 2)     A/F sensor 1 heater     Heated oxygen sensor 2 (bank 2)
P2099	POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too rich bank 2)	The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period.	<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.
- 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.

### P2096, P2097, P2098, P2099 A/F SENSOR 1

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > >> GO TO 2. 2.perform dtc confirmation procedure Α Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement". EC 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. 5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load. 6. Let engine idle for 1 minute. 7. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes. Check 1st trip DTC. D Is 1st trip DTC detected? >> Go to EC-479, "Diagnosis Procedure". YES NO >> INSPECTION END Е Diagnosis Procedure INFOID:0000000009064282 1. CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-45. "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. Н 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 EM-33, "Exploded View". >> GO TO 3. 3.CHECK FOR EXHAUST GAS LEAK Start engine and run it at idle. Listen for an exhaust gas leak before the three way catalyst 2. Is exhaust gas detected? YES >> Repair or replace. NO >> GO TO 4. 4. CHECK FOR INTAKE AIR LEAK Start engine and run it at idle. Listen for an intake air leak after the mass air flow sensor. Is intake air leak detected? YES >> Repair or replace. NO >> GO TO 5. N 5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR: Special Repair Requirement". Run engine for at least 10 minutes at idle speed. Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine? YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-266, "Diagnosis Procedure" or EC-270, "Diagnosis Procedure".

## **6.**CHECK HARNESS CONNECTOR

Turn ignition switch OFF.

>> GO TO 6.

NO

- 2. Disconnect A/F sensor 1 harness connector.
- Check harness connector for water.

**EC-479** Revision: 2013 March 2014 QX50

### 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			Ground	Voltage	
	Bank	Connector	Terminal	Giodila	voltage	
P2096 P2097	1	F3	4	Ground	Battery voltage	
P2098 P2099	2	F20	4	Oround	Dattery voltage	

### Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8.

## 8.DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

### >> Repair or replace harness or connectors.

# $9. {\tt CHECK\ A/F\ SENSOR\ 1\ INPUT\ SIGNAL\ CIRCUIT\ FOR\ OPEN\ AND\ SHORT}$

- 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	
	Bank	Connector	Terminal	Connector	Terminal	Continuity
P2096	1 1	F3	1	F102	57	Existed
P2097			2		61	
P2098 P2099	2 F20	F20	1		65	
		1 20	2		66	

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	Giodila	Continuity
P2096	1	F3	1		
P2097		13	2	Ground	Not existed
P2098	2	F20	1	Oround	Not existed
P2099	2	F2U	2		

			1		
DTC		ECM		Ground	Continuity
•	Bank	Connector	Terminal	-	
P2096	1		57		
P2097		F102	61	Ground	Not existed
P2098	2		65		
P2099	_		66		
. Also c	heck h	arness for	short to po	wer.	<u> </u>
the insp	ection	result norm	<u>nal?</u>		
	> GO 1				
					d or short to power in harness or connectors.
U.CHE	CK A/F	SENSOR	1 HEATER	3	
efer to E	C-181,	"Compone	ent Inspect	ion".	
the insp	ection	result norm	<u>nal?</u>		
	> GO 1				
	> GO 1				
I.CHEC	CK HE	ATED OXY	GEN SEN	SOR 2	
efer to E	C-181,	"Compone	ent Inspect	ion".	
the insp	ection	result norm	nal?		
	> GO ]				
_	-		_		gen sensor 2. Refer to EM-33, "Exploded View".
2.CHE	CK INT	ERMITTE	NT INCIDE	ENT	
erform <u>G</u>	l-42, "l	ntermittent	Incident".		
the insp	ection	result norm	<u>nal?</u>		
	> GO 1				
	•	air or replac			
3.REPL	ACE A	AIR FUEL I	RATIO (A/I	F) SENSO	OR 1
Replace ai	r fuel r	atio (A/F) s	sensor 1. F	Refer to EN	M-33, "Exploded View".
CAUTION		<b>-</b>			
					dropped from a height of more than 0.5 m (19.7 in) onto a e a new one.
					exhaust system threads using Oxygen Sensor Thread
				I (J-4389	97-18 or J-43897-12)] and approved Anti-seize Lubricant
•		ervice too	1).		
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			DINENI D	AIA	
With CO					
		switch ON D I-R1" an		I-R2" in "F	DATA MONITOR" mode with CONSULT.
					NSULT screen.
s "0.000" (					
		ECTION E	END		
NO >	> GO 1	ΓΟ 15.			
<b>5.</b> CLEA	R THE	E MIXTURI	E RATIO S	ELF-LEAI	RNING VALUE
					efer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE

CLEAR: Special Repair Requirement".

Do you have CONSULT?

## P2096, P2097, P2098, P2099 A/F SENSOR 1

[VQ37VHR]

YES >> GO TO 16.

NO >> INSPECTION END

16. CONFIRM A/F ADJUSTMENT DATA

## **⊕With CONSULT**

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
- 3. Make sure that "0.000" is displayed on CONSULT screen.

>> INSPECTION END

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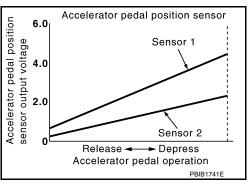
# P2122, P2123 APP SENSOR

Description INFOID:0000000009064283

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** INFOID:00000000009064284

### DTC DETECTION LOGIC

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-385, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	Harness or connectors     (APP sensor 1 circuit is open or shorted.)
P2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	Accelerator pedal position sensor (APP sensor 1)

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

# 2.perform dtc confirmation procedure

- Start engine and let it idle for 1 second.
- 2. Check DTC.

#### Is DTC detected?

YES >> Go to EC-483, "Diagnosis Procedure".

>> INSPECTION END NO

## Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

Is the inspection result normal?

**EC-483** Revision: 2013 March 2014 QX50

### **P2122, P2123 APP SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

APP se	ensor	Ground	Voltage (V)	
Connector Terminal		Giodila	voitage (v)	
E112 (Without ICC) E116 (With ICC)	5	Ground	Approx. 5	

### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

# 3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

# 4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

APP sei	nsor	EC	Continuity		
Connector Terminal		Connector	Terminal	Continuity	
E112 (Without ICC)	4	M107	100	Existed	
E116 (With ICC)	1	IVITOT	100	LAISIGU	

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

## 5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

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INFOID:0000000009064286

### < DTC/CIRCUIT DIAGNOSIS >

APP sei	nsor	EC	Continuity	
Connector Terminal		Connector		
E112 (Without ICC)	3	M107	97	Existed
E116 (With ICC)	4	101107	31	LAISIGU

2. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

## 7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 8. CHECK APP SENSOR

Refer to EC-485, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 9.

# 9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly. Refer to <u>ACC-3, "Removal and Installation"</u>.
- 2. Go to EC-486, "Special Repair Requirement".

### >> INSPECTION END

## 10. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection

# 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- 4. Check the voltage ECM harness connector terminals as per the following.

	ECM					
Connector	+	_	Condition		Voltage (V)	
Connector	Terminal					
	97 (APP sensor 1)	100		Fully released	0.45 - 1.0	
M107	37 (AFF SellSOI I)	100	Accelerator pedal	Fully depressed	4.2 - 4.8	
IVI I O 7	98 (APP sensor 2)	104	Accelerator pedar	Fully released	0.22 - 0.50	
	90 (AFF SellSUI 2)	104		Fully depressed	2.1 - 2.5	

#### Is the inspection result normal?

YES >> INSPECTION END

## **P2122, P2123 APP SENSOR**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> GO TO 2.

# 2.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- 2. Go to EC-486, "Special Repair Requirement".

>> INSPECTION END

### Special Repair Requirement

INFOID:0000000009064287

# 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 2.

## 2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".

>> GO TO 3.

## 3. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

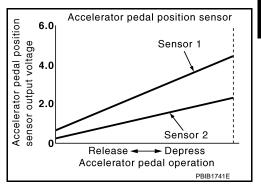
## P2127, P2128 APP SENSOR

Description INFOID:0000000009243837

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 INFOID:00000000009064289

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	Harness or connectors     (APP sensor 2 circuit is open or shorted.)     [CKP sensor (POS) circuit is shorted.]
P2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	<ul> <li>(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.

- Turn ignition switch OFF and wait at least 10 seconds. 1.
- Turn ignition switch ON.
- 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

- Start engine and let it idle for 1 second.
- Check DTC.

### Is DTC detected?

YES >> Go to EC-488, "Diagnosis Procedure".

>> INSPECTION END NO

**EC-487** Revision: 2013 March 2014 QX50

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## Diagnosis Procedure

INFOID:0000000009064290

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

APP se	ensor	Ground	Voltage (V)	
Connector	Connector Terminal		voltage (v)	
E112 (Without ICC)	6	Ground	Approx. 5	
E116 (With ICC)	3	Oround	Αμρίολ. 3	

### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

# 3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sen	sor	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E112 (Without ICC)			103	Existed
E116 (With ICC)	3	M107	103	LAISIEU

### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

## 4. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors M6, E106
- · Harness for open or short between ECM and accelerator pedal position sensor

### >> Repair open circuit.

# 5. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor			
Connector	Terminal	Name	Connector	Terminal	
F101 45		Brake booster pressure sensor	E48	1	
FIUI	46	CKP sensor (POS)	F2	1	

### **P2127, P2128 APP SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

ECM		Sensor			
Connector	Terminal	Name	Connector	Terminal	
M107 103	103	APP sensor	E112 (Without ICC)	6	
	741 30	AFF Selisui	E116 (With ICC)	3	
	107	EVAP control system pressure sensor	B252	3	
		Refrigerant pressure sensor	E77	3	

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### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

**6.**CHECK COMPONENTS

### Check the following.

- Crankshaft position sensor (POS) (Refer to EC-303, "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-378, "Component Inspection".)
- EVAP control system pressure sensor (Refer to <u>EC-337, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-530</u>, "<u>Diagnosis Procedure</u>".)

### Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace malfunctioning component.

# 7.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E112 (Without ICC) E116 (With ICC)	2	M107	104	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

>> GO TO 9. YES

NO >> GO TO 8.

### $oldsymbol{8}$ . 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

Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E112 (Without ICC)	1	M107	98	Existed
E116 (With ICC)	6	WITO	90	LXISIEG

**EC-489** Revision: 2013 March 2014 QX50

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### **P2127, P2128 APP SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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 EC-490. "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

# 12. REPLACE ACCELERATOR PEDAL ASSEMBLY

- Replace accelerator pedal assembly. Refer to <u>ACC-3, "Removal and Installation"</u>.
- 2. Go to EC-491, "Special Repair Requirement".

### >> INSPECTION END

# 13. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection

INFOID:0000000009243839

# 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- 4. Check the voltage ECM harness connector terminals as per the following.

ECM						
Connector	+ -		Condition		Voltage (V)	
Connector	Terminal	Terminal				
M107	97 (APP sensor 1)	100	- Accelerator pedal	Fully released	0.45 - 1.0	
	37 (All Sellsol I)			Fully depressed	4.2 - 4.8	
	QQ (ADD consor 2)	104	Accelerator pedar	Fully released	0.22 - 0.50	
	98 (APP sensor 2) 104			Fully depressed	2.1 - 2.5	

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

## 2. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- Go to <u>EC-496</u>, "Special Repair Requirement".

#### >> INSPECTION END

P2127, P2128 APP SENSOR	D.
< DTC/CIRCUIT DIAGNOSIS > [VQ37VH	<u>K]</u>
Special Repair Requirement	43840 A
1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING	
Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement	nt".
>> GO TO 2.	
2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	С
Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement".	_
	D
>> GO TO 3.  3. PERFORM IDLE AIR VOLUME LEARNING	
Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".	E
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Revision: 2013 March **EC-491** 2014 QX50

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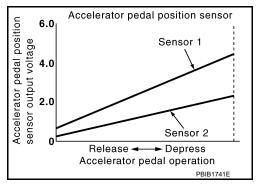
### P2138 APP SENSOR

Description INFOID:000000009243838

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-385, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	Harness or connectors (APP sensor 2 circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 2) (Brake booster pressure sensor circuit is shorted) Crankshaft position sensor (POS) EVAP control system pressure sensor Brake booster pressure sensor

### 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.
- 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

- Start engine and let it idle for 1 second.
- Check DTC.

### Is DTC detected?

YES >> Go to EC-493, "Diagnosis Procedure".

NO >> INSPECTION END

### **P2138 APP SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

## **Diagnosis Procedure**

#### INFOID:0000000009064295

# 1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

## Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground.

APP se	nsor	Ground	Voltage (V)
Connector	Terminal	Ground	voltage (v)
E112 (Without ICC) E116 (With ICC)	5	Ground	Approx. 5

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# 3.DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

## 4.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Turn ignition switch ON.
- 2. Check the voltage between APP sensor harness connector and ground.

APP se	nsor	Ground	Voltage (V)	
Connector Terminal		Ground	voltage (v)	
E112 (Without ICC) 6		Ground	Approx. 5	
E116 (With ICC)	3	Ground	Αφρίολ. σ	

### Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 5.

## 5.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

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APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E112 (Without ICC)	6	M107	103	Existed
E116 (With ICC)	3	IVITO7	103	LXISIGU

### Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

# 6. DETECT MALFUNCTIONING PART

### Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

### >> Repair open circuit.

## 7.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor			
Connector	Terminal	Name	Connector	Terminal	
F101 45		Brake booster pressure sensor	E48	1	
FIUI —	46	CKP sensor (POS)	F2	1	
M107	103 APP sensor	ADD concor	E112 (Without ICC)	6	
		AFF Selisui	E116 (With ICC)	3	
	107	EVAP control system pressure sensor	B252	3	
		Refrigerant pressure sensor	E77	3	

#### Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair short to ground or short to power in harness or connectors.

# 8. CHECK COMPONENTS

### Check the following.

- Crankshaft position sensor (POS) (Refer to EC-303, "Component Inspection".)
- Brake booster pressure sensor (Refer to EC-378, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-337, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-530, "Diagnosis Procedure"</u>.)

### Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace malfunctioning component.

## 9.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

#### [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F112	4	M107	100	Existed
LIIZ	2	IVITOT	104	LAISIEU

With ICC

Without ICC

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E116	1	M107	100	Existed
2		WITO	104	LAISIGU

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 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between APP sensor harness connector and ECM harness connector.

Without ICC

APP s	ensor	ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F112	3	M107	97	Existed
	1	WITO7	98	LAISIEU

With ICC

Α	PP s	ensor	ECM		Continuity
Conne	ctor	Terminal	Connector	Terminal	Continuity
E110	8	4	M107	97	Existed
L 1 1 1	J	6			LXISIGU

Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

# 12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors 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.

# 13. CHECK APP SENSOR

Refer to EC-496, "Component Inspection".

### Is the inspection result normal?

YES >> GO TO 15. NO >> GO TO 14.

**EC-495** Revision: 2013 March 2014 QX50

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# 14. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- 2. Go to EC-496, "Special Repair Requirement".

### >> INSPECTION END

# 15. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

### >> INSPECTION END

## Component Inspection

INFOID:0000000009243841

# 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- 1. Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- 4. Check the voltage ECM harness connector terminals as per the following.

ECM						
Connector +		_	Cond	Condition		
Connector	Terminal	Terminal				
	97 (APP sensor 1) 100			Fully released	0.45 - 1.0	
M107	37 (Al 1 3611301 1)	100	Accelerator pedal	Fully depressed	4.2 - 4.8	
IVI TO 7	98 (APP sensor 2)	104	Accelerator pedar	Fully released	0.22 - 0.50	
	30 (AFF SEIISUI 2)	104		Fully depressed	2.1 - 2.5	

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

## 2.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
- Go to EC-496. "Special Repair Requirement".

### >> INSPECTION END

# Special Repair Requirement

INFOID:0000000009243842

# 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING: Special Repair Requirement".

>> GO TO 2.

## 2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING: Special Repair Requirement",

>> GO TO 3.

# 3.perform idle air volume learning

Refer to EC-21, "IDLE AIR VOLUME LEARNING: Special Repair Requirement".

>> END

### ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000009064299

## ASCD BRAKE SWITCH

Description INFOID:0000000009243843

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to EC-77, "System Description" for the ASCD function.

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## Component Function Check

# CHECK ASCD BRAKE SWITCH FUNCTION

## (II) With CONSULT

- 1. Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- 3. Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition	Indication	
BRAKE SW1	Brake pedal	Slightly depressed OFF	
DIVARL SWI	Brake pedal	Fully released	ON

### 

- 1. Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

	ECM						
Connector	+	-	Condition		Condition Voltage (V)		Voltage (V)
Connector	Terminal	Terminal					
M107	126	128	Brake pedal	Slightly depressed	Approx. 0		
IVI TO 7	(ASCD brake switch signal)		Brake pedal	Fully released	Battery voltage		

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-497, "Diagnosis Procedure".

# Diagnosis Procedure

# 1. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ASCD brake switch harness connector. 2.
- Turn ignition switch ON.
- Check the voltage between ASCD brake switch harness connector and ground.

ASCD bra	ake switch	Ground	Voltage	
Connector	Terminal	Ground	vollage	
E109	1	Ground	Battery voltage	

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

# 2.DETECT MALFUNCTIONING PART

### Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- · Harness for open or short between ASCD brake switch and fuse

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2014 QX50

Revision: 2013 March

### < DTC/CIRCUIT DIAGNOSIS >

>> Repair open circuit or short to ground in harness or connectors.

# ${f 3.}$ CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E109	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E106, M6
- · Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 5. CHECK ASCD BRAKE SWITCH

Refer to EC-498, "Component Inspection (ASCD Brake Switch)"

#### Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ASCD brake switch. Refer to <u>BR-18</u>, "Exploded View".

## 6. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

# Component Inspection (ASCD Brake Switch)

INFOID:0000000009243844

# 1. CHECK ASCD BRAKE SWITCH-I

- Turn ignition switch OFF.
- Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	1 and 2 Brake pedal	Fully released	Existed
r and 2   Brake pedar	Slightly depressed	Not existed	

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

# 2. CHECK ASCD BRAKE SWITCH-II

- Adjust ASCD brake switch installation. Refer to <u>BR-19</u>. "Inspection and Adjustment".
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Condition Continu		Continuity
1 and 2	Brake pedal	Fully released	Existed		
1 and 2 B	brake pedar	Slightly depressed	Not existed		

## **ASCD BRAKE SWITCH**

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to BR-18, "Exploded View".

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### ASCD INDICATOR

ASCD operation status is indicated by two indicators (CRUISE and SET) and CRUISE lamp in combination meter.

CRUISE indicator is displayed to indicated that ASCD system is ready for operation when MAIN switch on ASCD steering switch is turned ON.

SET indicator is displayed when the following conditions are met.

- CRUISE indicator is displayed.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET indicator is displayed during ASCD control.

Refer to EC-77, "System Description" for the ASCD function.

## Component Function Check

INFOID:0000000009064303

## 1. CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	$ON \to OFF$
	MAIN switch: ON	ASCD: Operating	ON
• When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)		ASCD: Not operating	OFF

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-500, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000009064304

## 1. CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

## 3.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-136, "Removal and Installation".

NO >> Repair or replace.

## **COOLING FAN**

Description INFOID:0000000009064305

#### 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

# CHECK COOLING FAN FUNCTION

# (II) With CONSULT

- Turn ignition switch ON. 1.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT.
- Make sure that cooling fan speed varies according to the percentage.

### **W** Without CONSULT

- 1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description".
- Make sure that cooling fan operates.

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-501, "Diagnosis Procedure".

## Diagnosis Procedure

# ${f 1}$ .CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connector E37.
- 3. Turn ignition switch ON.
- Check the voltage between cooling fan control module harness connector and ground.

Cooling fan control module		Ground	Voltage
Connector	Terminal	Ground	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

- Turn ignition switch OFF.
- Check the continuity between cooling fan control module harness connector and ground.

Cooling fan co	ontrol module	Ground	Continuity	
Connector	Terminal	Ground	Continuity	
E37	1	Ground	Existed	

Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to power in harness or connectors.

**EC-501** Revision: 2013 March 2014 QX50

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# 3.check ipdm e/r ground circuit

- 1. Disconnect IPDM E/R harness connectors E5, E6.
- 2. Check the continuity between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Continuity	
Connector Terminal		Ground		
E5	12	Ground	Existed	
E6	41	Giouria		

3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to power in harness or connectors.

## 4. CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

- 1. Disconnect IPDM E/R harness connector E9.
- Check the continuity between IPDM E/R harness connector and cooling fan control module harness connector.

IPDM	I E/R	Cooling fan c	ontrol module	Continuity
Connector	Terminal	Connector Terminal		Continuity
E9	97	E37	2	Existed

3. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 5.CHECK COOLING FAN CONTROL MODULE OUTPUT SIGNAL CIRCUIT

- 1. Reconnect all harness connectors disconnected.
- 2. Disconnect cooling fan control module harness connectors E301, E302.
- 3. Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module harness connector and ground.

Cooling fan control module		Ground	Voltage	
Connector Terminal		Giodila		
E301	4	Ground	Battery voltage	
E302	6	Oround	Dattery Voltage	

## Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace cooling fan control module. Refer to CO-17, "Exploded View".

### 6.CHECK COOLING FAN MOTORS -1 AND -2

### Refer to EC-503, "Component Inspection (Cooling Fan Motor)".

### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan motor. Refer to CO-17, "Exploded View".

## 7. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect cooling fan relay.
- 3. Turn ignition switch ON.
- 4. Check the voltage between cooling fan relay harness connector and ground.

Cooling fan relay		Ground	Voltago	
Connector	Terminal	Giodila	Voltage	
F17	2	Ground	Battery voltage	
L17	3	Sibula		

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### Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8. С

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# 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. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF.
- 2. Check the continuity between cooling fan relay harness connector and ground.

Cooling fan relay		Ground	Continuity
Connector	Terminal	Oround	Continuity
E17	1	Ground	Existed

Check the continuity between cooling fan relay harness connector and cooling fan control module harness connector.

Cooling f	an relay	Cooling fan c	ontrol module	Continuity
Connector	Terminal	Connector Terminal		Continuity
E17	5	E37	3	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 10.check cooling fan relay

Refer to EC-504, "Component Inspection (Cooling Fan Relay)".

#### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan relay. Refer to <u>EC-39</u>, "Component Parts Location".

## 11. CHECK INTERMITTENT INCIDENT

Perform GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace harness connectors.

# Component Inspection (Cooling Fan Motor)

# 1. CHECK COOLING FAN MOTOR

- Turn ignition switch OFF.
- Disconnect cooling fan control module harness connectors E301, E302.

Revision: 2013 March **EC-503** 2014 QX50

INFOID:0000000009064309

### < DTC/CIRCUIT DIAGNOSIS >

3. Supply cooling fan control module terminals with battery voltage and check operation.

Cooling fan control module					
Motor	Motor Connector		ninal	Operation	
IVIOLOI	Connector	(+)	(-)		
1	E301	4	5	Cooling fan operates.	
2	E302	6	7		

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan motor. Refer to CO-17, "Exploded View".

## Component Inspection (Cooling Fan Relay)

# 1. CHECK COOLING FAN RELAY

1. Turn ignition switch OFF.

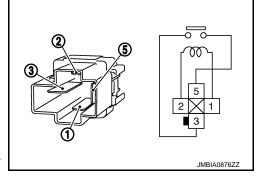
- 2. Remove cooling fan relay. Refer to EC-39, "Component Parts Location".
- 3. Check the continuity between cooling fan relay terminals under the following conditions.

Terminals	Conditions	Continuity
3 and 5	12 V direct current supply between terminals 1 and 2	Existed
3 and 3	No current supply	Not existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan relay. Refer to <a href="EC-39">EC-39</a>, "Component Parts Location".



#### **ELECTRICAL LOAD SIGNAL**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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### **ELECTRICAL LOAD SIGNAL**

Description INFOID:0000000009064310

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication line.

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## Component Function Check

# 1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

- Turn ignition switch ON.
- 2. Connect CONSULT and select "DATA MONITOR" mode.
- Select "LOAD SIGNAL" and check indication under the following conditions.

Monitor item	Condition	Indication	
LOAD SIGNAL	Rear window defogger switch	ON	ON
	Real Willdow delogger switch	OFF	OFF

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-505, "Diagnosis Procedure".

## 2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

Monitor item	Condition		Condition Indicat		Indication
LOAD SIGNAL Lighting switch	Lighting switch	ON at 2nd position	ON		
LOAD SIGNAL	Lighting switch	OFF	OFF		

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to EC-505, "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 fan control switch	OFF	OFF

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-505, "Diagnosis Procedure".

## Diagnosis Procedure

### 1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to EC-505, "Component Function Check".

#### Which circuit is related to the incident?

Rear window defogger>>GO TO 2.

Headlamp>>GO TO 3.

Heater fan>>GO TO 4.

Revision: 2013 March

## 2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-3, "Work Flow".

**EC-505** 

2014 QX50

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### **ELECTRICAL LOAD SIGNAL**

[VQ37VHR]

### < DTC/CIRCUIT DIAGNOSIS >

>> INSPECTION END

## 3. CHECK HEADLAMP SYSTEM

Refer to EXL-7, "Work Flow" (Xenon type) or EXL-226, "Work Flow" (Halogen type).

>> INSPECTION END

# 4. CHECK HEATER FAN CONTROL SYSTEM

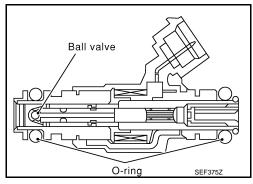
Refer to HAC-4, "Work Flow".

>> INSPECTION END

### **FUEL INJECTOR**

Description INFOID:0000000009064313

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



### Component Function Check

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.

NO >> Go to EC-507, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

#### (P)With CONSULT

- Start engine.
- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- Make sure that each circuit produces a momentary engine speed drop.

#### ®Without CONSULT

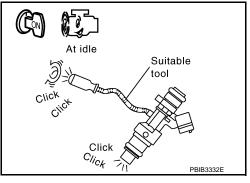
- Start engine.
- Listen to each fuel injector operating sound.

### Clicking sound should be heard.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-507, "Diagnosis Procedure".



## Diagnosis Procedure

# 1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect fuel injector harness connector.
- Turn ignition switch ON.
- Check the voltage between fuel injector harness connector and ground.

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Fuel injector			Ground	Voltage
Cylinder	Connector	Terminal	Giodila	voltage
1	F21	1		
2	F22	1		
3	F23	1	Ground	Battery voltage
4	F24	1	Ground	Ballery Vollage
5	F25	1		
6	F26	1		

#### Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 2.

### 2.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- Harness connectors F10, F120
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between fuel injector and fuse

>> Repair open circuit, short to ground or short to power in harness or connectors.

# ${f 3.}$ CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between fuel injector harness connector and ECM harness connector.

Fuel injector			EC	Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F21	2	F102	89	
2	F22	2		85	
3	F23	2		81	Existed
4	F24	2		90	Existed
5	F25	2		86	
6	F26	2		82	

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4

### 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors F109, F110
- Harness connectors F10, F120
- Harness for open or short between fuel injector and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 5. CHECK FUEL INJECTOR

Refer to EC-509, "Component Inspection".

Is the inspection result normal?

### **FUEL INJECTOR**

FUEL INJECTOR		
< DTC/CIRCUIT DIAGNOSIS >	[VQ37VHR]	
YES >> GO TO 6. NO >> Replace malfunctioning fuel injector. Refer to EM-36, "Removal and Installation".		٨
6.CHECK INTERMITTENT INCIDENT		Α
Refer to GI-42, "Intermittent Incident".		
Is the inspection result normal?		EC
YES >> Replace IPDM E/R. Refer to <u>PCS-32</u> , "Removal and Installation".		
NO >> Repair open circuit, short to ground or short to power in harness or connectors.		С
Component Inspection	INFOID:0000000009064316	
1.CHECK FUEL INJECTOR		D
Turn ignition switch OFF.		
<ol> <li>Disconnect fuel injector harness connector.</li> <li>Check resistance between fuel injector terminals as follows.</li> </ol>		Е
or enest resistance between rue injector terminale de reliente.		
Terminals Resistance ( $\Omega$ )		_
1 and 2 11.1 - 14.3 [at 10 - 60°C (60 - 140°F)]		F
Is the inspection result normal?		
YES >> INSPECTION END NO >> Replace malfunctioning fuel injector. Refer to EM-36, "Removal and Installation".		G
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Revision: 2013 March **EC-509** 2014 QX50

### **FUEL PUMP**

Sensor	Sensor Input signal to ECM		Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay ↓
Battery	Battery voltage*		Fuel pump

<sup>\*:</sup> ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation	
Ignition switch is turned to ON.	Operates for 1 second.	
Engine running and cranking	Operates.	
When engine is stopped	Stops in 1.5 seconds.	
Except as shown above	Stops.	

## Component Function Check

INFOID:0000000009064318

## 1. CHECK FUEL PUMP FUNCTION

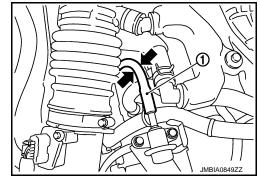
- 1. Turn ignition switch ON.
- Pinch fuel feed hose (1) with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

YES >> INSPECTION END

NO >> EC-510, "Diagnosis Procedure".



### Diagnosis Procedure

INFOID:0000000009064319

# 1. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- Check the voltage between ECM harness connector and ground.

ECM		Ground	Voltage	
Connector	Terminal	Ground	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

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the voltage between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Voltage	
Connector	Terminal	Giodila	voltage	
E7	77	Ground	Battery voltage	

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#### Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 10.

## 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between IPDM E/R and ECM

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>> 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.
- Reconnect all harness connectors disconnected.
- Disconnect "fuel level sensor unit and fuel pump" harness connector.
- Turn ignition switch ON.
- 5. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

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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 15A FUSE

Turn ignition switch OFF.

- Disconnect 15A fuse (No. 41) from IPDM E/R.
- Check 15 A fuse.

#### Is the inspection result normal?

YES

NO

>> GO TO 6. >> Replace fuse.

### 6.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

- 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

Also check harness for short to ground and short to power.

#### Is the inspection result normal?

>> GO TO 10. YES

>> GO TO 7. NO

# 7.DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E104, B4
- IPDM E/R harness connector E5
- Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"
  - >> Repair open circuit, short to ground or short to power in harness or connectors.

## 8. CHECK FUEL PUMP GROUND CIRCUIT

- Turn ignition switch OFF.
- 2. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and ground.

Fuel level s and fue		Ground	Continuity
Connector Terminal			
B22	3	Ground	Existed

3. Also check harness for short to power.

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to power in harness or connectors.

#### 9. CHECK FUEL PUMP

Refer to EC-512, "Component Inspection".

#### Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace fuel pump. Refer to FL-6, "Removal and Installation".

## 10. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-32, "Removal and Installation".

NO >> Repair or replace harness or connectors.

### Component Inspection

INFOID:0000000009064320

### 1. CHECK FUEL PUMP

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

Terminals	Resistance ( $\Omega$ )
1 and 3	0.2 - 5.0 [at 25°C (77°F)]

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6, "Removal and Installation".

### **ICC BRAKE SWITCH**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000009064322

## ICC BRAKE SWITCH

Description INFOID:0000000009064321

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to CCS-18, "System Description" for the ICC function.

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### Component Function Check

# CHECK ICC BRAKE SWITCH FUNCTION

## With CONSULT

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition	Indication	
BRAKE SW1	Brake pedal	Slightly depressed	OFF
DIVARL SWI	Brake pedal	Fully released	ON

### **Without CONSULT**

- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

ECM							
Connector	+	_	Condition		Condition Voltage (V)		Voltage (V)
Connector	Terminal	Terminal					
M107	126	128	Brake pedal	Slightly depressed	Approx. 0		
IVITOT	(ICC brake switch signal)	120	Brake pedal	Fully released	Battery voltage		

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-513, "Diagnosis Procedure".

## Diagnosis Procedure

# 1. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF.
- Disconnect ICC brake switch harness connector.
- Turn ignition switch ON.
- Check the voltage between ICC brake switch harness connector and ground.

ICC brak	e switch	Ground	Voltage	
Connector Terminal		Ground	voltage	
E111	1	Ground	Battery voltage	

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 2.

# 2.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ICC brake hold relay.
- Turn ignition switch ON.
- Check the voltage between ICC brake hold relay harness connector and ground.

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#### < DTC/CIRCUIT DIAGNOSIS >

ICC brake	hold relay	Ground	Voltage
Connector Terminal		Giodila	voltage
E50	3	Ground	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

# 3.DETECT MALFUNCTIONING PART

#### Check the following.

- Fuse block (J/B) connector E103
- 10A fuse (No. 3)
- Harness for open or short between ICC brake hold relay and fuse

>> Repair open circuit or short to ground in harness or connectors.

## 4. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF.
- Check the continuity between ICC brake switch harness connector and ICC brake hold relay harness connector.

ICC brak	e switch	ICC brake	hold relay	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E111	1	E50	4	Existed

3. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

## 5.CHECK ICC BRAKE HOLD RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake hold relay harness connector.
- Check the continuity between ICC brake hold relay harness connector and brake booster control unit harness connector.

ICC brake hold relay		brake booster control unit		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E50	1	B249	47	Existed

4. Check the continuity between ICC brake hold relay harness connector and ground.

ICC brake	hold relay	Ground	Continuity	
Connector Terminal		Ground	Continuity	
E50	2	Ground	Existed	

5. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

### **6.** DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E106, M6
- Harness connectors B201, M117
- Harness for open or short between ICC brake hold relay and brake booster control unit

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 7.CHECK ICC BRAKE HOLD RELAY

Refer to EC-463, "Component Inspection (ICC Brake Hold Relay)".

### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace ICC brake hold relay. Refer to BR-18, "Exploded View".

## 8.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brak	ICC brake switch		CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E111	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

### Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 9.

# 9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

### 10.CHECK ICC BRAKE SWITCH

Refer to EC-515, "Component Inspection (ICC Brake Switch)".

### Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace ICC brake switch. Refer to BR-18, "Exploded View".

## 11. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

### >> INSPECTION END

## Component Inspection (ICC Brake Switch)

## 1. CHECK ICC BRAKE SWITCH-I

- Turn ignition switch OFF.
- Disconnect ICC brake switch harness connector.
- Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	2 Brake pedal	Fully released	Existed
i and 2	brake pedar	Slightly depressed	Not existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

## 2.CHECK ICC BRAKE SWITCH-II

**EC-515** Revision: 2013 March 2014 QX50

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### **ICC BRAKE SWITCH**

### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Adjust ICC brake switch installation. Refer to <u>BR-19</u>, "Inspection and Adjustment".
- 2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
1 and 2	brake pedal	Slightly depressed	Not existed

### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch. Refer to <u>BR-18</u>, "Exploded View".

### **IGNITION SIGNAL**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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### **IGNITION SIGNAL**

Description INFOID:0000000009064325

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

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### Component Function Check

## 1.INSPECTION START

Turn ignition switch OFF, and restart engine.

#### Does the engine start?

YES-1 >> With CONSULT: GO TO 2.

YES-2 >> Without CONSULT: GO TO 3.

>> Go to EC-517, "Diagnosis Procedure".

# 2.CHECK IGNITION SIGNAL FUNCTION

### (P)With CONSULT

- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
- Make sure that each circuit produces a momentary engine speed drop.

### Is the inspection result normal?

YFS >> INSPECTION END

NO >> Go to EC-517, "Diagnosis Procedure".

## 3.CHECK IGNITION SIGNAL FUNCTION

### **W** Without CONSULT

Let engine idle.

Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

	E				
+		_		Voltage signal	
Connector	Terminal	Connector	Terminal		
	11				
F101	12	M107	128	50mSec/div	
	15				
	16			=	
	19				
	20			2V/div JMBIA0035GB	

#### NOTE:

The pulse cycle changes depending on rpm at idle.

#### Is the inspection result normal?

YES >> INSPECTION END

>> Go to EC-517, "Diagnosis Procedure". NO

## Diagnosis Procedure

## 1. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
- Check the voltage between ECM harness connector terminals as per the following.

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**EC-517** Revision: 2013 March 2014 QX50

Connector	+	_	Voltage
Connector	Terminal	Terminal	
M107	125	128	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-164, "Diagnosis Procedure".

# 2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between condenser harness connector and ground.

Cond	lenser	Ground	Voltage	
Connector Terminal		Oroana	voltage	
F8	1	Ground	Battery voltage	

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 3.

# 3.check ignition coil power supply circuit-iii

- Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connector E7.
- 3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM	E/R	Cond	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E7	53	F8	1	Existed

4. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> Go to EC-164, "Diagnosis Procedure".

NO >> GO TO 4.

### 4. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E13, F40
- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 5. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Check the continuity between condenser harness connector and ground.

Cond	enser	Ground	Continuity	
Connector Terminal		Oround	Continuity	
F8	2	Ground	Existed	

3. Also check harness for short to power.

### Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit or short to power in harness or connectors.

#### **IGNITION SIGNAL**

#### < DTC/CIRCUIT DIAGNOSIS >

#### [VQ37VHR]

### 6. CHECK CONDENSER

Refer to EC-521, "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.
- Disconnect ignition coil harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ignition coil harness connector and ground.

Ignition coil			Ground	Voltage
Cylinder	Connector	Terminal	Ground	voltage
1	F11	3		
2	F12	3		Battery voltage
3	F13	3	Ground	
4	F14	3	Giodila	
5	F15	3	1	
6	F16	3		

#### Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

### 8. DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connector F40
- Harness for open or short between ignition coil and harness connector F40

>> Repair or replace harness or connectors.

# $9.\mathsf{CHECK}$ IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Check the continuity between ignition coil harness connector and ground.

Ignition coil			Ground	Continuity	
Cylinder	Connector	Terminal	Ground	Continuity	
1	F11	2			
2	F12	2		Existed	
3	F13	2	Ground		
4	F14	2	Giodila		
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-519** 

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Ignition coil			EC	Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F11	1		20	
2	F12	1		16	
3	F13	1	F101	12	Existed
4	F14	1	FIUI	11	Existed
5	F15	1		15	
6	F16	1		19	

3. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

## 11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F104, F105
- Harness for open or short between ignition coil and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 12. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-520, "Component Inspection (Ignition Coil with Power Transistor)".

#### Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-46, "Removal and Installation"

# 13. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

## Component Inspection (Ignition Coil with Power Transistor)

INFOID:00000000009064328

# 1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

- Turn ignition switch OFF.
- 2. Disconnect ignition coil harness connector.
- 3. Check resistance between ignition coil terminals as per the following.

Terminals	Resistance (Ω) [at 25°C (77°F)]	
1 and 2	Except 0 or ∞	
1 and 3	Except 0	
2 and 3	Εχιτέρι σ	

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to <u>EM-46, "Removal and Installation"</u>.

### 2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

#### **CAUTION:**

Perform the following procedure in a place where with no combustible objects and good ventilation.

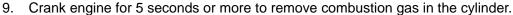
Turn ignition switch OFF.

- Reconnect all harness connectors disconnected.
- Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

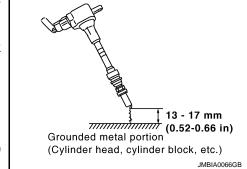
#### NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

- Start engine.
- 5. After engine stalls, crank it two or three times to release all fuel pressure.
- 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. Refer to EM-22, "Removal and Installation".



- 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:**

- Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made. NOTE:

When the gap is less than 13 mm (0.52 in), spark might be generated even if the coil is malfunctioning.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning ignition coil with power transistor. Refer to <u>EM-46, "Removal and Installation".</u>

## Component Inspection (Condenser)

## 1. CHECK CONDENSER

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser harness connector.
- Check resistance between condenser terminals as per the following.

Terminals	Resistance (MΩ)
1 and 2	Above 1 [at 25°C (77°F)]

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.

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### MALFUNCTION INDICATOR LAMP

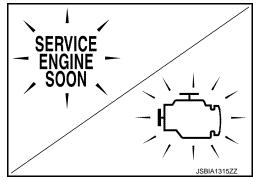
Description INFOID:0000000009064330

The Malfunction Indicator Lamp (MIL) is located on the combination

The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.

When the engine is started, the MIL should turn off. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.

For details, refer to EC-142. "DIAGNOSIS DESCRIPTION: Malfunction Indicator Lamp (MIL)".



### Component Function Check

# 1. CHECK MIL FUNCTION

- Turn ignition switch ON.
- Make sure that MIL illuminates.

#### Is the inspection result normal?

YES >> INSPECTION END

>> Go to EC-522, "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 "UNIFIED METER AND A/C AMP."

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

### 3.CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-136, "Removal and Installation".

NO >> Repair or replace.

INFOID:0000000009064333

## ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Description

EVAP/ORVR line Recirculation line To EVAP canister purae volume One-way fuel valve Fuel tank control solenoid valve **EVAP** canister Refueling EVAP vapor cut valve

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 <u>EC-631, "Inspection"</u>.
- 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

## 1. CHECK ORVE 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?

>> Go to EC-523, "Diagnosis Procedure". YES

>> INSPECTION END NO

### Diagnosis Procedure

## 1.INSPECTION START

Check whether the following symptoms are present.

A: Fuel odor from EVAP canister is strong.

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#### < DTC/CIRCUIT DIAGNOSIS >

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B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

#### Which symptom is present?

- A >> GO TO 2.
- B >> GO TO 7.

## 2.CHECK EVAP CANISTER

- 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-15</u>, "<u>Exploded View</u>".
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

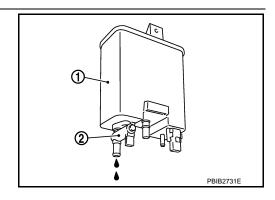
## ${f 3.}$ CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

2: EVAP canister vent control valve

### Does water drain from the EVAP canister?

YES >> GO TO 4. NO >> GO TO 6.



### 4. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-16, "Removal and Installation".

>> GO TO 5.

## 5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to FL-14, "Hydraulic Layout".

### 6.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-526, "Component Inspection".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11, "Exploded View".

### 7. CHECK EVAP CANISTER

- 1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to <u>FL-16</u>. "Removal and Installation".
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 9.

8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

#### < DTC/CIRCUIT DIAGNOSIS >

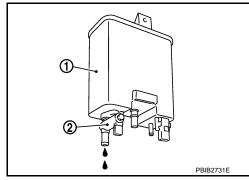
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Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 9. NO >> GO TO 11.



## 9. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-16, "Removal and Installation".

>> GO TO 10.

## 10.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

## 11. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

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-526, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11, "Exploded View".

## 14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube.

## 15. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 16.

NO >> Repair or replace one-way fuel valve with fuel tank.

### 16.CHECK ONE-WAY FUEL VALVE-II

- Make sure that fuel is drained from the tank.
- 2. Remove fuel filler tube and hose. Refer to FL-11, "Removal and Installation".

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**EC-525** Revision: 2013 March 2014 QX50

#### < DTC/CIRCUIT DIAGNOSIS >

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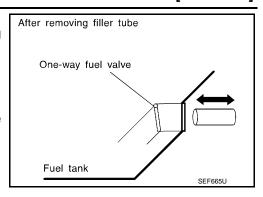
Check one-way fuel valve for operation as follows.
 When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



INFOID:0000000009064336

## Component Inspection

### 1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 3.

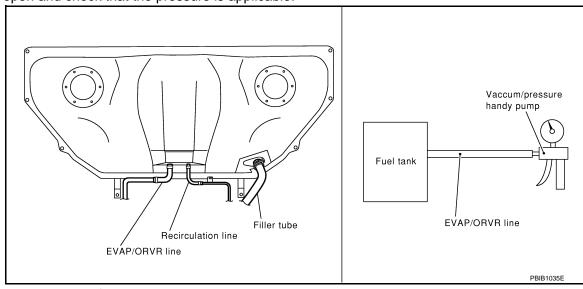
## 2. CHECK REFUELING EVAP VAPOR CUT VALVE

#### (I) With CONSULT

- Turn ignition switch OFF.
- Remove fuel tank. Refer to <u>FL-11</u>, "<u>Removal and Installation</u>".
- 3. Drain fuel from the tank as follows:
- Remove fuel feed hose located on the fuel gauge retainer.
- Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
- Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
- 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

### < DTC/CIRCUIT DIAGNOSIS >

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NO >> Replace refueling EVAP vapor cut valve with fuel tank.

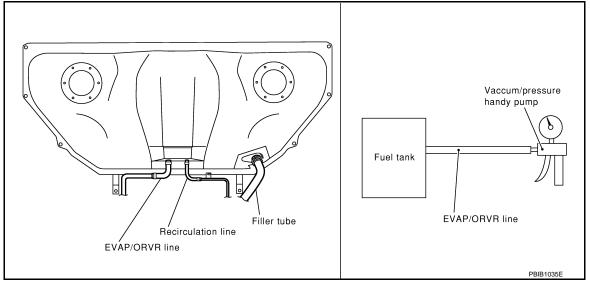
# 3.check refueling evap vapor cut valve

#### **Without CONSULT**

- 1. Turn ignition switch OFF.
- Remove fuel tank. Refer to <u>FL-11</u>, "<u>Removal and Installation</u>".
- 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.

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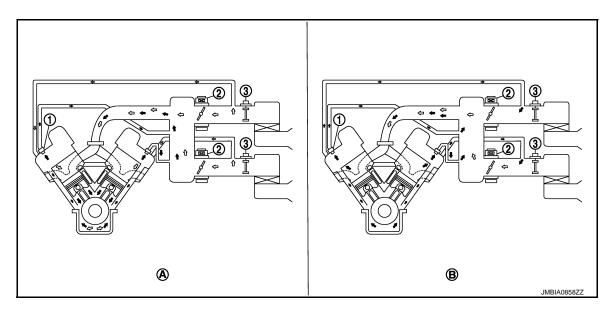
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### POSITIVE CRANKCASE VENTILATION



- 1. PCV valve
- A. Normal condition
- : Fresh air
- = : Blow-by air

- 2. Electric throttle control actuator
- B. Hi-load condition
- Mass air flow sensor

This system returns blow-by gas to the intake manifold.

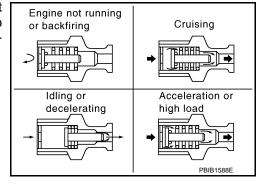
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

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 >

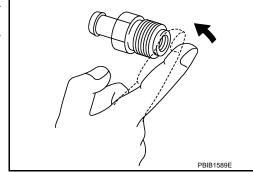
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With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace PCV valve. Refer to <a href="EM-46">EM-46</a>, "Exploded View".



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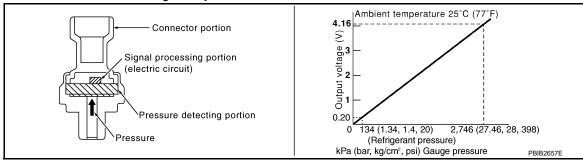
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### REFRIGERANT PRESSURE SENSOR

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



## Component Function Check

INFOID:0000000009064340

## 1. CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector terminals as per the following.

Connector	+	_	Voltage (V)
Connector	Terminal Termi		
M107	105 (Refrigerant pressure sensor signal)	112	1.0 - 4.0

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-530, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:00000000009064341

## 1. CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF.
- Turn ignition switch OFF.
- 3. Check ground connection M95. Refer to Ground Inspection in GI-45, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2.CHECK 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 pr	essure sensor	Ground	Voltage (V)	
Connector Terminal		Oround	voltage (v)	
E77	3	Ground	Approx. 5	

#### Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

#### REFRIGERANT PRESSURE SENSOR

## < DTC/CIRCUIT DIAGNOSIS >

### [VQ37VHR

# 3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and refrigerant pressure sensor

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>> Repair open circuit, short to ground or short to power in harness or connectors.

## f 4.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between refrigerant pressure sensor harness connector and ECM harness connec-

Refrigerant pressure sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
E77	1	M107	112	Existed	

Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

### DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

## 6.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E77	2	M107	105	Existed

2. Also check harness for short to ground and short to power.

#### Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

### .DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and refrigerant pressure sensor

### >> Repair open circuit, short to ground or short to power in harness or connectors.

### 8. CHECK INTERMITTENT INCIDENT

Refer to GI-42. "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to HAC-131, "Removal and Installation".

>> Repair or replace. NO

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### SNOW MODE SWITCH

The snow mode switch signal is sent to the "unified meter and A/C amp." from the snow mode switch. The "unified meter and A/C amp." then sends the signal to the ECM via the CAN communication line.

The snow mode is used for driving or starting the vehicle on snowy roads or slippery areas. If the snow mode is activated, the vehicle speed will not accelerates as quickly as normal to avoid vehicle slip. In other words, ECM controls rapid engine torque change by controlling the electric throttle control actuator operating speed.

### Component Function Check

INFOID:0000000009064343

## 1. CHECK SNOW MODE SWITCH FUNCTION

- 1. Turn ignition switch ON.
- 2. Select "SNOW MODE SW" in "DATA MONITOR" mode with CONSULT.
- 3. Check "SNOW MODE SW" indication under the following conditions.

Monitor item	Condition		Indication
SNOW MODE SW	Snow mode switch	ON	ON
	Show mode switch	OFF	OFF

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-532, "Diagnosis Procedure".

## 2.check snow mode indicator function

- 1. Turn ignition switch ON.
- 2. Check the snow mode indicator in the snow mode switch under the following condition.

Condition		Snow mode indicator
Snow mode switch	ON	ON
	OFF	OFF

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-532, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000009064344

# 1. CHECK SNOW MODE SWITCH OVERALL FUNCTION

Confirm the malfunctioning circuit (snow mode switch or snow mode indicator). Refer to <u>EC-532</u>, "Component <u>Function Check"</u>.

#### Which circuit is related to the incident?

Snow mode switch>>GO TO 2.

Snow mode indicator>>GO TO 6.

# 2.CHECK DTC WITH "UNIFIED METER AND A/C AMP."

#### Refer to MWI-42, "CONSULT Function (METER/M&A)".

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to MWI-4. "Work flow".

## 3.CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect snow mode switch harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between snow mode switch harness connector and ground.

Snow mo	de switch			_		Α
Connector	Terminal	Ground	Voltage			
M176	1	Ground	Battery voltage	_		F.C
Is the inspe	ction resu	ılt normal?		_		EC
	GO TO 5					
4	GO TO 4					С
4.DETECT		NCTIONING	G PART			
<ul><li>Check the f</li><li>Harness o</li></ul>		s F106 M6	3			
• Harness	connector	s M134, M <sup>2</sup>	170			
<ul><li>IPDM E/R</li><li>10 A fuse</li></ul>		connector	E7			
		r short betv	ween snow m	ode switch a	and fuse.	Е
_	•	•	_		o power in harness or connectors.	F
5.CHECK	SNOW M	ODE SWIT	CH INPUT S	GNAL CIR	CUIT FOR OPEN AND SHORT	
	nition swit					G
			nd A/C amp."		nnector. arness connector and "unified meter and A/C amp."	
	s connect		on snow mod	ic switch in	amess connector and animed meter and 700 amp.	
						-
Snow mod	le switch	Unified meter	er and A/C amp.	Continuity		
Connector	Terminal	Connector	Terminal			ı
M176	4	M66	23	Existed		
			rt to ground a	nd short to p	ower.	
Is the inspe	GO TO 8					J
_			short to grou	nd or short	o power in harness or connector.	
<b>6.</b> CHECK						K
1. Turn ig	nition swit	tch OFF.				
2. Check	ground co	nnection M	195. Refer to	Ground Insp	ection in GI-45, "Circuit Inspection".	ı
Is the inspe						
	· GO TO 7 · Repair o		round connec	tion		
_	•				CIRCUIT FOR OPEN AND SHORT	N
-					ness connector and ground.	
i. Official	une contin	idity between	SII SIIOW IIIOUG	5 SWILCH Hai	less confiector and ground.	N
Snow mod	le switch					
Connector	Terminal	Ground	Continuity			
M176	2	Ground	Existed			C
2. Also ch	eck harne	ess for sho	t to power.			
Is the inspe	ction resu	ılt normal?				F

YES >> GO TO 8.

NO >> Repair open circuit or short to power in harness or connectors.

## 8. CHECK SNOW MODE SWITCH

Refer to EC-534, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

### **SNOW MODE SWITCH**

#### < DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Replace snow mode switch. Refer to <a href="IP-12">IP-12</a>, "Exploded View".

## 9. CHECK INTERMITTENT INCIDENT

Refer to GI-42, "Intermittent Incident".

#### >> INSPECTION END

### Component Inspection

INFOID:0000000009064345

## 1. CHECK SNOW MODE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect snow mode switch harness connector.
- 3. Check the continuity between snow mode switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 4	Snow mode switch	ON	Existed
1 and 4 Snow mode sw	Onow mode switch	OFF	Not Existed

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace snow mode switch. Refer to <a href="IP-12">IP-12</a>, "Exploded View".

### 2. CHECK SNOW MODE SWITCH-II

Check the continuity between snow mode switch terminals under the following conditions.

Terminals (Polarity)	Continuity
2 (+) - 4 (-)	Existed
4 (+) - 2 (–)	Not Existed

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace snow mode switch. Refer to <a href="IP-12">IP-12</a>, "Exploded View".

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# **ECU DIAGNOSIS INFORMATION**

## **ECM**

Reference Value EC

#### 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 cam shaft position sensor and other sensors related to ignition timing.

For outlines of following items, refer to EC-146, "CONSULT Function".

#### CONSULT MONITOR ITEM

Monitor Item	Co	Values/Status	
ENG SPEED	Run engine and compare CONSUL	Almost the same speed as the tachometer indication	
MAS A/F SE-B1	See EC-156, "Description".		
MAS A/F SE-B2	See EC-156, "Description".		
B/FUEL SCHDL	See EC-156, "Description".		
A/F ALPHA-B1	See EC-156, "Description".		
A/F ALPHA-B2	See EC-156, "Description".		
COOLAN TEMP/S	Ignition switch: ON		Indicates engine coolant temperature
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
A/F SEN1 (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
HO2S2 (B1)	<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)	Revving engine from idle up to 3,00 are met.     Engine: After warming up     After keeping engine speed betwee idle for 1 minute under no load	0 - 0.3 V ←→ Approx. 0.6 · 1.0 V	
HO2S2 MNTR (B1)	Revving engine from idle up to 3,00 are met.     Engine: After warming up     After keeping engine speed betwee idle for 1 minute under no load	$LEAN \longleftrightarrow RICH$	
HO2S2 MNTR (B2)	Revving engine from idle up to 3,00 are met.     Engine: After warming up     After keeping engine speed betwee idle for 1 minute under no load	$LEAN \longleftrightarrow RICH$	
VHCL SPEED SE	Turn drive wheels and compare CO tion.	Almost the same speed as speedometer indication	
BATTERY VOLT	Ignition switch: ON (Engine stopped)	(b	11 - 14 V
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.45 - 1.00 V
AUGEL SEN I	(Engine stopped)	Accelerator pedal: Fully depressed	4.4 - 4.8 V

Monitor Item	Co	ondition	Values/Status
40051 05N 0±1	Ignition switch: ON	Accelerator pedal: Fully released	0.45 - 1.00 V
ACCEL SEN 2*1	(Engine stopped)	Accelerator pedal: Fully depressed	4.3 - 4.8 V
TD 0511 4 D 4	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
TP SEN 1-B1	<ul><li>(Engine stopped)</li><li>Selector lever: D</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
TP SEN 2-B1*1	(Engine stopped) • Selector lever: D	Accelerator pedal: Fully depressed	Less than 4.75 V
FUEL T/TMP SE	Ignition switch: ON		Indicates fuel tank tempera ture
INT/A TEMP SE	Ignition switch: ON		Indicates intake air temperature
EVAP SYS PRES	Ignition switch: ON		Approx. 1.8 - 4.8 V
FUEL LEVEL SE	Ignition switch: ON		Depending on fuel level of fuel tank
START SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow Ol$	N	$OFF \to ON \to OFF$
CLSD THL POS	Ignition switch: ON     (Engine stopped)	Accelerator pedal: Fully released	ON
CLSD THE POS		Accelerator pedal: Slightly depressed	OFF
	Engine: After warming up, idle the	Air conditioner switch: OFF	OFF
AIR COND SIG	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates.)	ON
D/N DOSLSW	Ignition switch: ON	Selector lever: P or N	ON
P/N POSI SW		Selector lever: Except above	OFF
PW/ST SIGNAL	Engine: After warming up, idle the engine	Steering wheel: Not being turned	OFF
FW/31 SIGNAL		Steering wheel: Being turned	ON
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
		Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$		$ON \to OFF \to ON$
HEATER FAN SW	Engine: After warming up, idle the	Heater fan switch: ON	ON
HEATER FAIN SW	engine	Heater fan switch: OFF	OFF
BRAKE SW	Ignition switch: ON	Brake pedal: Fully released	OFF
DIVARE OW	- ignition switch. ON	Brake pedal: Slightly depressed	ON
	Engine: After warming up	Idle	2.0 - 3.0 msec
INJ PULSE-B1	<ul><li>Selector lever: P or N</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
INJ PULSE-B2	<ul><li>Selector lever: P or N</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
IGN TIMING	<ul><li>Selector lever: P or N</li><li>Air conditioner switch: OFF</li><li>No load</li></ul>	2,000 rpm	25° - 45° BTDC
CAL /LD MALLIE	Engine: After warming up     Selector lever: P or N	Idle	5% - 35%
CAL/LD VALUE	<ul><li> Air conditioner switch: OFF</li><li> No load</li></ul>	2,500 rpm	5% - 35%

Monitor Item	Co	ondition	Values/Status
	Engine: After warming up	Idle	2.0 - 6.0 g/s
MASS AIRFLOW	<ul><li>Selector lever: P or N</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</li><li>Air conditioner switch: OFF</li></ul>	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
	No load	2,000 rpm	_
	Engine: After warming up	Idle	- 5 - 5°CA
INT/V TIM (B1)	<ul><li>Selector lever: P or N</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</li><li>Air conditioner switch: OFF</li><li>No load</li></ul>	2,000 rpm	Approx. 0 - 30°CA
	Engine: After warming up	Idle	0 - 2%
INT/V SOL (B1)	<ul><li>Selector lever: P or N</li><li>Air conditioner switch: OFF</li><li>No load</li></ul>	2,000 rpm	Approx. 0 - 50%
	Engine: After warming up	Idle	0 - 2%
INT/V SOL (B2)	Selector lever: P or N     Air conditioner switch: OFF     No load	2,000 rpm	Approx. 0 - 50%
	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</li></ul>	Accelerator pedal: Fully depressed	Less than 4.75 V
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36 V
TP SEN 2-B2* <sup>1</sup>	(Engine stopped)  • Selector lever: D	Accelerator pedal: Fully depressed	Less than 4.75 V
	- Golddon Idvar. D	Air conditioner switch: OFF	OFF
AIR COND RLY	Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	For 1 second after turning ignition s     Engine running or cranking	switch: ON	ON
	Except above		OFF
VENT CONT/V	Ignition switch: ON		OFF
THRTL RELAY	Ignition switch: ON		ON
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)	Engine speed: Below 3,600 rpm after the following conditions are met.     Engine: After warming up     Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	Engine speed: Above 3,600 rpm		OFF
I/P PULLY SPD	Vehicle speed: More than 20 km/h (	Almost the same speed as the tachometer indication	
VEHICLE SPEED	Turn drive wheels and compare CO tion.	NSULT value with the speedometer indica-	Almost the same speed as the speedometer indication

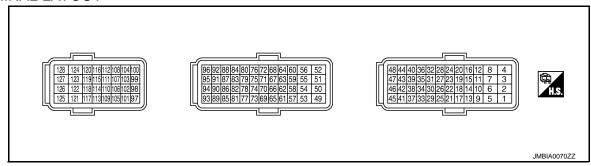
Monitor Item	C	Condition	Values/Status
IDL AA/LEADN	Fanina Punnin	Idle air volume learning has not been performed yet.	YET
IDL A/V LEARN	Engine: Running	Idle air volume learning has already been performed successfully.	CMPLT
CNOW MODE CW	a lonition quitable ON	Snow mode switch: Pressed	ON
SNOW MODE SW	Ignition switch: ON     Snow mode switch: Released		OFF
ENG OIL TEMP	Engine: After warming up		More than 70°C (158°F)
TRVL AFTER MIL	Ignition switch: ON	Vehicle has traveled after MIL has illuminated.	0 - 65,535 km (0 - 40,723 miles)
A/F S1 HTR (B1)	Engine: After warming up, idle the (More than 140 seconds after start		4 - 100%
A/F S1 HTR (B2)	Engine: After warming up, idle the (More than 140 seconds after start		4 - 100%
AC PRESS SEN	Engine: Idle     Both A/C switch and blower fan sw	vitch: ON (Compressor operates)	1.0 - 4.0 V
VHCL SPEED SE	Turn drive wheels and compare Cotion.	DNSULT value with the speedometer indica-	Almost the same speed as the speedometer indication
SET VHCL SPD	Engine: Running	ASCD: Operating	The preset vehicle speed is displayed
MAINI CW	a Ignition quitable ON	MAIN switch: Pressed	ON
MAIN SW	Ignition switch: ON	MAIN switch: Released	OFF
CANCEL SW	a Ignition quitable ON	CANCEL switch: Pressed	ON
CANCEL SVV	Ignition switch: ON	CANCEL switch: Released	OFF
DECLIME/ACC CM		RESUME/ACCELERATE switch: Pressed	ON
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Released	OFF
SET SW	Ignition switch: ON	SET/COAST switch: Pressed	ON
SET SW	Ignition switch. ON	SET/COAST switch: Released	OFF
BRAKE SW1		Brake pedal: Fully released	ON
(ICC/ASCD brake switch)	Ignition switch: ON	Brake pedal: Slightly depressed	OFF
BRAKE SW2	a lonition quitable ON	Brake pedal: Fully released	OFF
(Stop lamp switch)	Ignition switch: ON	Brake pedal: Slightly depressed	ON
DIST SW	Ignition switch: ON	DISTANCE switch: Pressed	ON
DIST SW	Ignition switch. ON	DISTANCE switch: Released	OFF
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time $\rightarrow$ at the 2nd time	$ON \to OFF$
BAT CUR SEN	<ul> <li>Engine speed: Idle</li> <li>Battery: Fully charged*<sup>2</sup></li> <li>Selector lever: P or N</li> <li>Air conditioner switch: OFF</li> <li>No load</li> </ul>		Approx. 2,600 - 3,500 mV
ALT DUTY	Engine: Idle		0 - 80%
ATOM PRES SEN	This item is displayed but is not ap	plicable to this model.	I
BRAKE BST PRES SE	This item is displayed but is not ap	plicable to this model.	
	Engine: After warming up	Idle	Approx. 0.25 - 1.40 V
VVEL POSITION SEN-B1	Selector lever: P or N     Air conditioner switch: OFF     No load	When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V

Monitor Item		Condition	Values/Status	
	Engine: After warming up	Idle	Approx. 0.25 - 1.40 V	
VVEL POSITION SEN-B2	Selector lever: P or N     Air conditioner switch: OFF     No load	When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V	
	Engine: After warming up	Idle	Approx. 0 - 20 deg	
VVEL TIM-B1	<ul><li>Selector lever: P or N</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	
	Engine: After warming up	Idle	Approx. 0 - 20 deg	
VVEL TIM-B2	<ul><li>Selector lever: P or N</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 LEARN	• Ignition switch: OFF $\rightarrow$ ON	VVEL learning has not been performed yet.	YET	_
V V L L L L / II (I V	(After warming up)	VVEL learning has already been performed successfully.	DONE	_
VVEL SEN LEARN- B1	VVEL learning has already been p	performed successfully	Approx. 0.30 - 0.80 V	_
VVEL SEN LEARN- B2	VVEL learning has already been p	performed successfully	Approx. 0.30 - 0.80 V	_
A/F ADJ-B1	Engine: Running		-0.330 - 0.330	-
A/F ADJ-B2	Engine: Running		-0.330 - 0.330	_
FAN DUTY	Engine: Running		0 - 100%	
ALT DUTY SIG	Power generation voltage variable	control: Operating	ON	
7121 2011 010	Power generation voltage variable control: Not operating		OFF	_
EVAP LEAK DIAG	Ignition switch: ON	Depending on condition of EVAP leak diagnosis		
EVAP DIAG READY	Ignition switch: ON (READY)	Depending on ready condition of EVAP leak diagnosis		
THRTL STK CNT B1	This item is displayed but is not approximately			
	DTC P0139 self-diagnosis (delayer)	ed response) has not been performed yet.	INCMP	
HO2 S2 DIAG1 (B1)	DTC P0139 self-diagnosis (delayer successfully.	ed response) has already been performed	CMPLT	
	DTC P0159 self-diagnosis (delayed response) has not been performed yet.		INCMP	
HO2 S2 DIAG1 (B2)	DTC P0159 self-diagnosis (delayer successfully.	ed response) has already been performed	CMPLT	
	DTC P0139 self-diagnosis (slow relative properties)	esponse) has not been performed yet.	INCMP	_
HO2 S2 DIAG2 (B1)	DTC P0139 self-diagnosis (slow recessfully.	esponse) has already been performed suc-	CMPLT	
	DTC P0159 self-diagnosis (slow re	esponse) has not been performed yet.	INCMP	
HO2 S2 DIAG2 (B2)	DTC P0159 self-diagnosis (slow recessfully.	esponse) has already been performed suc-	CMPLT	
A/F SEN1 DIAG1	DTC P015A and P015B self-diagnos	sis incomplete.	INCMP	
(B1)	DTC P015A and P015B self-diagnos	CMPLT		
A/F SEN1 DIAG1	DTC P015C and P015D self-diagnos	sis incomplete.	INCMP	
(B2)	DTC P015C and P015D self-diagnos	sis is complete.	CMPLT	
A/F SEN1 DIAG2	DTC P014C and P014D self-diagnos	sis incomplete.	INCMP	
(B1)	DTC P014C and P014D self-diagnos	sis is complete.	CMPLT	
A/F SEN1 DIAG2	DTC P014E and P014F self-diagnos	sis incomplete.	INCMP	
(B2)	DTC P014E and P014F self-diagnos	sis is complete.	CMPLT	

Monitor Item	Monitor Item Condition		
A/F SEN1 DIAG3	The vehicle condition is not within the diagnosis range of DTC P014C, P014D, P015A or P015B.	ABSNT	
(B1)	The vehicle condition is within the diagnosis range of DTC P014C, P014D, P015A or P015B.	PRSNT	
A/F SEN1 DIAG3	The vehicle condition is not within the diagnosis range of DTC P014E, P014F, P015C or P015D.	ABSNT	
(B2)	The vehicle condition is within the diagnosis range of DTC P014E, P014F, P015C or P015D.	PRSNT	

<sup>\*1:</sup> Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

#### **TERMINAL LAYOUT**



#### PHYSICAL VALUES

#### NOTE:

- ECM is located 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.

Terminal No. (Wire color)		Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
1 (W)	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  5V/div  JMBIA0030GB

<sup>\*2:</sup> Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to <u>PG-3</u>, "<u>How to Handle Battery</u>".

Termir (Wire	nal No. color)	Description		2	Value
+	<u>-</u>	Signal name	Input/ Output	Condition	(Approx.)
2	128	Throttle control motor		[Ignition switch: ON]  • Engine stopped  • Selector lever: D  • Accelerator pedal: Fully depressed	0 - 14 V★  500μSec/div  5V/div  JMBIA0031GB
(G)	(B)	(Open) (bank 1)	Output	[Ignition switch: ON]  • Engine stopped  • Selector lever: D  • Accelerator pedal: Fully released	0 - 14 V★  500μSec/div  5V/div  JMBIA0032GB
3 (R)	128 (B)	Throttle control motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
4 (BR)	128 (B)	Throttle control motor (Close) (bank 1)	Output	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D</li> <li>Accelerator pedal: In the middle of releasing operation</li> </ul>	0 - 14 V★  500μSec/div  5V/div  JMBIA0033GB
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  5V/div  JMBIA0030GB
8 (B)	_	ECM ground	_	_	_
11 (GR) 12 (L)		Ignition signal No. 4 Ignition signal No. 3		<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed NOTE: The pulse cycle changes depending on</li> </ul>	0 - 0.2 V★ 50mSec/div
(V) 16 (G)	128 (B)	Ignition signal No. 5 Ignition signal No. 2	Output	rpm at idle	2V/div JMBIA0035GB  0.1 - 0.4 V★  50mSec/div
19 (SB) 20 (Y)		Ignition signal No. 6 Ignition signal No. 1		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	

	inal No. e color)	Description		O Itis	Value
+		Signal name	Input/ Output	Condition	(Approx.)
2	128	Throttle control motor	Output	[Ignition switch: ON]  • Engine stopped  • Selector lever: D  • Accelerator pedal: Fully depressed	0 - 14 V★  500µSec/div  5V/div  JMBIA0031GB
(G)	(B)	(Open) (bank 1)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	0 - 14 V★  500µSec/div  5V/div  JMBIA0032GB
3 (R)	128 (B)	Throttle control motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
4 (BR)	128 (B)	Throttle control motor (Close) (bank 1)	Output	<ul> <li>[Ignition switch: ON]</li> <li>Engine stopped</li> <li>Selector lever: D</li> <li>Accelerator pedal: In the middle of releasing operation</li> </ul>	0 - 14 V★  500µSec/div  5V/div  JMBIA0033GB
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  5V/div  JMBIA0030GB
8 (B)	_	ECM ground	_	_	_
11 (GR) 12 (L) 15 (V)	128	Ignition signal No. 4 Ignition signal No. 3 Ignition signal No. 5	Output	<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>	0 - 0.2 V★  50mSec/div  2V/div  JMBIA0035GB
16 (G) 19 (SB) 20 (Y)	(B)	Ignition signal No. 2 Ignition signal No. 6 Ignition signal No. 1	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	0.1 - 0.4 V★  50mSec/div  2V/div  JMBIA0036GB

	nal No. color)	Description		Condition	Value	-	
+		Signal name	Input/ Output	Condition	(Approx.)		
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  5V/div  JMBIA0037GB		
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)	_	
				<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	BATTERY VOLTAGE (11 - 14 V)		
18 (W)	128	Intake valve timing control solenoid valve (bank	Output		7 - 12 V★	=	
(۷۷)	(B)	1)		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000rpm</li></ul>	5V/div JMBIA0038GB		
						BATTERY VOLTAGE (11 - 14 V)★	-
				<ul><li>[Engine is running]</li><li>Idle speed</li><li>Accelerator pedal: Not depressed even</li></ul>	50mSec/div		
21	128	EVAP canister purge vol-		slightly, after engine starting	10V/div JMBIA0039GB		
(GR)	(B)	ume control solenoid valve	Output		BATTERY VOLTAGE (11 - 14 V)★	-	
				<ul><li>[Engine is running]</li><li>Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)</li></ul>	50mSec/div 10V/div JMBIA0040GB		
22	128 (B)	Fuel pump relay	Output	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.5 V	-	
(R)	(B)		-	[Ignition switch: ON]  • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14 V)	=	

	nal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
24 (P)	128 (B)	ECM relay (Self shut-off)	Output	<ul><li>[Engine is running]</li><li>[Ignition switch: OFF]</li><li>A few seconds after turning ignition switch OFF</li></ul>	0 - 1.5 V
(1)	(5)	(Och Shat Oh)		<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
28 (BR)	128 (B)	VVEL actuator motor relay abort signal [VVEL control module]	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 V
				<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	BATTERY VOLTAGE (11 - 14 V)
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★  5V/div JMBIA0038GB
30	40	Throttle position sensor	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully released</li></ul>	More than 0.36 V
(Y)	(R)	1 (bank 1)	трас	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully depressed</li></ul>	Less than 4.75 V
31	48	Throttle position sensor	Innut	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully released</li></ul>	More than 0.36 V
(R)	(B)	-	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully depressed</li></ul>	Less than 4.75 V

	inal No. e color)	Description		Condition	Value		
+		Signal name	Input/ Output	Condition	(Approx.)		
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  5V/div  JMBIA0037GB		
				[Ignition switch: ON]  • Engine stopped [Engine is running]  • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)		
34	40	Throttle position sensor	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully released</li></ul>	Less than 4.75 V		
(B)	(R)	2 (bank 1)	πραι	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully depressed</li></ul>	More than 0.36 V		
35	48 Throttle position sensor	Throttle position sensor	Throttle position sensor		lane et	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</li><li>Accelerator pedal: Fully released</li></ul>	Less than 4.75 V
(W)	(B)	2 (bank 2)	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Selector lever: D</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-	loová	<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  2V/div  JMBIA0041GB		
(W)	(B)	sor (POS)	Input	[Engine is running] • Engine speed: 2,000 rpm	4.0 - 5.0 V★  1mSec/div  2V/div  JMBIA0042GB		
38 (O)	96 (P)	Manifold absolute pres- sure (MAP) sensor	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	1.2 V		
(0)	(P)	Sure (IVIAP) Sensor		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	1.5 V		

	inal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
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	·	<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)]	_	_	_
43 (G)	48 (B)	Sensor power supply [Throttle position sensor (bank 2)]	_	[Ignition switch: ON]	5 V
44 (L)	40 (R)	Sensor power supply [Throttle position sensor (bank 1)]	_	[Ignition switch: ON]	5 V
45 (LG)	36 (O)	Sensor power supply [Brake booster pressure sensor]	_	[Ignition switch: ON]	5 V
46 (R)	128 (B)	Sensor power supply [Crankshaft position sensor (POS)]	_	[Ignition switch: ON]	5 V
47 (Y)	_	Sensor ground [Crankshaft position sensor (POS)]	_	_	_
48 (B)	_	Sensor ground [Throttle position sensor (bank 2)]	_	_	_
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</li> <li>Accelerator pedal: In the middle of releasing operation</li> </ul>	0 - 14 V★  500μSec/div  5V/div  JMBIA0033GB
50	128	Throttle control motor	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	0 - 14 V★  500μSec/div  5V/div  JMBIA0031GB
(V)	(B)	(Open) (bank 2)	Output	[Ignition switch: ON]  • Engine stopped  • Selector lever: D  • Accelerator pedal: Fully released	0 - 14 V★  500μSec/div  5V/div  JMBIA0032GB

	inal No. e color)	Description		Condition	Value
+	-	Signal name	Input/ Output	Condition	(Approx.)
52 (R)	128 (B)	Throttle control motor power supply (bank 2)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
53 (W)	128 (B)	Ignition switch	Input	[Ignition switch: OFF]  [Ignition switch: ON]	0 V BATTERY VOLTAGE (11 - 14 V)
54 (Y)	_	CAN communication line [VVEL control module]	Input/ output	_	_
55 (LG)	_	CAN communication line [VVEL control module]	Input/ output	_	_
57 (L)	128 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	2.2 V
	Camshaft 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>	3.0 - 5.0 V★  20mSec/div  2V/div  JMBIA0045GB	
(O)	(O) (B) sor (PHASE) (bank 1)	sor (PHASE) (bank 1)		[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	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	1.8 V Output voltage varies with air fuel ratio.
63	128	Camshaft 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>	3.0 - 5.0 V★  20mSec/div  2V/div  JMBIA0045GB
(L)	(B)	sor (PHASE) (bank 2)	mput	[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★  20mSec/div  2V/div  JMBIA0046GB

# < ECU DIAGNOSIS INFORMATION >

	nal No. color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
64 (SB)	128 (B)	Sensor power supply [Camshaft position sen- sor (PHASE) (bank 2), Battery current sensor]	_	[Ignition switch: ON]	5 V
65 (LG)	128 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	2.2 V
66 (V)	128 (B)	A/F sensor 1 (bank 2)	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	1.8 V Output voltage varies with air fue ratio.
67 (P)	128 (B)	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.
68 (LG)	_	Sensor ground [Mass air flow sensor (bank 1), Intake air tem- perature sensor]	_	_	_
69 (W)	128 (B)	Knock sensor (bank 2)	Input	[Engine is running] • Idle speed	2.5 V*1
71 (Y)	128 (B)	Engine coolant tempera- ture sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine coolant temperature.
72 (—)	_	Sensor ground (Knock sensor)	_	_	_
73 (W)	128 (B)	Knock sensor (bank 1)	Input	[Engine is running] • Idle speed	2.5 V* <sup>1</sup>
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
77	68	Mass air flow sensor	Input	[Engine is running]  • Warm-up condition  • Idle speed	0.7 - 1.2 V
(SB)	(LG)	(bank 1)	прис	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.3 - 1.7 V
78 (G)	84 (B)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine oil temperature.
79	94	Mass air flow sensor	Input	[Engine is running]  • Warm-up condition  • Idle speed	0.7 - 1.2 V
(BR)	(Y)	(bank 2)	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,500 rpm</li></ul>	1.3 - 1.7 V

# [VQ37VHR]

	nal No. color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
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) 82 (V)		Fuel injector No. 3 Fuel injector No. 6		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	BATTERY VOLTAGE  (11 - 14 V)★  50mSec/div
85 (BR)	128	Fuel injector No. 2	0 1 1	NOTE: The pulse cycle changes depending on rpm at idle	10V/div JMBIA0047GB
86 (W) 89 (GR)	(B)	Fuel injector No. 5 Fuel injector No. 1	Output	[Engine is running]	BATTERY VOLTAGE  (11 - 14 V)★  50mSec/div
90 (O)		Fuel injector No. 4		Warm-up condition     Engine speed: 2,000 rpm	10V/div JMBIA0048GB
84 (B)	_	Sensor ground (Heated oxygen sensor 2, Engine coolant tem- perature sensor, Engine oil temperature sensor)	_	_	_
87	96 (B)	Power steering pressure	Output	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5 V
(Y)	(P)	sensor	•	[Engine is running]  • Steering wheel: Not being turned	0.4 - 0.8 V
91 (SB)	95 (G)	Battery current sensor	Input	<ul> <li>[Engine is running]</li> <li>Battery: Fully charged*<sup>2</sup></li> <li>Idle speed</li> </ul>	2.6 - 3.5 V
92 (G)	_	Sensor ground [Camshaft position sensor (PHASE) (bank 2)]	_	_	_
93 (P)	128 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
94 (Y)	_	Sensor ground [Mass air flow sensor (bank 2)]	_	_	_
95 (G)	_	Sensor ground (Battery current sensor)	_	_	_
96 (P)	_	Sensor ground [Camshaft position sensor (PHASE) (bank 1),Manifold absolute pressure (MAP) sensor, Power steering pressure sensor]	_	_	_

	inal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
97	100	Accelerator pedal posi-	loout	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.45 - 1.00 V
(R)	(W)	tion sensor 1	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	4.2 - 4.8 V
98 (P) <sup>*3</sup>	104 (GR) <sup>*3</sup>	Accelerator pedal posi-	Input	[Ignition switch: ON]  • Engine stopped  • Accelerator pedal: Fully released	0.22 - 0.50 V
(Y)*4	(BR)*4	tion sensor 2	mput	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	2.1 - 2.5 V
99 (L) <sup>*3</sup> (G) <sup>*4</sup>	100 (W)	Sensor power supply (Accelerator pedal position sensor 1)	_	[Ignition switch: ON]	5 V
100 (W)	_	Sensor ground (Accelerator pedal position sensor 1)		_	_
		ICC steering switch (models with ICC system)		[Ignition switch: ON] • ICC steering switch: OFF	4 V
			Input	[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.5 V
101 (SB)	108 (Y)			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3.4 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	2.8 V
				[Ignition switch: ON] • DISTANCE switch: Pressed	2.2 V
				[Ignition switch: ON] • LDP/DCA switch: Pressed	0.8 V
				[Ignition switch: ON] • ASCD steering switch: OFF	4 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
101 (SB)	108 (Y)	ASCD steering switch (models with ASCD sys-	Input	[Ignition switch: ON] • CANCEL switch: Pressed	1 V
,		tem)		[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	2 V
102 (LG)	112 (V)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	1.8 - 4.8 V
103 (G) <sup>*3</sup> (L) <sup>*4</sup>	104 (GR) <sup>*3</sup> (BR) <sup>*4</sup>	Sensor power supply (Accelerator pedal position sensor 2)	_	[Ignition switch: ON]	5 V

# [VQ37VHR]

	nal No. color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
104 (GR) <sup>*3</sup> (BR) <sup>*4</sup>	_	Sensor ground (Accelerator pedal position sensor 2)	_	_	_
105 (L)	112 (V)	Refrigerant pressure sensor	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 (BG)	112 (V)	Sensor power supply (EVAP control system pressure sensor, Refrig- erant pressure sensor)	_	[Ignition switch: ON]	5 V
108 (Y)	_	Sensor ground (ASCD/ICC steering switch)	_	_	_
109	128		Input	[Ignition switch: ON] • Selector lever: P or N	BATTERY VOLTAGE (11 - 14 V)
(G)	(B)	PNP signal		[Ignition switch: ON] • Selector lever: Except above	0 V
110	128	Engine speed output sig-		<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>	1 V★  10mSec/div  2V/div  JMBIA0076GB
(R)	(B)	nal	Output	[Engine is running] • Engine speed is 2,000 rpm	1 V★  10mSec/div  2V/div  JMBIA0077GB
112 (V)	_	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 (V)	128 (B)	Data link connector	Input/ Output	_	_
121 (LG)	128 (B)	EVAP canister vent control valve	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)

### < ECU DIAGNOSIS INFORMATION >

	nal No. e color)	Description		Condition	Value
+		Signal name	Input/ Output	Condition	(Approx.)
122	128	Character assistate		[Ignition switch: OFF] • Brake pedal: Fully released	0 V
(P)	(B)	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
123 (B) 124 (B)	_	ECM ground	_		_
125 (R)	128 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
126	128	ICC brake switch (models with ICC system)	1	[Ignition switch: ON] • Brake pedal: Slightly depressed	0 V
(BR)	(B)	ASCD brake switch (models with ASCD system)	Input	[Ignition switch: ON]  • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)
127 (B) 128 (B)	_	ECM ground	_	_	_

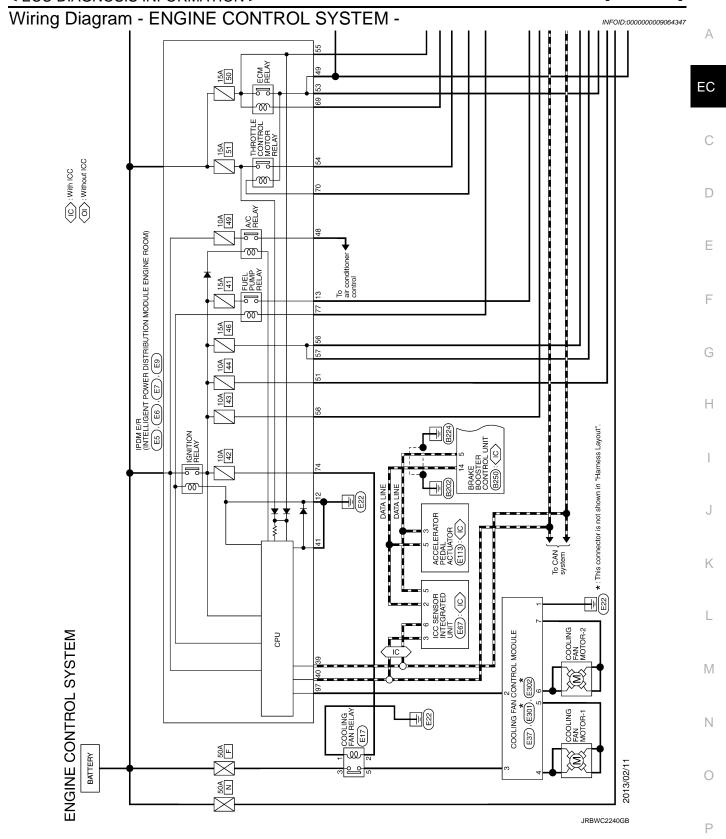
<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

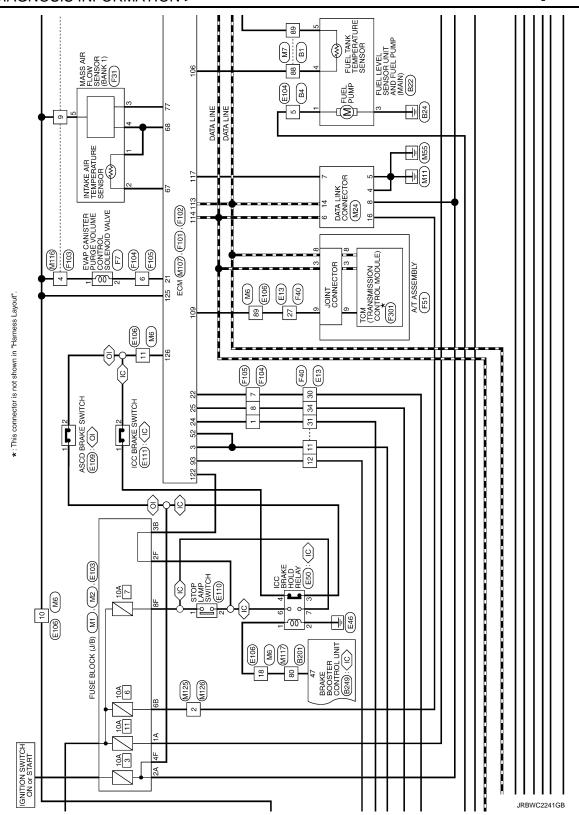
<sup>\*1:</sup> This may vary depending on internal resistance of the tester.

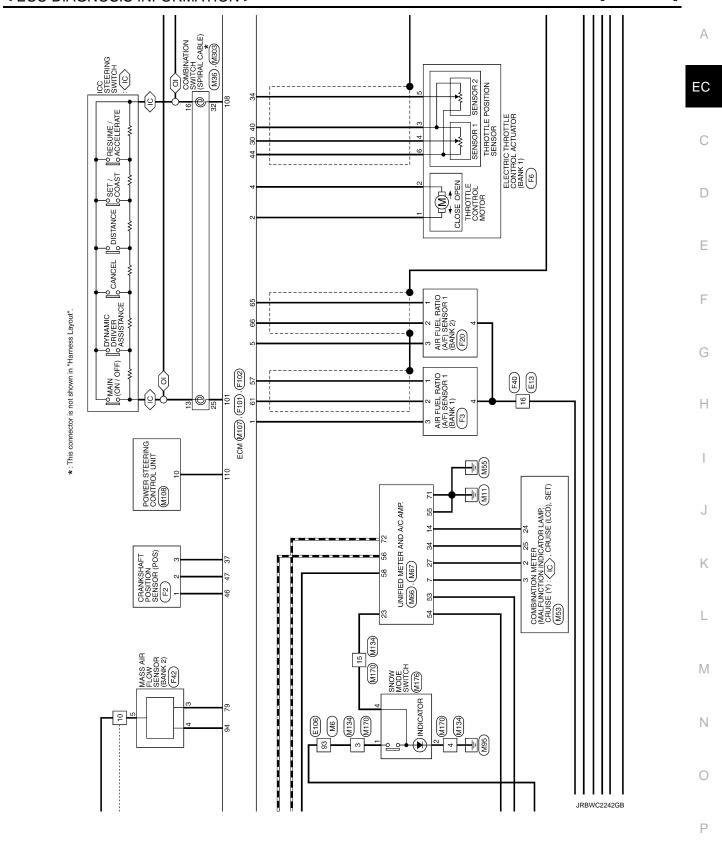
<sup>\*2:</sup> Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to <u>PG-3, "How to Handle Battery"</u>.

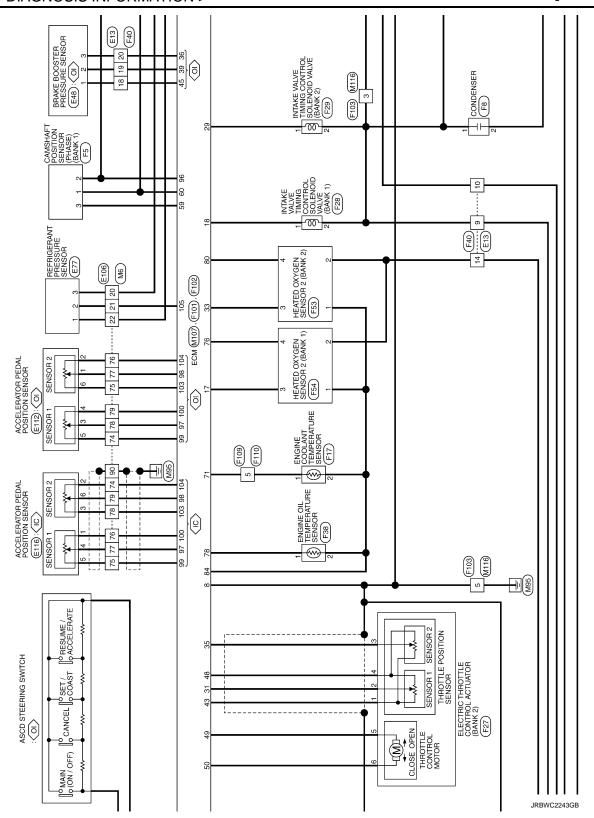
<sup>\*3:</sup> Without ICC

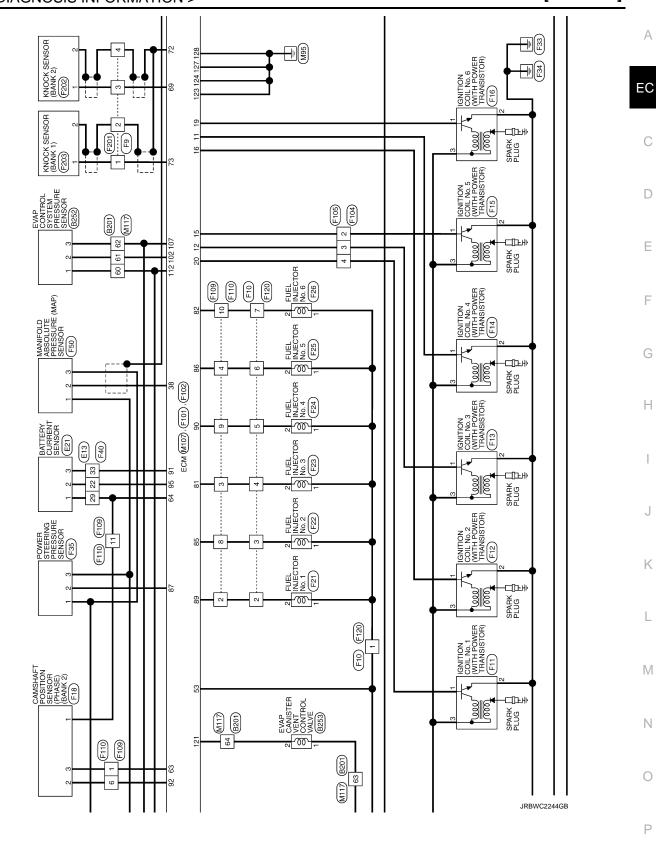
<sup>\*4:</sup> With ICC

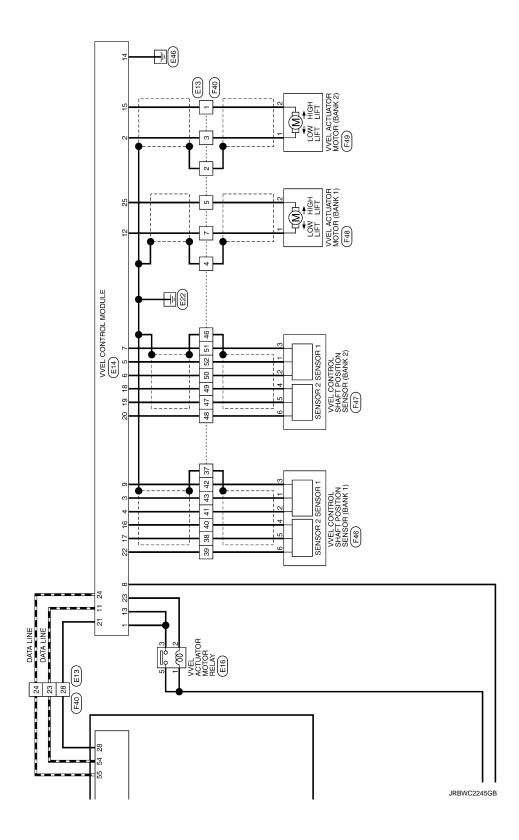












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Connector Nan	or No.	Connector Name WIRE TO WIRE	62 64	SHELD		Connec	Connector Name	WIRE TO WIRE	Come	Connector Name	Connector Name WIRE TO WIRE	
Connecto	or Type	Connector Type TH80FW-CS16-TM4	8	œ (ر		Connec	tor Type	Connector Type NS12FW-CS	Conne	ctor Type	Connector Type TH80FW-CS16-TM4	
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Terminal	Color Of Wire	Of Signal Name [Specification]	74	_   ≥		Terminal	al Color Of Wire	Signal Name [Specification]	Terminal	ial Color Of Wire	Of Signal Name [Specification]	
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7	>		79	GR		4	SHIELD		4	BG		
00	٦		83	BG		2	۵		7	PT		
12	SB		82	>		7	>	•	10	$\dashv$		
13	P		98	P.	,	00	œ		15	SB		
14	GR		87	>		6	BR		16	>		
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20	¥	~ !!	92	¥ (		4			29	<b>≻</b>	•	
21	SHELD		88	υ (	-	Connec	Connector No.	B22	8	) 왕		
77	<b>-</b> □	-	\$ 8	3	,	Connec	Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN)	31	¥ 8		
27	۵ ا		8 8	>		Jacob	Connector Type	Sd-X53903	32 25	6 4		
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33	SB					•	ä		29	SHIELD	OT	
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36	٦	-				Termin	erminal Color Of	Signal Name [Specification]	62	BR	-	
37	۵	-				ġ Z	Wire	freezonadol organização	8	۵.	ı	
38	BR.					,-	۵		8	-		
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45	GR.					4	œ		67	_		
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R253 Cornector No.	EVAP CANISTER VENT CONTROL VALVE	EUZFB-KS			((1 2))		C+ h+ C+ D+		Sinnal Name (Specification)	Ognaria regine populationis	39 P	$\dashv$		43	4 :	PDM ER (INTELLIGENT POWER DISTRIBUTION MODULE 45 G	THEODON CE42 M4 43/	_	Connector No.   E7	PDM E/R (WIELLISENT POWER DISTRIBUTION MODULE	COMPECTOR Name ENGINE ROOM)	95				Signal Name [Specification]	( F			- Terminal C	No. Wire	49 BG	+				- 26		- 57 G	57 G · ·	+	+++
B250 Connector No.	BRAKE BOOSTER CONTROL UNIT Connector Name	Corrector Type		][		10 12 14 15 17	19 20 21 22 24		nal Color Of Sional Name [Snecification]	No. Wire Ognan varie [Opcomoducing] No. Wire	1 W BATTERY 1 P		Ы	SB RELEASE SW PWR	K BRAKE PRESSURE SEN PWR Comedia No.	G BOOSTER SOL PWR Connector Name	Constitution	I.S. COMMA-RI COMMERCIAL LYDE	L BRAKE	19 B GROUND	20 B GROUND	21 Y CHIME SIGNAL	P RELEASE SW (NO)	24 BG BRAKE PRESSURE SEN GND	Tolor Of	Connector No. B252 No. Wire	4		Connector Type E03FGY-RS 7 R	12 B/W	- 133 A	+	((12)3)	╀	F	H		Signal Name [Specification] 36		. 91	LG	LG
ENGINE CONTROL SYSTEM	75 7	$\perp$	H	83 P	Н	86 BG -	Н	88 P	91 V -	4	4	_	4	4	4	- d 66			Connector No. B249		Connector Name BRAKE BOOSTEK CONTROL UNIT	Connector Type TK24FGY				Ş		46 47		<u>a</u>	Wire	í g	42 G G G G G G G G G G G G G G G G G G G	о П	>							

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ENGINE CONTROL SYSTEM 76 Y 80 W Corrector No. E9 POUR EN ENTELGEN POWER GENERAL PROJUCE	20 02 02 02 02 02 02 02 02 02 02 02 02 0	LG R B B B B B B B B B B B B B B B B B B		Connector No. Connector Name Connector Type	Vane WEI	L CONTROL MODULE SFB-AIZS-RH		Corrector No. E16 Corrector Name VVEL ACTUA Corrector Type 24347_9F900	Corrector No. E16  Corrector Name (VVEL ACTUATOR MOTOR RELAY  Corrector Type (24347_9F900
ENSINE ROOM)	П	++++		H.S.	<u></u>	2 3 4 5 6 7 8 9 11 12 15 16 17 18 19 30 21 22 23 24 25		H.S.	1 2 2 1 2 1
197	30 23 24 34 35 35 35 35 35 35 35 35 35 35 35 35 35	3 R > 9 R	2 %	Terminal Color Of No. Wire 1 V 2 L/B	-	Signal Name [Specification] WEL ACTUATOR MOTOR POWER SUPPLY (BANK 2) WELL ACTUATOR MOTOR FROMEN (BANK 2) WELL ACTUATOR MOTOR (HACH LIFT) (BANK 2)	ANK 2)	Terminal Color Of No. Wire 1 R 2 GR	Signal Name [Specification]
Signal Name [Specification]	3 3 3 3 3	1 1 1		2 4 6	+++	SINGER CONTROL SINGER TO STATE STATE OF THE SINGER SINGER SERVICE STATE STATE STATE STATE STATE SINGER SING	BANK 13 ANK 2) BANK 23 BANK 23	+ Island	
	38 88 88 88 84 94 94 94 94 94 94 94 94 94 94 94 94 94	++++		. 8 8 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	++++	POWER SUPPLY FOR VVEL CONTROL MODULE SERVER OF WELL CONTROL MODULE SERVER SUPER FOR VVEL CONTROL MODULE ENGINE SUPER VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 1)		g a	COOLING FAN RELAY 24347_9F900
Corrector No. E13  Corrector Type SAA26MB-RS9-SHZ8	43 43 45 46 47 47 48 48 49	LG SHIELD W W BR	0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -		BW VVEL LY WIE R VVE G VVE	VVEL COUNTED MODITAL GROUND  VVEL COUNTROL MODULE GROUND  VVEL CONTROL SHAT FOSITION SESSON 2 (SAWK) 1	ND NK Z) NK Z) NK Z) MK Z) MK Z) MK Z) MK Z) MK Z) MK Z)	E.S.	
Secret Name (Secreticalism)	52	HH		20 22 23 24 25	BR WITH	THE ACTUATOR MOTOR RELAYABORS ISSAM, SHOWN ISSAMD SERVING ACTUATOR MOTOR RELAYABORS ISSAM, SHOWN ISSAMD SERVING ACTUATOR MOTOR RELAY ENGINE COMMUNICATION LINE WELACTUATOR MOTOR (LOW LIFT) (BANK 1)	GOVALL GOVALL GOVALL (TV NY NY NY NK 1)	Terminal Color Of No. Wire 1 B B 2 P P 3 W 5 R	Signal Name [Specification]

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ENGINE CONTROL SYSTEM Connector No. E21 Connector Name BATTERY CURRENT SENSOR			
Corrector Type RHOSTB  H.S. (123)	Connector Type RH403FB  H.S.	Connector Type RS06FB-PR	Corrector Type   NS16FW-CS
Ferminal Color Of   Signal Name (Specification)   Wire   Signal Name   Specification   2   W	Terminal Color Of   Signal Name (Specification)   No. Wire   Wire   AVCCZ_MVPRES   2 BG   MVPRES   3 B   GNDA_MVPRES	Terminal Color Of   Signal Name   Specification   1	Terminal Color Of   Signal Name (Specification)   No. Wire   Signal Name (Specification)   1
Corrector No. E37  Corrector Name COOLING FAN CONTROL MODULE  Corrector Type SIZO1FGY-SNZ2	Corrector No. E50 Corrector Name ICC BRAKE HOLD RELAY Corrector Type Model CY-R-US	5 P ITS COMM-L CAN-L CAN	8F L · ·
H.S.	H.S.	Connector Name REFRIGERANT PRESSURE SENSOR Connector Type RK03FB	Corrector Type NST2MW-CS  To a first
Terminal Color Of Signal Name (Specification) No. Wire 1 B. 1 B.	Terminal Color Of Signal Name [Specification]	H.S. (123)	8 9 10 11
3 2 - 2 5 - 3 - 2 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3	₩	Terminal Color Of Signal Name [Specification]	Terminal Color Of Signal Name [Specification]
	6 P P R	2 L · · · · · · · · · · · · · · · · · ·	2 BR
			4 SHIELD - 5 5 7 5 5 7 5 5 7 5 5 7 5 5 7 5 5 7 5 5 7 5
			7 Y 8
			9 BR - 1
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ENGINE	NE S	ENGINE CONTROL SYSTEM	43	8	,	. 8 26	Connector No. 15111
onnectc	r Name	Connector Name WIRE TO WIRE	42	≥ -		돐	g.
onnectc	Connector Type	TH80FW-CS16-TM4	50	1		ŧ	Connector Type M02FBR-LC
	,		51		·		]
	1		\$ 6	5 0		Connector No E100	
•	Į	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5 65	≦ ≥			<u> </u>
4	e		9	: 97		Connector Name   ASCD BRAKE SWITCH	
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			62	SB			
			63	Μ			
Ferminal	Terminal Color Of	Signal Name [Specification]	26	ω (			Terminal Color Of Signal Name [Specification]
<u> </u>	2		3 8	9 00			+
. 2	· >		67	SHIELD			2 SB
8	B		89	>			
4	SR		69	97			
5	GR		20	W		) lar	Connector No. E112
8	Υ.		71	ď			Connector Name Accel ERATOR PEDAL POSITION SENSOR
6	쓞		72	<u> </u>		-1 0	
₽ ;	BG G		73	В		2 SB -	Connector Type RH06FB
= 5	3 8		4 1	¥ -	- [with ICC]		
12	3 -		77	ا ر		Commodor No E110	
14	u 22		22	)   3	ľ	Τ	
15	۵		9/	*		Connector Name STOP LAMP SWITCH	(412) 3 14 15 18
16	۸		92	<b>&gt;</b>	- [Without ICC]	Connector Type M04FW-LC	
17	SB	-	77	Ь		,	
18	>		1	œ		[	
20	- BG		78	뚭 -	- [Without ICC]		Terminal Color Of Signal Name [Specification]
2 66	۱ >		0 0	1	[with ICC]	THE STATE OF THE S	+
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24	۵		88	SB	L		3 BR
25	>		8	2			╀
26	^		85	SB		J	
27	Μ		83	BG		No. Wire Signal Name [Specification]	- M 9
28	9		84	9		1 L	
31	BG		82	_		2 W	
32	×	•	88	۵.		3 ×	
33	В		87	>		4 SB .	
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38	BR	1	83	>			
39	BG		94	PI			
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42	9		96	۵	<u> </u>		

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Connecte	INE CC	ENGINE CONTROL SYSTEM Connector No.   E113	Cornector No. E301	Connector No. F2	Connector No.   F5	
Connecto	or Name A(	Connector Name ACCELERATOR PEDAL ACTUATOR	Connector Name COOLINS FAN CONTROL MODULE (COOLING FAN MOTOR:1)	Connector Name CRANKSHAFT POSITION SENSOR (POS)	Connector Name (CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)	
Connecto	Connector Type KDZ06FB	(DZ06FB	Connector Type 6188-0259	Connector Type RH03FB	Connector Type RH03FB	
7	H.S.	(4   1   1   1   1   1   1   1   1   1	H.S.	H.S.	H.S.	
Terminal	Terminal Color Of	Signal Name (Specification)	國	Jai	豆豆	
No. 1	Wire	IGNITION	No. Wire	No. Wire		
3 2	BG P	BATTERY ITS COMM-I		2 Y	0 C	
4	B/W	GROUND	Commenter No.			
,		TI-MINI-LI	T 9	Connector No.   F3	Connector No.   F6	
Connector No.		E116		Connector Name AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)	Connector Name ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 1)	
Connecto	or Name AC	Connector Name Accelerator Pedal Position Sensor		Connector Type RH04MDGY-BR	Connector Type RH06FB	
Connecto	Connector Type AA	AAZ06FB1				
	7	1321	H.S.	H.S.	H.S.	
7	H.S.	654	豆豆	- on-	0 .00.	
			NO: VVIPE	Ferminal Color Of Signal Name [Specification]   No.   Wire	Ferminal Color Of Signal Name [Specification]   No. Wire	
Terminal	Ferminal Color Of Wire	Signal Name [Specification]	7	1 L	1 G MOTOR1-1	
-	*			3 W	œ	
2	BR			4 Y	4 Y TPS1-1	
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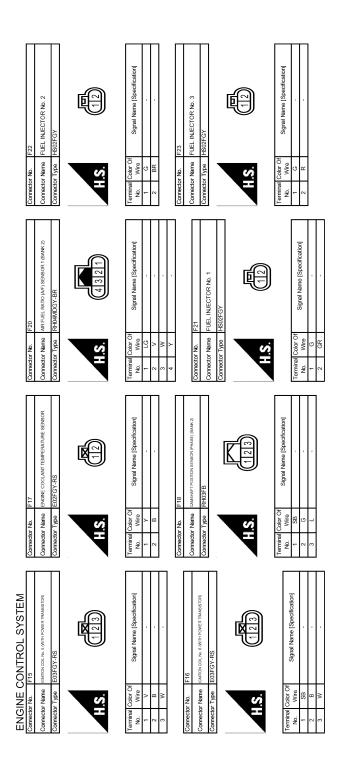
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Connector No.	ENGINE CONTROL SYSTEM Connector No.   F24	Connector No. F26	Connector No. F28	Connector No. F31
Connector Name FUEL INJE Connector Type HS02FGY	Connector Name FUEL INJECTOR No. 4  Connector Type HS02FGY	Connector Name FUEL INJECTOR No. 6  Connector Type HS02FGY	Connector Name Intake value TMING CONTROL SOLENOD VALUE (BANK 1)  Connector Type E02FG-RS-LGY	Connector Name MASS AIR FLOW SENSOR (BANK 1)  Connector Type RH06FB
H.S.		H.S.	H.S.	H.S.
Terminal Color Of No. Wire 1 6 2 0	Signal Name [Specification]	Terminal Cobor Of   Signal Name   Specification  No.   Wire	Terminal Color Of   Signal Name   Specification   No.   Wife	Terminal Color Of   Signal Name (Specification)   No.   Wire
Connector No.	Corrector No. F25  Corrector Name FUEL INJECTOR No. 5		Corrector No. F29 Corrector Name wave value make control solehod value gake a	
Connector Type H.S.	A Construction	Cornector Type   RH06FB	Connector Type E02FG-HS-LGV	Connector No. F55  Connector Type RK03FB
Terminal Color Of No. Wire G	Signal Name [Specification]	Terminal Cobr Of   Signal Name   Specification	Terminal Color Of   Signal Name   Specification   No. Wire   1   G   2   R	Terminal Color Of Signal Name [Specification]
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ENGINE CONTROL SYSTEM Connector No.   F38	21		Connector No. F46	Corrector No.   F48
ENGINE OIL TEMPERATURE SENSOR	₩	p >	Connector Name VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)	Connector Name VVEL ACTUATOR MOTOR (BANK 1)
Coffector type Euzhor-Ko	25	2] > 8	Corrector Type Introot 6	Connector type   Auziris
Ŕ	+	£		Ú
	₩	٠,	H.S. (1 2 3 4 5 6)	(1 <u>1</u> 2)
)	33	<i>x</i> ≥		
	╀	- as		
Terminal Color Of Signal Name [Specification]	Н	- 0	E E	<u>ra</u>
	30 00	SHIELD .	No. Wire	No. Wire
	+	M >		2 BB
	+	. 0	3 85	┨
	ł		0	
F40	╁	GR .	М	Connector No. F49
Leave	┝		6 Y AVCC2	S ALEXAND TO THOUSE THE STATE OF THE STATE O
COMBOUNT NAME TO WINE	Н	- 0		COLLECCOL NAME VVEL ACTUALOR (MOTOR (DAINN 2)
Connector Type SAA36FB-RS8-SHZ8		SHIELD -		Connector Type X02FB
	Н	W/L -	Connector No. F47	•
2 11 15 15	48	re re	Connector Name IVVEL CONTROL SHAFT POSITION SENSOR (BANK 2)	
3 44 13	+	O/L :	т	Ę
4 N N N N N N N N N N N N N N N N N N N	90		Comector Type RHUDEB	
0 6 4 8 8 8 8	+			
	┨			
	Connector No	E43		Torinia Olor Of
No Wire Signal Name [Specification]	COLLECTO	0. ۲42	(123456)	l ermiral Color Of Signal Name [Specification]
	Connector Name	ame MASS AIR FLOW SENSOR (BANK 2)		+
	Connector Type	WDe RH06FB		2
			Terminal Color Of	
SHELD -			No. Wire Signal Name [Specification]	
	<b>T</b>		1 L/G VEL/S-R1	
,		K	2 L/Y AGND3	
	Ę	Ŀ	3 W AVCC3	
,	1	3 4 5	4 O/L VEL/S-L2	
			T/M	
			6 LG AVCC4	
	Terminal Color Of			
	No.	Wire Oglikii Name [Specification]		
	3	BR -		
	Н	· .		
-	2	GR -		

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ENGINE CONTROL SYSTEM	Connected his PEO	Commence No F404		- All and a second	4	E400
2	_			200	2	
Connector Name MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR	Connector Name HEATED OXYGEN SENSOR 2 (BANK 2)	Connector Name ECM		Connec	Connector Name	ECM
Connector Type RH03FB	Connector Type AFZ04FB	Connector Type RH40FB-RZ8-L-LH-Z		Connect	Connector Type	RH40FBR-RZ8-L-LH-Z
			20 1612 8 4		1	
(1213)	$\left(\frac{1}{3}\frac{2}{4}\right)$	47 42 38 55 37 69 46 60 60 60 60 60 60 60 60 60 60 60 60 60	19 15 11 3	7	Ś	98 99 98 99 99 99 99 99 99 99 99 99 99 9
		5				
a	la I	la l	ecification	Terminal	0	Signal Name [Specification]
No. Wire	No. Wire	No. Wire	TED (BANK 4)	ė ę	Wire	IN NAME OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OWNER OF THE OWNER
2 O OUTPUT	2 LG	Ŧ	OR (BANK 1) (OPEN)	20 4	<u></u>	THROTTLE CONTROL MOTOR (CHOSE) (BANK 2)
3 W GND	3 SB	3 R THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (SANK 1)	r POWER SUPPLY (BANK 1)	25	œ	THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (BANK 2)
	4 0 -	4 BR THROTTLE CONTROL MOTOR (BANK 1) (CLOSE	R (BANK 1) (CLOSE)	23	Μ	IGNITION SWITCH
		AVF SEN	TER (BANK 2)	55	>	CAN COMMUNICATION LINE (W/EL CONTROL MODULE).
Connector No. F51			OND	22	PT	CAN COMMUNICATION LINE (VVEL CONTROL MODULE)
Connector Name A/T ASSEMBLY	Connector No. F54	GR	JAL NO. 4	25	٦	A/F SENSOR 1 (BANK 1)
	Connector Name HEATED OXYGEN SENSOR 2 (BANK 1)	7	JAL NO. 3	28	0	CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
Connector Type RK10FG-DGY	П	>	JAL NO. 5	9	U	SENSOR POWER SUPPLY
< ·	Connector Type   AFZ04FB	ڻ د	ML NO. 2	61	≅ .	A/F SENSOR 1 (BANK 1)
		1/ P HEALED OXYGEN SENSOR 2 HEALER (BANK 1	2 HEATER (BANK 1)	20	۵ ا	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)
1		# 8%	MIND 6	9	9 5	A/F SENSOR 1 (BANK 2)
((5 4 3 2 1)		3 >	AL NO. 1	99	>	AF SENSOR 1 (BANK 2)
1.5.		GR EWPCANE	ONTROL SOLENOID WALVE	29	۵	INTAKE AIR TEMPERATURE SENSOR
		22 R FUEL PUMP RELAY	RELAY	89	97	SENSOR GROUND
	)	24 P ECM RELAY (SELF SHUT-OFF)	: SHUT-OFF)	69	Μ	KNOCK SENSOR (BANK 2)
ē		$\dashv$	MOTOR RELAY	7	>	ENGINE COOLANT TEMPERATURE SENSOR
No. Wire	힐	28 BR VVELACTUATOR MOTOR RELAY ABORT SIGNAL (VVEL CONTROL MODUL	GNAL (VVEL CONTROL MODULE)	72	SHELD	4
1 Y IGNITION POWER SUPPLY	0	ອ :	D VALVE (BANK 2)	2	\$	KNOCK SENSOR (BANK 1)
2 BK BATTERY POWER SUPPLY	n c	30 Y THROLLLE FUSITION SENSOR 1 (BANK 1)	NSOR 1 (BANK 1)	9 F	> 5	MASS AID FLOW STRISON (BANK 1)
	2 C	S. S.	2 HEATER (BANK 2)	- 82	3 6	ENGINE OIL TEMPERATURE SENSOR
<u>ш</u>	╀	8	ENSOR 2 (BANK 1)	79	æ	MASS AIR FLOW SENSOR (BANK 2)
6 Y IGNITION POWER SUPPLY		35 W THROTTLE POSITION SENSOR 2 (BANK 2)	ENSOR 2 (BANK 2)	80	0	HEATED OXYGEN SENSOR 2 (BANK 2)
BACK-U		36 O SENSOR GROUND	OUND	81	٣	FUEL INJECTOR NO. 3
		37 W CRANKSHAFT POSITION SENSOR (POS	N SENSOR (POS)	82	^	FUEL INJECTOR NO. 6
9 GR STARTER RELAY		0	SURE (MAP) SENSOR	8	8	SENSOR GROUND
		P BRAKE BC	SSURE SENSOR	82	¥ :	FUEL INJECTOR NO. 2
		× (	COUNT	£ !	≥ ;	FUEL INJECTOR NO. 5
		O	R SUPPLY	87	> {	POWER STEERING PRESSURE SENSOR
		-	R SUPPLY	68	g.	FUEL INJECTOR NO. 1
		PT	R SUPPLY	06	0	FUEL INJECTOR NO. 4
		SEN SEN	R SUPPLY	9	gg (	BATTERY CURRENT SENSOR
		4/ Y SENSOR GROUND 40 P SENSOB GROUND		85	D	SENSOR GROUND DOWED SLIBBLY FOR FOM (BACK LIB)
			COUNT	88	r	POWER SUPPLY FOR EUM (BAUN-UF)

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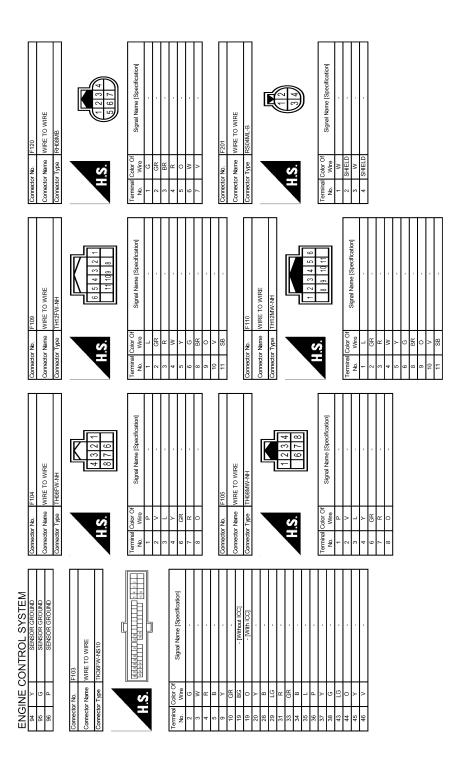
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ENGINE CONTROL SYSTEM	Connector No	502		Connector No	CM		ć	>	,	
Commoder Name (AND OF STREED DANK OF			CONTROL MODILE	Consolidation Man		1	17	· SB		
CONTRECTOR NAME (NINOUN SENSOR (BAINN 2)	Confrector Name	Name I on (I ransmission o	ONI ROL MODULE)	Connector Name	IE FUSE BLUCK (J	(5)	18	>		
Connector Type E02FG-RS-LGY	Connector Type	Type SP10FG		Connector Type	Connector Type NS10FW-CS		20	g .	1	
•		•	≪	_			22 22	<b>→</b>		
		1					23			
		E			Pr Pr		24	BR		
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	4		K-LINE	+			98	SHIELD		
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SE SHARES ECONOMISS	9	- IGNITION P	IGNITION POWER SUPPLY	8B R			88	BG		
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Connector Type E02FG-RS-LGY	8	-	AN-L				41	Μ		
	6	- STARI	STARTER RELAY				45	BG	-	
	10	- GF	GROUND	Connector No.	M6		43	BG		
				Connector Name	WIRE TO WIRE		42	×		
		ſ					49	_		
	Connector No.	No. M1		Connector Type	e TH80MW-CS16-TM4	TM4	20	Ь		
	Connector Name	Name FLISE BLOCK ( I/B)					21	BR		
				_	Ľ		54	>	-	
	Connector Type	Type NS06FW-M2		\	H	8 8 8 2 2 2 2 3 3 9 1 9 1 9	25	9		
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	44	Ь	-	_	~	-	72	Υ	-	
	2A	٨	-	10 R		-	73	SB		
	6A	Υ		Н	~		74	BR	- [With ICC]	
	7.A	Я		12 BG	<b>(D</b>		74	٦	- [Without ICC]	
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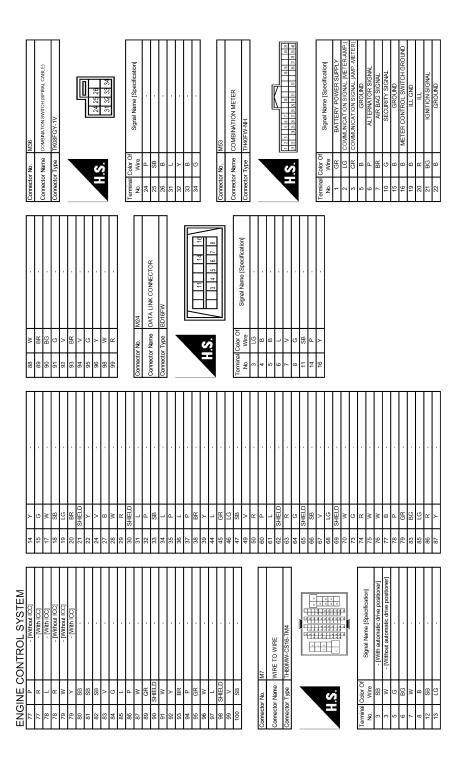
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Corrector No. M108 Corrector Name POWER STEERING CONTROL UNIT Corrector Type TH12FW-NH	H.S.	Terminal Color Of Signal Name [Specification]	- 0	2 S S	9 e	NOUTICE] 8 L VEHICLE SPEEU(ZP) 10 R ENG TACHO	CH	SENSOR Connector No M116		Connector Name	ICC] Connector Type   TK36MW-NS10	SOR		第5 第 第 第 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	SNAL COMBINE		П	NE Terminal Color Of Signal Name [Specification]	VALVE	3 L	+	e c	» (s	7 O	+	+	28 B	+	-	╀
THYZ	122 114 110 121 113 110 110 110 110 110 110 110 110 11	Signal Name [Specification]	ACCELERATOR PEDAL POSITION SENSOR 1	ACCELERATOR PEDAL POSITION SENSOR 2 [With ICC] ACCELERATOR PEDAL POSITION SENSOR 2 [With ICC]	SENSOR POWER SUPPLY [With ICC]	SENSOR POWER SUPPLY [Without ICC.]	ASCD/ICC STEERING SWITCH	SENSOR POWER SLIPPLY IWITHOUT ICC	SENSOR POWER SUPPLY [With ICC]	SENSOR GROUND [With ICC]	SENSOR GROUND [Without ICC]	FUEL TANK TEMPERATURE SENSOR	SENSOR POWER SUPPLY	SENSOR GROUND	ENGINE SPEED OUTPUT SIGNAL	SENSOR GROUND	CAN COMMUNICATION LINE	DATA LINK CONNECTOR	EVAP CANISTER VENT CONTROL	STOP LAMP SWITCH	ECM GROUND	ECM GROUND	FOWER SUPPLY FOR ECM	ASCUILC BRAKE SWITC	ECM CBOIND	ECM GROUND				
Connector No. Connector Name Connector Type	H.S.	Ferminal Color Of No. Wire	97 R	+	9 66	100 W	Н	102 103 G	╀	Н	4	106 W	107 BG	108	110 R	112 V	113 P	114 L	121 LG	122 P	4	+	R 621	120 BK	+	4				
Corrector No. M67 Corrector Name UNIFED METER AND A/O AMP.	(2) 上 (2) (2) (3) (3) (3) (3) (3) (3) (3) (3) (3) (3	Terminal Color Of Signal Name [Specification]	41 V ACC POWER SUPPLY	43 R INTAKE SENSOR SIGNAL	II 97	45 P AMBIENI SENSUR SIGNAL 46 BG SUNLOAD SENSOR SIGNAL	G EXHAUS	53 G IGNITION POWER SUPPLY 54 Y BATTERY POWER SUPPLY	· @	_ i	× 8	59 GR INTAKE SENSOR GROUND		61 BR AMBIENT SENSOR GROUND	8 2	BG	_	70 R EACH DOOR MOTOR POWER SUPPLY					-1			_				
CONTROL SYSTEM   24 BR   COMMUNICATION SIGNAL (LCD-AMP.)   25 Y   COMMUNICATION SIGNAL (AMPLCD)   25 Y   COMMUNICATION SIGNAL (AMPLCD)   27 V   PARKIND BRAKE SWITCH SIGNAL (AMPLCD)   27 V   PARKIND BRAKE SWITCH SIGNAL (AMPLCD)   28 BRAINET BLACE SWITCH SIGNAL (AMPLCD)   29 BRAINET BLACE SWITCH SIGNAL (AMPLCD)   29 BRAINET BLACE SWITCH SIGNAL (AMPLCD)   20 BRAINET BLACE SWITCH SW	- 88 L B	P ILLUMINATION CONTRA BG ILLUMINATION CONTRA		Connector No. M66	Connector Name UNIFIED METER AND A/C AMP.	Connector Type TH40FW-NH	1			20 00 10 10 10 10 10 10 10 10 10 10 10 10			E E		'I 🛪	VEHICLE SPEED	SB SEAT BELT BUCKLE SWII	10 W MANUAL MODE SIGNAL	BR COMMUNICATION:	20 L ION ON/OFF SIGNAL	Y AT SNOW SV	25 V MANUAL MODE SHIFT DOWN SIGNAL	LG COMMUNICATIONS	" III	S COMMINICATIONS	Y COMMUNICATION:	38 P BLOWER MOTOR CONTROL SIGNAL			

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ENGIN	ENGINE CONTROL SYSTEM				
36	٠.	64		Connector No. M126	Connector No. M170
4		65		Connector Name WIRE TO WIRE	Connector Name WIRE TO WIRE
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			-	Connector Type M03MW-LC	Connector Type TH24FW-NH
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46 E	. Se	20			
		7.1	SB -		
		72		<u> </u>	987654321
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Connector Type	ype TH80MW-CS16-TM4	81	8s	Terminal Color Of Size   Nove 18	Terminal Color Of
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		87	-		5 SB
		88		Connector No. M134	- e
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Terminal Cole	Color Of	6		Connector Name WIRE TO WIRE	88
No.	Wire Signal Name [Specification]	94		Connector Type TH24MW-NH	╁
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+	BR			<u></u>	
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09	^	ġ	Wire Signal Name [Specification]	17 B -	No. Wire Signal Marine [Specification]
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Fail safe

NON DTC RELATED ITEM

ENGINE CONTROL SYSTEM

Engine operating condition in fail-safe mode	Detected items	Remarks	Reference page
Engine speed will not rise more than 2,500 rpm due to the fuel cut	Malfunction indicator lamp circuit	When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system.  Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function.  The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction.	<u>EC-522</u>

### DTC RELATED ITEM

DTC No.	Detected items	Engine opera	ting 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 to control does not function.		
P0102 P0103 P010C P010D	Mass air flow sensor circuit	circuit Engine speed will not rise more than 2,400 rpm due to the fuel cut.		
P0117 P0118	Engine coolant tempera- ture sensor circuit	Engine coolant temperature will be determined by ECM based on the following 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 2,500 rpm due to the fuel cut.		
P0643	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.		

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DTC No.	Detected items	Engine opera	ating condition in fail-safe mode					
P1087 P1088	VVEL control function	VVEL of normal bank is controlled Engine speed will not rise more that	•					
P1089 P1092	VVEL control shaft position sensor	VVEL value is maintained at a fixed Engine speed will not rise more that	•					
P1608	VVEL control shaft position sensor	VVEL actuator motor relay is turned Engine speed will not rise more that	d off, and VVEL value is become at a minimum angle. an 3,500 rpm due to the fuel cut					
P1090 P1093	VVEL actuator motor	VVEL of normal bank is controlled Engine speed will not rise more that						
		VVEL actuator motor relay is turned Engine speed will not rise more that	d off, and VVEL value is become at a minimum angle. an 3,500 rpm due to the fuel cut.					
P1091	VVEL actuator motor relay		VEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. ngine speed will not rise more than 3,500 rpm due to the fuel cut.					
P1233 P2101	Electric throttle control function		CM stops the electric throttle control actuator control, throttle valve is maintained at a xed opening (approx. 5 degrees) by the return spring.					
P1236 P2118	Throttle control motor	ECM stops the electric throttle cont fixed opening (approx. 5 degrees) I	trol actuator control, throttle valve is maintained at a by the return spring.					
P1238 P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spri malfunction:)  ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.						
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.						
		(When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually because of fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.						
P1290 P2100 P2103	Throttle control motor relay	ECM stops the electric throttle confixed opening (approx. 5 degrees) I	trol actuator control, throttle valve is maintained at a by the return spring.					
P1606	VVEL control module	VVEL actuator motor relay is turned Engine speed will not rise more that	d off, and VVEL value is become at a minimum angle. an 3,500 rpm due to the fuel cut.					
P1805	Brake switch	ECM controls the electric throttle or small range.  Therefore, acceleration will be poor	ontrol actuator by regulating the throttle opening to a r.					
		Vehicle condition	Driving condition					
		When engine is idling	Normal					
		When accelerating	Poor acceleration					
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	order for the idle position to be with	peed of the throttle valve to be slower than the normal					

# DTC Inspection Priority Chart

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If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority Detected items (DTC)
Priority  • U0101 U1001 U1003 CAN communication line • U1024 VVEL CAN communication line • U1024 VVEL CAN communication line • P0102 P0103 P010C P010D Mass air flow sensor • P0102 P0103 P010C P010D Mass air flow sensor • P0111 P0112 P0113 P0127 Intake air temperature sensor • P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throi • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0196 P0197 P0198 Engine oil temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 P0345 Camshaft position sensor (PHASE) • P0460 P0461 P0462 P0463 Fuel level sensor • P0555 Brake booster pressure sensor • P0655 Brake booster pressure sensor • P0665 P0607 ECM • P0643 Sensor power supply • P0700 TCM • P0705 Transmission range switch • P0850 Park/neutral position (PNP) switch • P1089 P1092 P1608 VVEL control shaft position sensor • P1606 P1607 VVEL control module • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1606 Bake booster pressure sensor

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> </ul>	A
	<ul> <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> </ul>	EC
	<ul> <li>P0441 EVAP control system purge flow monitoring</li> <li>P0443 P0444 P0445 EVAP canister purge volume control solenoid valve</li> <li>P0447 P0448 EVAP canister vent control valve</li> <li>P0451 P0452 P0453 EVAP control system pressure sensor</li> </ul>	С
	<ul> <li>P0550 Power steering pressure sensor</li> <li>P0603 ECM power supply</li> <li>P0710 P0717 P0720 P729 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> </ul>	D
	<ul> <li>P1087 P1088 VVEL system</li> <li>P1090 P1093 VVEL actuator motor</li> <li>P1091 VVEL actuator motor relay</li> <li>P1217 Engine over temperature (OVERHEAT)</li> </ul>	Е
	<ul> <li>P1233 P2101 Electric throttle control function</li> <li>P1236 P2118 Throttle control motor</li> <li>P1290 P2100 P2103 Throttle control motor relay</li> <li>P1805 Brake switch</li> </ul>	F
3	P0011 P0021 Intake valve timing control P0101 P010B Mass air flow sensor P0171 P0172 P0174 P0175 Fuel injection system function P0200 P0206 Minfrise	G
	<ul> <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> </ul>	Н
	<ul> <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> </ul>	I
	<ul> <li>P1211 TCS control unit</li> <li>P1212 TCS communication line</li> <li>P1238 P2119 Electric throttle control actuator</li> <li>P1564 ICC steering switch / ASCD steering switch</li> </ul>	J
	<ul> <li>P1564 ICC steering switch / ASCD steering switch</li> <li>P1568 ICC command value</li> <li>P1572 ICC brake switch / ASCD brake switch</li> <li>P1574 ICC vehicle speed sensor / ASCD vehicle speed sensor</li> </ul>	K

DTC Index

×:Applicable —: Not applicable

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DTC*1	1	Items	SRT			Permanent DTC	Reference
CONSULT GST*2	ECM*3	(CONSULT screen terms)	code	Trip	MIL	group*4	page
U0101	0101 <sup>*5</sup>	CAN COMM CIRCUIT	_	1	×	В	EC-169
U1001	1001 <sup>*5</sup>	CAN COMM CIRCUIT	_	1 or 2	_	_	EC-170
U1003	1003	CAN COMM CIRCUIT		2	_	_	EC-171
U1024	1024	VVEL CAN COMM CIRCUIT	_	1	×	В	EC-173
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	_	_	Flashing <sup>*8</sup>	_	_
P0011	0011	INT/V TIM CONT-B1	×	2	×	В	EC-175
P0021	0021	INT/V TIM CONT-B2	×	2	×	В	EC-175
P0031	0031	A/F SEN1 HTR (B1)	_	2	×	В	EC-179
P0032	0032	A/F SEN1 HTR (B1)	_	2	×	В	EC-179

DTC*	1	Items	SRT			Permanent DTC	Reference
CONSULT GST*2	ECM*3	(CONSULT screen terms)	code	Trip	MIL	group*4	page
P0037	0037	HO2S2 HTR (B1)	_	2	×	В	EC-182
P0038	0038	HO2S2 HTR (B1)	_	2	×	В	EC-182
P0051	0051	A/F SEN1 HTR (B2)	_	2	×	В	EC-179
P0052	0052	A/F SEN1 HTR (B2)	_	2	×	В	EC-179
P0057	0057	HO2S2 HTR (B2)	_	2	×	В	EC-18
P0058	0058	HO2S2 HTR (B2)	_	2	×	В	EC-18
P0075	0075	INT/V TIM V/CIR-B1	_	2	×	В	EC-18
P0081	0081	INT/V TIM V/CIR-B2	_	2	×	В	EC-18
P0101	0101	MAF SEN/CIRCUIT-B1	_	2	×	В	EC-18
P0102	0102	MAF SEN/CIRCUIT-B1	_	1	×	В	EC-19
P0103	0103	MAF SEN/CIRCUIT-B1	_	1	×	В	EC-19
P010A	010A	ABSL PRES SEN/CIRC	_	2	×	В	EC-20
P010B	010B	MAF SEN/CIRCUIT-B2	_	2	×	В	EC-18
P010C	010C	MAF SEN/CIRCUIT-B2	_	1	×	В	EC-19
P010D	010D	MAF SEN/CIRCUIT-B2	_	1	×	В	EC-19
P0111	0111	IAT SENSOR1 B1	_	2	×	Α	EC-20
P0112	0112	IAT SEN/CIRCUIT-B1	_	2	×	В	EC-20
P0113	0113	IAT SEN/CIRCUIT-B1	_	2	×	В	EC-20
P0116	0116	ECT SEN/CIRC	_	2	×	A	EC-21
P0117	0117	ECT SEN/CIRC	_	1	×	В	EC-21
P0118	0118	ECT SEN/CIRC	_	1	×	В	EC-21
P0122	0122	TP SEN 2/CIRC-B1	_	1	×	В	EC-21
P0123	0123	TP SEN 2/CIRC-B1		' 1	×	В	EC-21
P0125	0125	ECT SENSOR	_	2	×	В	EC-22
P0123	0123	IAT SENSOR-B1		2		В	
P0127		THERMSTAT FNCTN	_		×		EC-22
	0128		_	2	×	A	EC-22
P0130	0130	A/F SENSOR1 (B1)	_	2	X	A	EC-22
P0131	0131	A/F SENSOR1 (B1)	_	2	×	В	EC-23
P0132	0132	A/F SENSOR1 (B1)	_	2	X	В	EC-23
P0137	0137	HO2S2 (B1)	×	2	×	A	EC-23
P0138	0138	HO2S2 (B1)	×	2	×	A	EC-24
P0139	0139	HO2S2 (B1)	×	2	×	A	EC-25
P014C	014C	A/F SENSOR1 (B1)	×	2	×	A	EC-25
P014D	014D	A/F SENSOR1 (B1)	×	2	×	А	EC-25
P014E	014E	A/F SENSOR1 (B2)	×	2	×	Α	EC-25
P014F	014F	A/F SENSOR1 (B2)	×	2	×	А	EC-25
P0150	0150	A/F SENSOR1 (B2)	_	2	×	A	EC-22
P0151	0151	A/F SENSOR1 (B2)	_	2	×	В	EC-23
P0152	0152	A/F SENSOR1 (B2)	_	2	×	В	EC-23
P0157	0157	HO2S2 (B2)	×	2	×	А	EC-23
P0158	0158	HO2S2 (B2)	×	2	×	А	EC-24
P0159	0159	HO2S2 (B2)	×	2	×	А	EC-25

DTC*	1	Homo	SRT			Permanent DTC	Doforces
CONSULT GST*2	ECM*3	Items (CONSULT screen terms)	code	Trip	MIL	group*4	Reference page
P015A	015A	A/F SENSOR1 (B1)	×	2	×	А	EC-259
P015B	015B	A/F SENSOR1 (B1)	×	2	×	А	EC-259
P015C	015C	A/F SENSOR1 (B2)	×	2	×	А	EC-259
P015D	015D	A/F SENSOR1 (B2)	×	2	×	А	EC-259
P0171	0171	FUEL SYS-LEAN-B1	_	2	×	В	EC-265
P0172	0172	FUEL SYS-RICH-B1	_	2	×	В	EC-269
P0174	0174	FUEL SYS-LEAN-B2	_	2	×	В	EC-265
P0175	0175	FUEL SYS-RICH-B2	_	2	×	В	EC-269
P0181	0181	FTT SENSOR	_	2	×	A and B	EC-273
P0182	0182	FTT SEN/CIRCUIT	_	2	×	В	EC-277
P0183	0183	FTT SEN/CIRCUIT	_	2	×	В	EC-277
P0196	0196	EOT SENSOR	_	2	×	A and B	EC-280
P0197	0197	EOT SEN/CIRC	_	2	×	В	EC-284
P0198	0198	EOT SEN/CIRC	_	2	×	В	EC-284
P0222	0222	TP SEN 1/CIRC-B1	_	1	×	В	EC-287
P0223	0223	TP SEN 1/CIRC-B1	_	1	×	В	EC-287
P0227	0227	TP SEN 2/CIRC-B2	_	1	×	В	EC-216
P0228	0228	TP SEN 2/CIRC-B2	_	1	×	В	EC-216
P0300	0300	MULTI CYL MISFIRE	_	1 or 2	×	В	EC-291
P0301	0301	CYL 1 MISFIRE	_	1 or 2	×	В	EC-291
P0302	0302	CYL 2 MISFIRE	_	1 or 2	×	В	EC-291
P0303	0303	CYL 3 MISFIRE	_	1 or 2	×	В	EC-291
P0304	0304	CYL 4 MISFIRE	_	1 or 2	×	В	EC-291
P0305	0305	CYL 5 MISFIRE	_	1 or 2	×	В	EC-291
P0306	0306	CYL 6 MISFIRE	_	1 or 2	×	В	EC-291
P0327	0327	KNOCK SEN/CIRC-B1	_	2	_	_	EC-297
P0328	0328	KNOCK SEN/CIRC-B1	_	2	_	_	EC-297
P0332	0332	KNOCK SEN/CIRC-B2	_	2	_	_	EC-297
P0333	0333	KNOCK SEN/CIRC-B2	_	2	_	_	EC-297
P0335	0335	CKP SEN/CIRCUIT	_	2	×	В	EC-300
P0340	0340	CMP SEN/CIRC-B1	_	2	×	В	EC-304
P0345	0345	CMP SEN/CIRC-B2	_	2	×	В	EC-304
P0420	0420	TW CATALYST SYS-B1	×	2	×	A	EC-308
P0430	0430	TW CATALYST SYS-B2	×	2	×	A	EC-308
P0441	0441	EVAP PURG FLOW/MON	×	2	×	A	EC-313
P0443	0443	PURG VOLUME CONT/V	_	2	×	A	EC-318
P0444	0444	PURG VOLUME CONT/V	_	2	×	В	EC-323
P0445	0445	PURG VOLUME CONT/V	_	2	×	В	EC-323
P0447	0447	VENT CONTROL VALVE	_	2	×	В	EC-326
P0448	0448	VENT CONTROL VALVE	_	2	×	В	EC-330
P0446	0448	EVAP SYS PRES SEN	_	2	×	A	EC-334
1 0401	0451	EVAP SYS PRES SEN		2	^	В	EC-338

DTC*	l	Items	SRT			Permanent DTC	Reference
CONSULT GST*2	ECM*3	(CONSULT screen terms)	code	Trip	MIL	group*4	page
P0453	0453	EVAP SYS PRES SEN	_	2	×	В	EC-343
P0456	0456	EVAP VERY SML LEAK	×*7	2	×	А	EC-349
P0460	0460	FUEL LEV SEN SLOSH	_	2	×	А	EC-355
P0461	0461	FUEL LEVEL SENSOR	_	2	×	В	EC-357
P0462	0462	FUEL LEVL SEN/CIRC	_	2	×	В	EC-359
P0463	0463	FUEL LEVL SEN/CIRC	_	2	×	В	EC-359
P0500	0500	VEH SPEED SEN/CIRC*6		2	×	В	EC-361
P0506	0506	ISC SYSTEM	_	2	×	В	EC-363
P0507	0507	ISC SYSTEM	_	2	×	В	EC-365
P050A	050A	COLD START CONTROL	_	2	×	А	EC-367
P050E	050E	COLD START CONTROL	_	2	×	А	EC-367
P0524	0524	ENGINE OIL PRESSURE	_	2	×	В	EC-369
P0550	0550	PW ST P SEN/CIRC	_	2	_	_	EC-372
P0555	0555	BRAKE BSTR PRES SEN/CIRC	_	2	×	В	EC-375
P0603	0603	ECM BACK UP/CIRCUIT	1	2	×	В	EC-380
P0605	0605	ECM		1 or 2	× or —	В	EC-382
P0607	P0607	ECM	_	1	×	В	EC-384
P0643	0643	SENSOR POWER/CIRC	_	1	×	В	EC-385
P0705	0705	T/M RANGE SWITCH A	_	1	×	В	<u>TM-75</u>
P0710	0710	FLUID TEMP SENSOR A*9	_	2	×	В	<u>TM-77</u>
P0717	0717	INPUT SPEED SENSOR A	_	2	×	В	TM-80
P0720	0720	OUTPUT SPEED SENSOR*6		2	×	В	<u>TM-82</u>
P0729	0729	6GR INCORRECT RATIO*9	_	2	×	В	TM-86
P0730	0730	INCORRECT GR RATIO	_	2	×	В	TM-88
P0731	0731	1GR INCORRECT RATIO*9		2	×	В	<u>TM-90</u>
P0732	0732	2GR INCORRECT RATIO*9	_	2	×	В	<u>TM-92</u>
P0733	0733	3GR INCORRECT RATIO*9		2	×	В	TM-94
P0734	0734	4GR INCORRECT RATIO*9	_	2	×	В	<u>TM-96</u>
P0735	0735	5GR INCORRECT RATIO*9	_	2	×	В	<u>TM-98</u>
P0740	0740	TORQUE CONVERTER	_	2	×	В	TM-100
P0744	0744	TORQUE CONVERTER	_	2	×	В	TM-102
P0745	0745	PC SOLENOID A	_	2	×	В	TM-104
P0750	0750	SHIFT SOLENOID A	_	2	×	В	TM-105
P0775	0775	PC SOLENOID B	_	2	×	В	<u>TM-106</u>
P0780	0780	SHIFT	1	1	×	В	<u>TM-107</u>
P0795	0795	PC SOLENOID C	_	2	×	В	TM-109
P0850	0850	P-N POS SW/CIRCUIT	1	2	×	В	EC-388
P100A	100A	VVEL SYSTEM-B1	1	2	×	В	EC-391
P100B	100B	VVEL SYSTEM-B2		2	×	В	EC-391
P1087	1087	VVEL SYSTEM-B1	_	1	×	В	EC-395
P1088	1088	VVEL SYSTEM-B2		1	×	В	EC-395

DTC*	1	ltama	CDT			Permanent DTC	Dofores	F
CONSULT GST*2	ECM*3	Items (CONSULT screen terms)	SRT code	Trip	MIL	group*4	Reference page	<i>j-</i>
P1089	1089	VVEL POS SEN/CIRC-B1	_	1	×	В	EC-396	ΕŒ
P1090	1090	VVEL ACTR MOT-B1	_	1	×	В	EC-400	
P1091	1091	VVEL ACTR MOT PWR	_	1 or 2	×	В	EC-404	
P1092	1092	VVEL POS SEN/CIRC-B2	_	1	×	В	EC-396	(
P1093	1093	VVEL ACTR MOT-B2	_	1	×	В	EC-400	
P1148	1148	CLOSED LOOP-B1	_	1	×	А	EC-407	
P1168	1168	CLOSED LOOP-B2	_	1	×	А	EC-407	
P1211	1211	TCS C/U FUNCTN	_	2	_	_	EC-408	
P1212	1212	TCS/CIRC		2	_	_	EC-409	E
P1217	1217	ENG OVER TEMP	_	1	×	В	EC-410	
P1225	1225	CTP LEARNING-B1	_	2	_	_	EC-414	
P1226	1226	CTP LEARNING-B1	_	2	_	_	EC-416	F
P1233	1233	ETC FNCTN/CIRC-B2	_	1	×	В	EC-418	
P1234	1234	CTP LEARNING-B2	_	2	_	_	EC-414	(
P1235	1235	CTP LEARNING-B2	_	2	_	_	EC-416	
P1236	1236	ETC MOT-B2	_	1	×	В	EC-422	
P1238	1238	ETC ACTR-B2	_	1	×	В	EC-425	ŀ
P1239	1239	TP SENSOR-B2	_	1	×	В	EC-427	
P1290	1290	ETC MOT PWR-B2	_	1	×	В	EC-430	
P1550	1550	BAT CURRENT SENSOR	_	2	_	_	EC-432	
P1551	1551	BAT CURRENT SENSOR	_	2	_	_	EC-435	
P1552	1552	BAT CURRENT SENSOR	_	2	_	_	EC-435	
P1553	1553	BAT CURRENT SENSOR	_	2	_	_	EC-438	
P1554	1554	BAT CURRENT SENSOR	_	2	_	_	EC-441	ŀ
P1564	1564	ASCD SW	_	1	_	_	EC-445 (with ASCD) EC-448 (with ICC)	L
P1568	1568	ICC COMMAND VALUE	_	1	_	_	EC-451	
P1572	1572	ASCD BRAKE SW	_	1	_	_	EC-452 (with ASCD) EC-457 (with ICC)	Ν
P1574	1574	ASCD VHL SPD SEN	_	1	_	_	EC-464 (with ASCD) EC-466 (with ICC)	N
P1606	1606	VVEL CONTROL MODULE	_	1 or 2	× or —	В	EC-468	
P1607	1607	VVEL CONTROL MODULE	_	1	×	В	EC-470	
P1608	1608	VVEL SENSOR POWER/CIRC	_	1	×	В	EC-472	F
P1610	1610	LOCK MODE	_	2	_	_	<u>SEC-33</u>	
P1611	1611	ID DISCARD, IMM-ECM		2	_	_	<u>SEC-34</u>	
P1612	1612	CHAIN OF ECM-IMMU	_	2	_	_	<u>SEC-35</u>	
P1614	1614	CHAIN OF IMMU-KEY	_	2	_	_	<u>SEC-36</u>	
P1615	1615	DIFFERENCE OF KEY	_	2	_	_	SEC-39	

DTC*	1	lt	CDT			Permanent DTC	Deference
CONSULT GST*2	ECM*3	Items (CONSULT screen terms)	SRT code	Trip	MIL	group*4	Reference page
P1730	1730	INTERLOCK	_	2	×	В	<u>TM-114</u>
P1734	1734	7GR INCORRECT RATIO*9	_	2	×	В	TM-116
P1805	1805	BRAKE SW/CIRCUIT	_	2	_	_	EC-475
P1806	1806	BRAKE BSTR PRES SEN/CIRC	_	2	×	В	BRC-86
P2096	2096	POST CAT FUEL TRIM SYS B1	_	2	×	А	EC-478
P2097	2097	POST CAT FUEL TRIM SYS B1	_	2	×	Α	EC-478
P2098	2098	POST CAT FUEL TRIM SYS B2	_	2	×	Α	EC-478
P2099	2099	POST CAT FUEL TRIM SYS B2	_	2	×	Α	EC-478
P2100	2100	ETC MOT PWR-B1	_	1	×	В	EC-430
P2101	2101	ETC FNCTN/CIRC-B1	_	1	×	В	EC-418
P2103	2103	ETC MOT PWR	_	1	×	В	EC-430
P2118	2118	ETC MOT-B1	_	1	×	В	EC-422
P2119	2119	ETC ACTR-B1	_	1	×	В	EC-425
P2122	2122	APP SEN 1/CIRC	_	1	×	В	EC-483
P2123	2123	APP SEN 1/CIRC	_	1	×	В	EC-483
P2127	2127	APP SEN 2/CIRC	_	1	×	В	EC-487
P2128	2128	APP SEN 2/CIRC	_	1	×	В	EC-487
P2132	2132	TP SEN 1/CIRC-B2	_	1	×	В	EC-287
P2133	2133	TP SEN 1/CIRC-B2	_	1	×	В	EC-287
P2135	2135	TP SENSOR-B1	_	1	×	В	EC-427
P2138	2138	APP SENSOR	_	1	×	В	EC-492
P2713	2713	PC SOLENOID D		2	×	В	TM-121
P2722	2722	PC SOLENOID E	_	2	×	В	TM-122
P2731	2731	PC SOLENOID F	_	2	×	В	TM-123
P2807	2807	PC SOLENOID G	_	2	×	В	TM-124

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

#### Test Value and Test Limit

INFOID:0000000009429035

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)

<sup>\*2:</sup> This number is prescribed by SAE J2012/ISO 15031-6.

<sup>\*3:</sup> In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

<sup>\*4:</sup> Refer to EC-32, "Description", "PERMANENT DIAGNOSTIC TROUBLE CODE (PERMANENT DTC)".

<sup>\*5:</sup> The troubleshooting for this DTC needs CONSULT.

<sup>\*6:</sup> When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

<sup>\*7:</sup> SRT code will not be set if the self-diagnostic result is NG.

<sup>\*8:</sup> When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status".

<sup>\*9:</sup> When erasing this DTC, always use CONSULT or GST.

	OBD-			li	e and Test mit display)		А
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description	EC
			P0131	83H	0BH	Minimum sensor output voltage for test cycle	C
			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	Е
			P0133	87H	04H	Response rate: Response ratio (lean to rich)	
			P0133	88H	04H	Response rate: Response ratio (rich to lean)	F
			P2A00 or P2096	89H	84H	The amount of shift in air fuel ratio (too lean)	G
			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	I
			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	k
			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	L
			P015B	93H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1	N
			P015B	94H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1	
			P0133	95H	04H	Response rate: Response ratio (lean to rich)	٨
			P0133	96H	84H	Response rate: Response ratio (rich to lean)	C

	OBD-			li	e and Test mit display)	
Item HO2S	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			P0138	07H	0CH	Minimum sensor output voltage for tes cycle
		Heated oxygen sensor 2	P0137	08H	0CH	Maximum sensor output voltage for test cycle
	02H	(Bank 1)	P0138	80H	0CH	Sensor output voltage
			P0139	81H	0CH	Difference in sensor output voltage
			P0139	82H	11H	Rear O2 sensor delay response diag nosis
			P0143	07H	0CH	Minimum sensor output voltage for tes cycle
03H	03H	Heated oxygen sensor 3 (Bank 1)	P0144	08H	0CH	Maximum sensor output voltage for test cycle
			P0146	80H	0CH	Sensor output voltage
			P0145	81H	0CH	Difference in sensor output voltage
			P0151	83H	0BH	Minimum sensor output voltage for tes cycle
			P0151	84H	0BH	Maximum sensor output voltage for test cycle
			P0150	85H	0BH	Minimum sensor output voltage for tes cycle
		Air fuel ratio (A/F) sensor 1	P0150	86H	0BH	Maximum sensor output voltage for test cycle
HO2S			P0153	87H	04H	Response rate: Response ratio (lear to rich)
			P0153	88H	04H	Response rate: Response ratio (rich t lean)
			P2A03 or P2098	89H	84H	The amount of shift in air fuel ratio (to lean)
			P2A03 or P2099	8AH	84H	The amount of shift in air fuel ratio (to rich)
	05H	(Bank 2)	P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequence
			P014E	8DH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014E	8EH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014F	8FH	84H	O2 sensor slow response - Lean to ric bank 2 sensor 1
			P014F	90H	84H	O2 sensor slow response - Lean to ric bank 2 sensor 1
			P015C	91H	01H	O2 sensor delayed response - Rich t lean bank 2 sensor 1
			P015C	92H	01H	O2 sensor delayed response - Rich t lean bank 2 sensor 1
			P015D	93H	01H	O2 sensor delayed response - Lean trich bank 2 sensor 1

< ECO DI	AGNU	SIS INFORMATION >				[VQ3/VIK]	_
	055			li	e and Test mit display)		
Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description	EC
			P015D	94H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1	С
	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)	D
			P0158	07H	0CH	Minimum sensor output voltage for test cycle	Е
	0011	Heated oxygen sensor 2	P0157	08H	0CH	Maximum sensor output voltage for test cycle	
HO2S	06H	(Bank 2)	P0158	80H	0CH	Sensor output voltage	F
			P0159	81H	0CH	Difference in sensor output voltage	_
			P0159	82H	11H	Rear O2 sensor delay response diagnosis	G
			P0163	07H	0CH	Minimum sensor output voltage for test cycle	
	07H	Heated oxygen sensor 3 (Bank2)	P0164	08H	0CH	Maximum sensor output voltage for test cycle	F
			P0166	80H	0CH	Sensor output voltage	
			P0165	81H	0CH	Difference in sensor output voltage	
		Three way catalyst function (Bank1)	P0420	80H	01H	O2 storage index	
	21H		P0420	82H	01H	Switching time lag engine exhaust index value	
	2111		P2423	83H	0CH	Difference in 3rd O2 sensor output voltage	
CATA-			P2423	84H	84H	O2 storage index in HC trap catalyst	k
LYST			P0430	80H	01H	O2 storage index	
	22H	Three way catalyst function	P0430	82H	01H	Switching time lag engine exhaust index value	L
	2211	(Bank2)	P2424	83H	0CH	Difference in 3rd O2 sensor output voltage	
			P2424	84H	84H	O2 storage index in HC trap catalyst	11
			P0400	80H	96H	Low flow faults: EGR temp change rate (short term)	
			P0400	81H	96H	Low flow faults: EGR temp change rate (long term)	
EGR SYSTEM	31H	EGR function	P0400	82H	96H	Low flow faults: Difference between max EGR temp and EGR temp under idling condition	C
			P0400	83H	96H	Low flow faults: Max EGR temp	F
			P1402	84H	96H	High Flow Faults: EGR temp increase rate	

					e and Test mit	
	OBD-				display)	
VVT	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
VVT			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)
	зэп		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)
			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)
			P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
	36H	VVT Monitor (Bank2)	P0024	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
	3011		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
	3ВН	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)
EVAP			P0456	80H	05H	Leak area index (for more than 0.02 inch)
SYSTEM	3СН	EVAP control system leak (Very small leak)	P0456	81H	FDH	Maximum internal pressure of EVAP system during monitoring
			P0456	82H	FDH	Internal pressure of EVAP system at the end of monitoring
	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control valve close

Item	OBD-	Self-diagnostic test item	DTC	lii	e and Test mit display)	Description					
пеш	MID	Self-diagnostic test item	ыс	TID	Unitand Scaling ID	Description					
	41H	A/F sensor 1 heater (Bank 1)	Low Input: P0031 High Input: P0032	81H	0BH	Converted value of heater electric current to voltage					
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage					
O2 SEN- SOR	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage					
HEATER -	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage					
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage					
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage					
050		er (Bank 2)	P0411	80H	01H	Secondary air injection system incor- rect flow detected					
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary air injection system insufficient flow					
		Secondary air system							P2445	82H	01H
OND-	71H		P2448	83H	01H	Secondary air injection system high airflow					
SEC- OND- ARY AIR			Bank1: P2440 Bank2: P2442	84H	01H	Secondary air injection system switching valve stuck open					
			P2440	85H	01H	Secondary air injection system switching valve stuck open					
			P2444	86H	01H	Secondary air injection system pump stuck on					
			P0171 or P0172	80H	2FH	Long term fuel trim					
	81H	Fuel injection system function (Bank 1)	P0171 or P0172	81H	24H	The number of lambda control clamped					
FUEL			P117A	82H	03H	Cylinder A/F imbalance monitoring					
SYSTEM			P0174 or P0175	80H	2FH	Long term fuel trim					
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	81H	24H	The number of lambda control clamped					
			P117B	82H	03H	Cylinder A/F imbalance monitoring					

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				lii	e and Test mit	
Item	OBD- MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
			P0301	80H	24H	Misfiring counter at 1000 revolution of the first cylinder
			P0302	81H	24H	Misfiring counter at 1000 revolution of the second cylinder
			P0303	82H	24H	Misfiring counter at 1000 revolution of the third cylinder
			P0304	83H	24H	Misfiring counter at 1000 revolution of the fourth cylinder
			P0305	84H	24H	Misfiring counter at 1000 revolution of the fifth cylinder
		Multiple cylinder misfires	P0306	85H	24H	Misfiring counter at 1000 revolution of the sixth cylinder
			P0307	86H	24H	Misfiring counter at 1000 revolution of the seventh cylinder
			P0308	87H	24H	Misfiring counter at 1000 revolution o the eighth cylinder
MISFIRE			P0300	88H	24H	Misfiring counter at 1000 revolution of the multiple cylinders
	A1H		P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder
	АІП	Multiple cylinder mislires	P0302	8AH	24H	Misfiring counter at 200 revolution of the second cylinder
			P0303	8BH	24H	Misfiring counter at 200 revolution of the third cylinder
			P0304	8CH	24H	Misfiring counter at 200 revolution of the fourth cylinder
			P0305	8DH	24H	Misfiring counter at 200 revolution of the fifth cylinder
			P0306	8EH	24H	Misfiring counter at 200 revolution of the sixth cylinder
			P0307	8FH	24H	Misfiring counter at 200 revolution of the seventh cylinder
			P0308	90H	24H	Misfiring counter at 200 revolution of the eighth cylinder
			P0300	91H	24H	Misfiring counter at 1000 revolution of the single cylinder
			P0300	92H	24H	Misfiring counter at 200 revolution of the single cylinder
			P0300	93H	24H	Misfiring counter at 200 revolution of the multiple cylinders

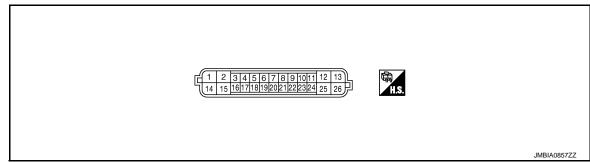
	OBD-			li	e and Test mit display)	
Item	MID	Self-diagnostic test item	DTC	TID	Unitand Scaling ID	Description
	A2H	No. 1 cylinder misfire	P0301	ОВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current driving cycles
	АЗН	No. 2 cylinder misfire	P0302	овн	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0302	0CH	24H	Misfire counts for last/current driving cycles
MISFIRE -	A4H	No. 3 cylinder misfire	P0303	овн	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0303	0CH	24H	Misfire counts for last/current driving cycles
	A5H	No. 4 cylinder misfire	P0304	ОВН	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0304	0CH	24H	Misfire counts for last/current driving cycles
	А6Н	No. 5 cylinder misfire	P0305	овн	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0305	0CH	24H	Misfire counts for last/current driving cycles
	A7H	No. 6 cylinder misfire	P0306	овн	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0306	0CH	24H	Misfire counts for last/current driving cycles
	A8H	No. 7 cylinder misfire	P0307	овн	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
		No. / cylinder mistire	P0307	0CH	24H	Misfire counts for last/current driving cycles
	A9H	No. 8 cylinder misfire	P0308	овн	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0308	0CH	24H	Misfire counts for last/current driving cycles

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# **VVEL CONTROL MODULE**

Reference Value

#### **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.

Term	inal No.	Description			Value		
+		Signal name	Input/ Output	Condition	(Approx.)		
1 (V)	14 (B/W)	VVEL actuator motor pow- er supply (bank 2)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)		
2	14	VVEL actuator motor	Output	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 - 14 V★  100μSec/div  5V/div  JMBIA0854ZZ		
(L/B)	(B/W)	(High lift) (bank 2)		<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	VVEL control shaft position sensor 1 (bank 1)	Input	[Engine is running]  • Warm-up condition  • Idle speed	Approx.0.25 - 1.40 V		
(G)	(W)			<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 position sensor 1 (bank 1)]	_	_	_		

## **VVEL CONTROL MODULE**

## < ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

Termi	inal No.	Description			Value	Δ.
+		Signal name	Input/ Output	Condition	(Approx.)	А
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	EC
(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	С
6 (B)	_	Sensor ground [VVEL control shaft position sensor 1 (bank 2)]	I	_	_	D
7 (SB)	6 (B)	Sensor power supply [VVEL control shaft posi- tion sensor 1 (bank 2)]		[Ignition switch: ON]	5 V	Е
8 (BG)	14 (B/W)	Power supply for VVEL control module		[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)	F
9 (LG)	4 (W)	Sensor power supply [VVEL control shaft position sensor 1 (bank 1)]	_	[Ignition switch: ON]	5 V	G
11 (G)	_	Engine communication line	Input/ Output	_	_	
12 (G)	14	VVEL actuator motor	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★  100μSec/div  5V/div  JMBIA0854ZZ	H
(6)	(B/W)	(High lift) (bank 1)	Сара	<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	K
13 (W)	14 (B/W)	VVEL actuator motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)	M
14 (B/W)	_	VVEL control module ground	_	_	_	N

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## < ECU DIAGNOSIS INFORMATION >

Termi	inal No.	Description			Value	
+		Signal name	Input/ Output	Condition	(Approx.)	
15	14	VVEL actuator 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	
(L/Y)	(B/W)	VVEL actuator motor (Low lift) (bank 2)	·	<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	
16	17	VVFL control shaft posi-		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	3.50 - 4.75 V	
(R)	(L)	17 VVEL control shaft position sensor 2 (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>	0.25 - 4.75 V	
17 (L)	_	Sensor ground [VVEL control shaft position sensor 2 (bank 1)]	_	_	_	
18 (G)	19 (W)	VVEL control shaft position 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 rpm quickly</li> </ul>	3.50 - 4.75 V 0.25 - 4.75 V	
19 (W)	_	Sensor ground [VVEL control shaft position 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	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 V	
22 (P)	17 (L)	Sensor power supply [VVEL position sensor 2 (bank 1)]	_	[Ignition switch: ON]	5 V	
23 (GR)	14 (B/W)	VVEL control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)	
24 (L)	_	Engine communication line	Input/ Output	[Ignition switch: ON]	0 - 1.0 V	

## **VVEL CONTROL MODULE**

## < ECU DIAGNOSIS INFORMATION >

[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)	Output	<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  JMBIA0856ZZ

 $<sup>\</sup>bigstar$ : Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

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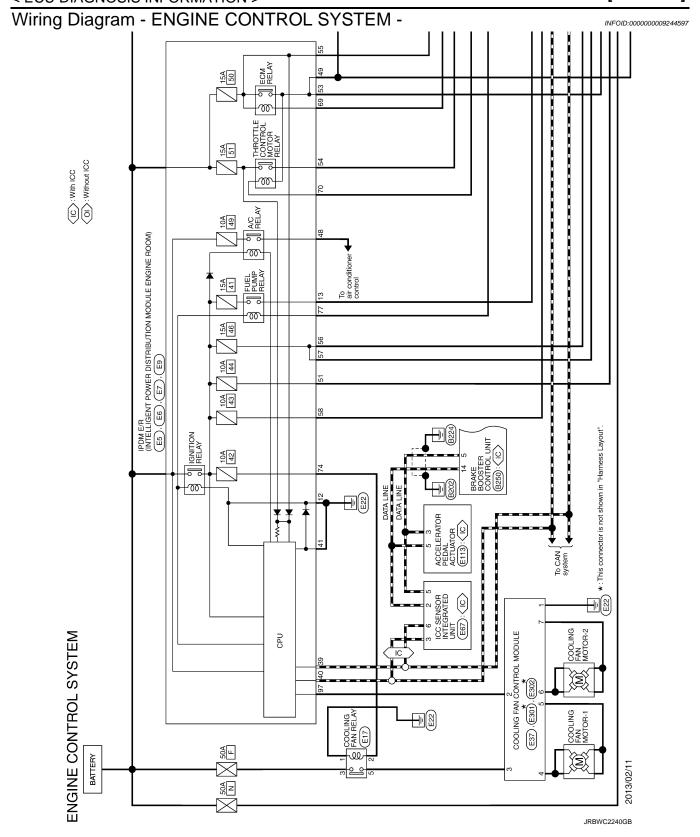
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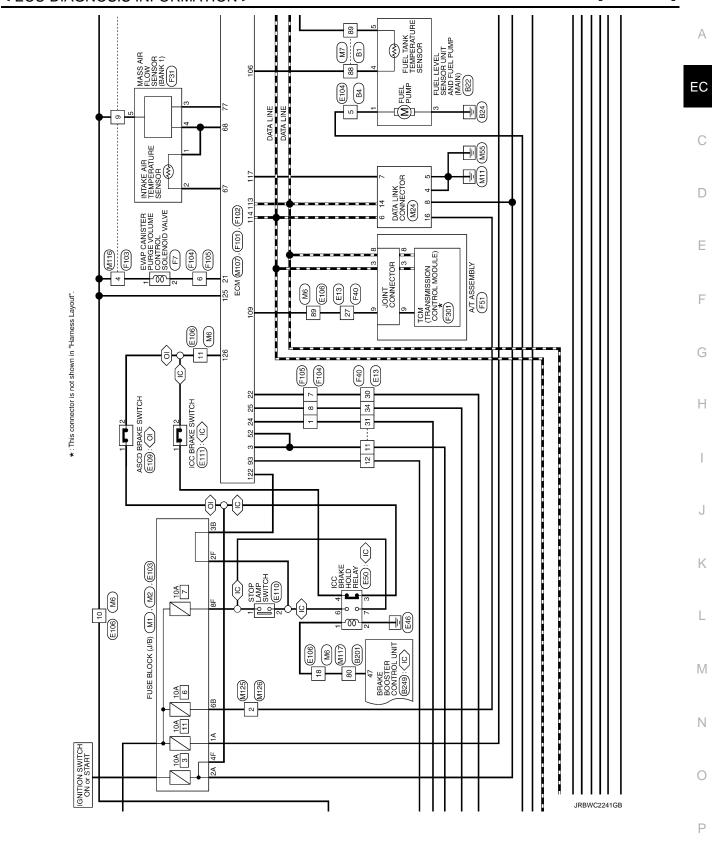
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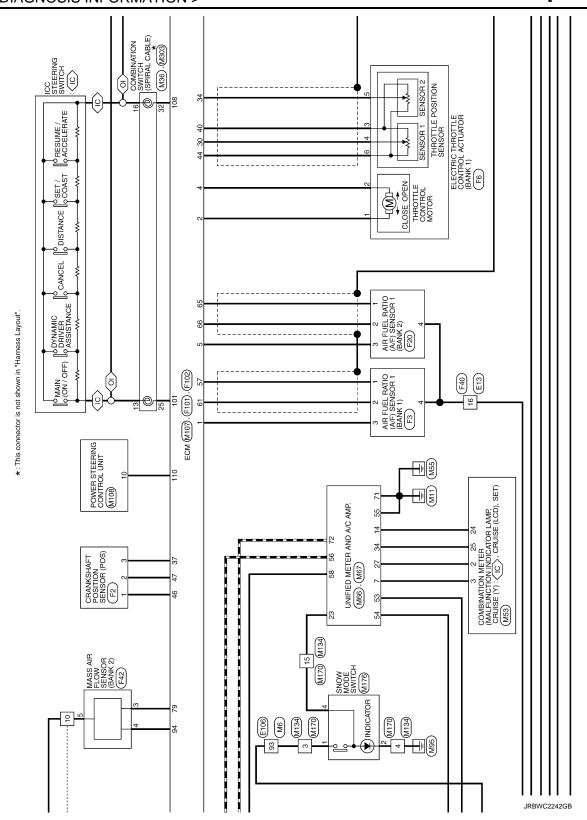
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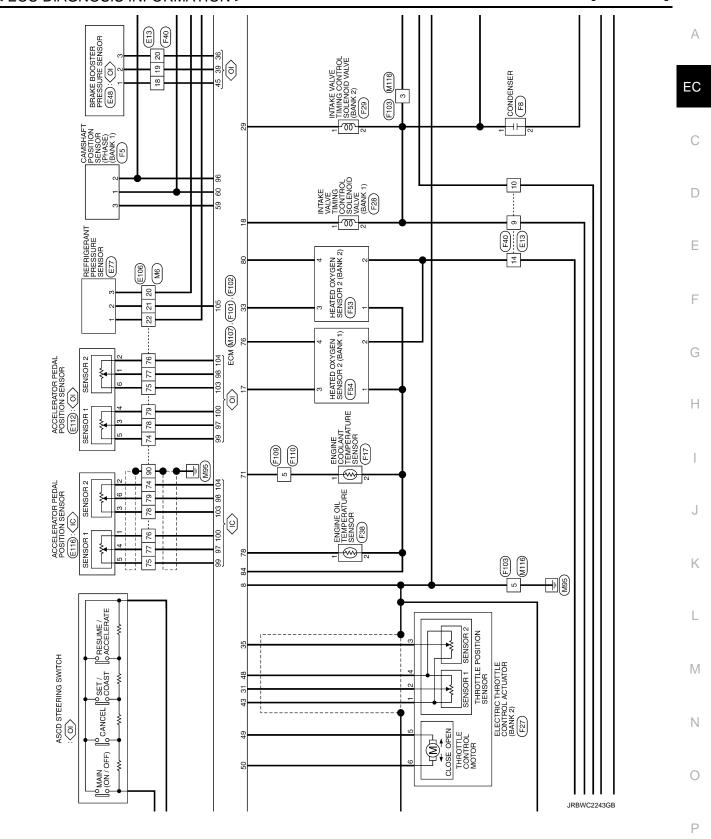
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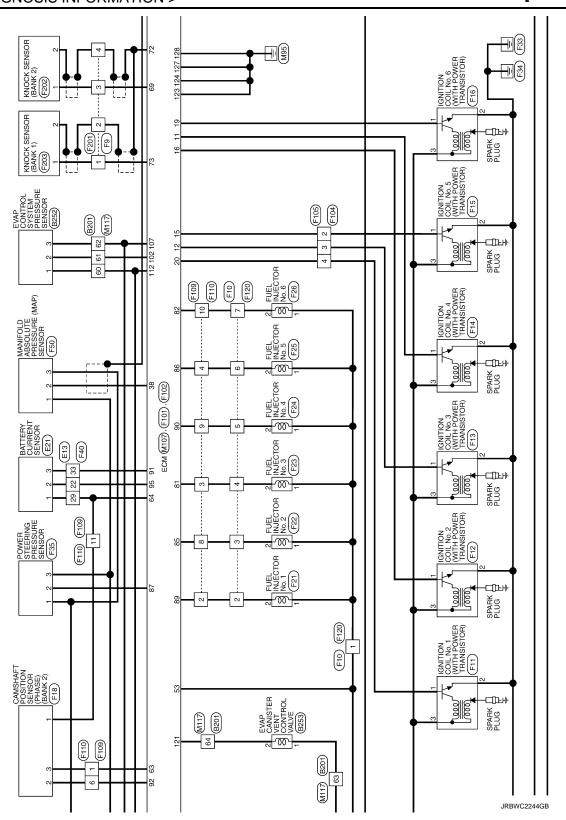
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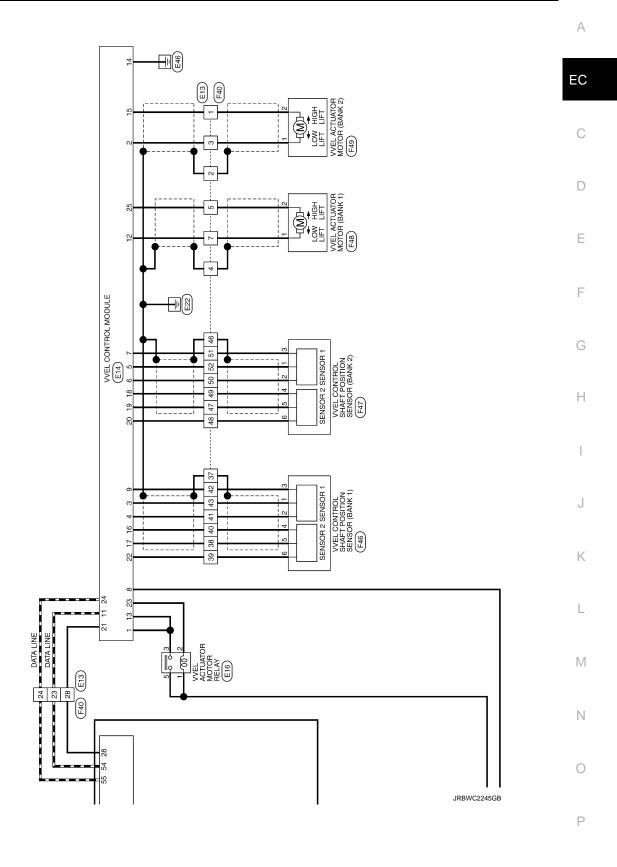












ENGINE	ENGINE CONTROL SYSTEM									
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Connector Name	WIRE TO WIRE	62	SHELD		Connector Name	ime WIRE TO WIRE	Connector	Connector Name WIRE TO WIRE	WIRE	
Connector Type	TH80FW-CS16-TM4	83	ď		Connector Type	pe NS12FW-CS	Connector Type	Type TH80FW-CS16-TM4	SS16-TM4	
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$\dashv$		82	>		7		10	M	i.	
13 LG		98	9		$\dashv$		15	SB		
$\dashv$		87	>		$\dashv$	BR -	16	>	1	
2 re		88	œ		$\dashv$	BG -	17	H.		
-		88	В		-	LG -	56	BR		
$\dashv$		06	BG	-	12	GR -	27	٦	-	
		91	9				28	Υ .		
		95	BR	-			59	Υ.	-	
11 SHIELD	- ·	93	O		Connector No.	i. B22	30	GR		
Н		94	SB	-	Connector Name	FIEL FVELSENSOR INT AND FIELD PURAP MARKS	31	æ	1	
$\dashv$		92	O				32	H.		
57 B		96	>		Connector Type	pe E05FGY-RS	33	9	-	
	-	86	Μ	-			51	В	-	
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ENGINE CONTROL SYSTEM   72   W     73   BR     75   Y	Corrector No. 8250 Corrector Name BRAKE BOOSTER CONTROL UNIT	Connector No. 8253 Connector Name Evus Canaster year Control valve	
80 V 81 SB 82 LG	Corrector I ype   IK24+W	Connector Type LCZFH-KS	Connector I ype   I H08+W-NH
84 R	1 2 6		414033
	10 12 14 15 17 19 20 21 24 24	lis.	46 45 44 43
+	la Ia	la l	la Ia
+	1 W BATTERY	1 P	39 P
+	≥ 0	2 L -	7
. 5 06 0 76			41 blw -
Н	R BRA	Connector No. E5	Н
100 L	10 G BOOSTER SOL PWR 12 R BOOSTER SOL GND	Connector Name FINGING ENGINE ROOM FOR ENGINE ROOM FOR (INTELLIGENT POWER DISTRIBUTION MODULE FINGING ROOM)	45 G -
		Connector Type TH20FW-CS12-M4-1V	1
Connector No. 18249	15 LG RELEASE SW (NC) 17 L BRAKE PRESSURE SEN SIGNAL	•	Connector No.
	89		9
Connector Type TK24FGY	n >-	4 6 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	
	22         P         RELEASE SW (NO)           24         BG         BRAKE PRESSURE SEN GND		
E		10 TO	
40 40	Connector No. B252	Feminal Color Of   Signal Name [Specification]   No.   Wire   Signal Name [Specification]	
46 47	Connector Name EVAP CONTROL SYSTEM PRESSURE SENSOR	5 V	
	Connector Type E03FGY-RS	H	
Terminal Color Of No Wire Signal Name [Specification]		12 B/W -	Terminal Color Of Signal Name [Specification]
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ENGIN	ENGINE CONTROL SYSTEM							
4		13	_		<u>હ</u>	Connector No.	E14	Connector No. E16
4		41	O		5	Connector Name	W/EL CONTROL MODILE	Connector Name 1///EL ACTUATOR MOTOR RELAY
80 V		15	ď		3	meeton regime	VALLE CONTINCE MICEORE	CONTRACTOR INC. LOCATION INC.
		16	PT	-	Š	mector Type	Connector Type RH18FB-AJZ8-RH	Connector Type 24347_9F900
		18	\ 					
Connector No.	. E9	19	BG		_	7		
		20	В			•		
Connector Name	Me ENGINE ROOM)	21	88		_		7 1 2 3 4 5 6 7 8 9 11 12 13 1	
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		/7	5		<u>ē</u>	g g	Signal Name [Specification]	<u>a</u>
٧   	97 92 91	58	>		ב ד	No.	┪	No. Wire
		59	۵			^	WEL ACTUATOR MOTOR POWER SUPPLY (BANK 2)	1 R
	104	30	œ			2 L/B	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 2)	2 GR -
		31	æ		L	3	WEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)	> >
Terminal Color Of		32	>			W W	SENSOR GROUND INVEL CONTROL SHAFT POSITION SENSOR (1 BANK 1)	5 R
No.	Wire Signal Name [Specification]	c c	C		<u> </u>	ł	SANGLY DOGREDON CHART DOCUMENT ON CONTROL OF THE CO	┨
+	D	3	2 2		 	+	WEL CONTROL SPAFF FOSTI ON SENSOR 1 (BARN 2)	
+	,	34	Se		_	a o	SENSOR GROUND INVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2);	-[
92 B	BG .	37	SHIELD	OT		7 SB	-	Comnector No. E17
	_ ^	88	_			8 BG	POWER SUPPLY FOR VVEL CONTROL MODULE	
104 Li		39	۵	,		97 6	SENSOR POWER SUPRICY [VALL CONTROL SHAFT POSITION SCHSOR 1 (BANK 1)]	COMPECTOR NAME COULING FAIN RELAY
ł		40	ď		Ĺ	11	FNGINE COMMUNICATION LINE	Connector Type   24347 9F900
		5 2	· M		Ľ	+	VAZEL ACTIVITOD MOTOR (HICH LIED, (BANK 4)	٦.
- In the second	2,5	Ş	1		ľ	+	VACE ACTORION INCIDA (IIIGI EIFT) (DAVA 1)	
COLLINECTOR INC.	- 1	45	2 (		1	+	3	
Connector Name	me WIRE TO WIRE	43	9		_	14 B/W	┪	
		45	BG			15 L/Y	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 2)	
Connector Type	pe SAA36MB-RS8-SHZ8	46	SHELD	. 91		16 R	WEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)	
		47	Μ			17 L	SENSOR GROUND (IVVII. CONTROL SHAFT POSTTON SENSOR 2 (BANK 1))	
_		48	BR		Ľ	18 G	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)	
,	2 3 2 5 5	40	ď		Ľ	ł	The departure of the contract	
	2 2	P	1		ľ	+	SERVICOROUND JULES CLASS HOLD SHAFT PUBLICAN SERVICE (BANKLO)	
		96	n		1	Z0 BK	SENSOR POWER SUPPLY IVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 28)	<u> </u>
2		21	S			21 ^	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL	No. Wire
		25	ď			22 P	SENSOR POWER SUPPLY (VALL CONTROL SHAFT) POSITION SENSOR 2 (BANK 1)]	1 B
	8 12 13 13 13 13 13 13 13 13 13 13 13 13 13				Ľ	23 GR	VVEL ACTUATOR MOTOR RELAY	2 P
					Ľ	+	FNGINE COMMUNICATION LINE	$\frac{1}{1}$
Totalog	30 ::				Î	ľ	Š	+
No Mo	Signal Name [Specification]					1	+	1
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Corrector No. E103 Corrector Name FUSE BLOCK (J/B) Corrector Type NS16FW-CS	H.S.	Terminal Color Of   Signal Name   Specification   No. Wire   SB	ctor No	Corrector Type NST2MW-CS  Corrector Type   NST2MW-CS		No. Wire Sgrai Name [Specincation] 1 W 2 BR	3 L SHELD 5 Y 5	9 BR
Connector No. E67 Connector Name ICC SENSOR INTEGRATED UNIT Connector Type RS06FB-PR	H.S.	Terminal Cook Of   Signal Name (Specification)   1	ector No. E77	ne REFRIGERANT PRESS RK03FB	<u> </u>		, BG	
Corrector No. E48 Corrector Name BRAKE BOOSTER PRESSURE SENSOR Corrector Type RH03FB	H.S.	Terminal Color Of   Signal Name (Specification)   No.   Wire   Y   AVC02_MVPRES   2   BG   MVPRES   3   B   GNDA_MVPRES	Connector No. ESO Connector Name ICC BRAKE HOLD RELAY Connector Type M09FGY-R-US	H.S.	Terminal Color Of   Signal Name [Specification]   No. Wire   V	3 P S S S S S S S S S S S S S S S S S S	× .	
ENGINE CONTROL SYSTEM Connector Name BATTERY CURRENT SENSOR Connector Type RH03FB	H.S.	Terminal Color Of Nure   Signal Name   Specification  Nu. Wire   P	Corrector No. E37  Corrector Name COOLING FAN CONTROL MODULE  Corrector Type SLZ01FGY-SNZ2	H.S.	Terminal Color Of   Signal Name [Specification]	3 R		

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Conne	Connector Type	e TH80FW-CS16-TM4	20	۵	-	100	Ь		Connector Type M02FBR-LC
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	1		\$	BG	,				
	-	- 60 00 00 00 00 00 00 00 00 00 00 00 00	2/	¥ :	•	Connector No.	No. E109		I
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n	+		0 1	\$ (		lerminal Color Of		Signal Name [Specification]	- 1
00	+		V	¥ :		o .	0		Connector Name   ACCELERATOR PEDAL POSITION SENSOR
6	$\dashv$		72	>		-	9		
10	_	-	73	В	-	2	SB	_	Connector Type RH06FB
11	SB	-	74	BR	- [With ICC]				
12			74	_	- [Without ICC]				
13	L	-	22	9	- [With ICC]	Connector No.	No. E110		K
14	œ		75	Μ	- [Without ICC]		CTOTIVE GAME	i OH	
15	L	-	9/	Μ	- [With ICC]	Connector Name	Name SLOP LAMP SW	5	(12 3 4 5 6)
16	L		9/	>	- [Without ICC]	Connector	Connector Type M04FW-LC		<i></i>
17	g	-	77	۵	- [Without ICC]				
18	╀		77	œ	- [With ICC]	_	•	[	
20	BB	-	78	æ	- [Without ICC]		•		Terminal Color Of
21	H		78	_	- [With ICC]	_		2 4	No. Wire Signal Name [Specification]
22	╀		6/	Ŀ	- [Without ICC]		ć	F (	۲
23	9		79	>	- [With ICC]	=	á	1 2	2 Y
24	L		80	SB				]	3 BR
25	≻		84	ď					4 L
26			82	SB		Terminal Color Of			9
27	≽	,	83	8		ġ	Wire	ogral varie (opecification)	- M 9
28	L		88	O		-	1	ı	
31	BG	-	82	Ŀ		2	*		
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8 8	2		68	. B			3		
35	+		06	SHIFLD					
36	σ̈	- 1	6	≥	,				
37			95	>					
38	BR	-	83	>					
39	╀		94	9T	,				
4	╀		95	BB					
42	· ·		95	۵					
_	4		<u>.</u>						

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F5 OAMSWAT POSITION SENDOR (PHASE) (BANK 1) RH03FB		Of Signal Name [Specification]	Corrector No.   F6  Corrector Name   ELEGING TRECTILE CONTROL ACTUATOR BANK 1)  Corrector Type   RHV6FB	123456	Signal Name [Specification]   MoTORR-1   MOTORR-1   MOTORR-2   GND-4(TPS)   TPS-1   CUIPUIZ(TPS)   INPUIT(TPS)   INPUIT(TPS)   MPUIT(TPS)   MATORIA   MATO
Connector No. F5 Connector Name CAMSHAFTI Connector Type RH03FB	H.S.	Terminal Color Of No. Wire 1 G 2 P 3 O	Connector No. F6 Connector Name ELECTROP Connector Type RH06FB	H.S.	Terminal Color Of No. Wire   Wire   Virginia   Virgin
F2 CRANKSHAFT POSITION SENSOR (POS) RH09FB		Signal Name (Specification)	F3 ARF LEL RATIO (A.F.) SENSOR 1 (BANK 1) RHOMNDGY-BR	4321	Signal Name (Specification)
Connector No. F2 Connector Name CRANKSH Connector Type RH03FB	H.S.	Terminal Color Of No. Wire 1 R 2 Y 3 W	Connector No. F3 Connector Name ARF LEL RATIO (A) Connector Type RHO4MDGY-BR	H.S.	Terminal Color Of No. Wire   Wire   1
Ocnrector No. E301 Corrector Name couns ray counte (cocuse frantacion) Corrector Type 6189-0259	H.S.	e :	Corrector No. E302  Corrector Name crouns an control around (cocune final vicines)  Corrector Type 6(188-0259	H.S.	Terminal Color Off Signal Name [Specification] 6 7
ENGINE CONTROL SYSTEM  Corrector Name   ACCELERATOR PEDAL ACTUATOR    Corrector Type   KDZ06FB		Signal Name (Specification) (GNITION BATTERY TIS COMM-L GROUND	ITS COMM-H E116 ACCELEATOR PEDAL POSITION SENSOR	AAZ06FB1	
ENGINE COnnector No. Econnector Name Aconnector Type K	H.S.	Terminal Color Of No. Wire 1 R 2 BG 3 P 4 BW	5 L Connector No. E Connector Name	Connector Type A	No.   Wire   No.   Wire   No.   Wire   No.   N
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ENGINE CONTROL SYSTEM Corrector No. F7 Corrector Name Inverse more volune connector Name Inverse more volune connector Name Inverse EUSPIL/RS-LIGY	Connector Nb. F9 Connector Name WIRE TO WIRE Connector Type RSO4FL-B	Connector No. F11 Connector Name armon cou vs. 1 wm Power raws shoq	Corrector No. F13  Corrector Name lowInch to a with Provies Travestoral  Corrector Type E09FOY-RS
H.S.	H.S.	H.S.	H.S.
Terminal Color Of   Signal Name (Specification)   No. Wire	Terminal Color Of   Signal Name [Specification]   No. Wire   W   W	Terminal Color Of   Signal Name   Specification   No.   Wire   Y   Y   Z   E   Z   E   Z   X   W   Z   Z   X   W   Z   Z   X   W   Z   Z   X   W   Z   Z   X   W   Z   Z   X   W   Z   Z   X   Z   Z   Z   Z   Z   Z   Z	Terminal Color Of No.   Signal Name [Specification]   No.   Wire
9 0	Corrector No. F10  Corrector Name WIRE TO WIRE  Corrector Type RH08FB	Corrector No. F12 Corrector Type E03FGV-RS  H.S.	Corrector None Corrector Type E09FGY-RS  H.S.
Terminal Cobr Of Signal Nane (Specification) No. Wire 1 W - 2 B	Terminal Color Of Signal Name (Specification) 1	Terminal Color Of   Signal Name [Specification]   No.   Wire	Terminal Color Of   Signal Name [Specification]   No.   Wire   Signal Name   Specification

JRBWC2363GB

Corrector No. F22 Corrector Name FUEL INJECTOR No. 2 Corrector Type HSIZFGY	H.S.	Terminal Color Of   Signal Name [Specification]   No. Wire   G     1   G     2   ER	Corrector No. F723 Corrector Name FUEL INJECTOR No. 3 Corrector Type HSIZFGY	H.S.	Terminal Color Of   Signal Name (Specification)   No. Wire   Signal Name (Specification)   1
Corrector No. F20 Corrector Name ARFJEL RATIO (AF) SERSOR 1 (BANK 2) Corrector Type RH9MMDGY-BR	H.S.	Terminal Color Of   Signal Name [Specification]   No. Wire   Signal Name [Specification]   2		H.S.	Terminal Color Of Number   Signal Name   Specification   Number   1 G
Corrector No. F17  Corrector Name BNANE COOLANT TEMPERATURE SENSOR  Corrector Type E02FGY-RS	H.S.	Terminal Color Of   Signal Name   Specification  No.   Wire     Y	Cornector Name Ownwortheams general parts (Cornector Name RH03FB	H.S.	Terminal Codor Of   Signal Name [Specification]   Wire   Signal Name [Specification]   1   State   2   G   -
ENGINE CONTROL SYSTEM Connector No. F15 Connector Name Guitancolle & Winterportes Travascribe Connector Type E03FGV-RS	H.S.	Terminal Color Of   Signal Name [Specification]   No. Wire   V	Connector No. F16  Connector Name ownow.co.u.e.e.with Power Traves/1769  Connector Name E03F/CV-RS	H.S.	Terminal Color Of   Signal Name [Specification]   No.   Wire     Signal Name   Specification]   1   SB

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SONTROL S F38 ENGINE OIL TEMPE E02FGY-RS Signal Name F40 WIRE TO WIRE SAA36FB-RSS-SH28 SAA36FB-RSS-SH28	23	F46	X03FB F48 X03FB F48 X03FB X03F
Terminal Cadro Off   Terminal Cadro Off   Terminal Cadro Off   Signal Name   Specification     1	1 1 1 15 15 1 1 1	H.S.	Terminal Clodor Of   Signal Name [Specification]   No. Wire   1 U/B   2 U/V

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Corrector No. F102 Corrector Name ECM Corrector Type RH40FBR-R28-LLH-Z	1	Terminal Color Of Signal Name [Specification]	49 GR	1) (OPEN) 50 V THROTTLE CONTROL MOTOR (OPEN) (BANK 2) PLYBANK 3) 52 R THROTTLE CONTROL MOTOR BELLAVENANCE SURPLY (BANK 2)	23 W	<u>₹</u>	55 LG CANCOMMUNCATIONLINE (VVEL CONTROL MODULE) 57 A/F SENSOR 1 (RANK 1)	59 O CAMSHA	60 G SENSOR POWER SUPPLY	61 R	63 L CAMSH	1) 64 SB S	99 FG	> 0	/0	W KNC	71 Y ENGINE C	5 SHIELD	BANK 2) /3 W KNOCK SENSOR (BANK 1) 76 W HEATED OXYGEN SENSOB 2 (BANK 1)	87	2 8 Z	1) 79 BR	) 80 O HEATED	81 R	82 V F	R 84 B	R 85 BR	86 W	, 87 Y POWER	89 GR	Y 90 O FUEL INJECTOR NO. 4	200	P POWER S
Cornector No. F101 Connector Name ECM Connector Type RH40FB-RZ8-L1H-Z	S. H. S.	Terminal Color Of Signal Name [Specification]	Н	2 G THROTTLE CONTROL MOTOR (BANK 1) (OPEN 3 R THROTTLE CONTROL MOTOR BELLAY POWER SUIDEN Y PRANK.	t.	W A/F SEN	8 B ECM GROUND 11 GR IGNITION SIGNAL NO 4		15 V IGNITION SIGNAL NO. 5	Н	17 P HEATED OXYGEN SENSOR 2 HEATER (BANK 1)	W NT CON	SB	> 8	23 D CHR EWP CANISTER PURGE VOLUME CONTROL SOLENOID WALVE	- ECM	25 0 THROTTLE CONTROL MOTOR RELAY	28 BR VVELACTUATOR MOTOR RELAY ABORT SKRAL (VVEL CONTROL MODUL	+	α	SB	34 B THROTTLE POSITION SENSOR 2 (BANK	W THROTTLE	0	Α	0	P BRAKE BC	œ	9	<u>-</u>	45 LG SENSOR POWER SUPPLIA	<b>4</b> >	. в
Corrector No. F53 Corrector Name HEATED OXYGEN SENSOR 2 (BANK 2) Corrector Type AFZ04FB	H.S.	Terminal Color Of Signal Name [Specification] No.		3 SB	+		Connector No F54	_	Connector Name   HEATED UXYGEN SENSOR 2 (BANK 1)	Connector Type AFZ04FB				(412)	1.5			D Inc	NO. Wife	2 8		4 W											
ENGINE CONTROL SYSTEM Corrector No. F50 Corrector Name (MARFOLD ABSOLUTE PRESSURE (MAP) SERSOR Corrector Type RH03FB	H.S.	Terminal Color Of Signal Name [Specification]	1	3 w GND		Γ	Connector No. F51	Connector Name A/T ASSEMBLY	Connector Type RK10FG-DGY	\ \	<		5 4 3 2 1	, (			Terminal Color Of	No. Wire Signal Name [Specimoation]	7 RP RATTERY DOWER SUPPLY	c	>	5 B GROUND	¥	BACK-U	97	9 GR STARTER RELAY							

JRBWC2367GB

HNGIN 98 98 98	ENGINE CONTROL SYSTEM   SENSOR GROUND   SO   SENSOR GROUND   SENSOR GROUND   SO   SENSOR GROUND   SENSOR GROUND   SENSOR GROUND   SENSOR GROUND   SENSOR G	Connector No.   F104 Connector Name   WIRE TO WIRE Connector Type   TH50FW-NH	Connector No. F109 Connector Name WIRE TO WI Connector Type TH12FW-NH	F109 WIRE TO WIRE THTE/W-NH	Corrector No.         F120           Corrector Name         WIRE TO WIRE           Corrector Type         R+030AB
Connector No. Connector Name Connector Type	Connector No. F103 Connector Name VINE TO WIRE Connector Type TK38FW-NS10	H.S.	H.S.	0 2 1 4 0 5 0 0 0 0 0 1 0 1 0	H.S.
H.S.		Terminel Color Of   Signal Name   Specification   1   P	Terminal Color Of No. Wire 1 L 2 GR	Signal Name [Specification]	Terminal Color Of   Note   Signal Name   Specification   Note   Note
Terminal Col	Color Of Signal Name [Specification]	$\mathbb{H}$	++		+
3 2	9 M	7 R	9 8 B		-
4 9			H		
Н	· ·	Connector No. F105	11 SB		Connector No. F201
+	noutivoi -	$\neg$			
19	O - [With ICC]	Connector Type TH08MW-NH	Connector No.	F110	Connector Type RS04ML-B
+	- B		Connector Name	WIRE TO WIRE	
29	. 91		Connector Type TH12MW-NH	TH12MW-NH	
+	GR	1234	_		
34		678	<b>\</b>		H.3.
38 33			Ę	1 2 3 4 5 6	
37	. >	L	ij	8 9 10 11	al Color Of
38		No. Wire signal vame [specification]			No. Wire Signal Name [Specification]
+		d :			W <u>r</u>
45		+	No. Wire	Signal Name [Specification]	3 W
46		ł	t		SHIELD
		6 GR	2 GR		
		7 R -	3 R	-	
		8 0			
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			9 88 9 BB	1 1	
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	•						1 1	,								-						,			-		-			-		-		-				,	-				-	- [with ICC]	- [Without ICC]	-	- [Without ICC]	- [with ICC]
>	SB	> 8	9g -	- M	. a	. 8	<u> </u>	. >	. (5)	U	_	9	В	M	Ж	SHIELD	۸	98	18 18	*	BG	BG	Μ	-	Ь	18 18	Υ	9	W	1	9	as	9	В	>	œ	SHIELD	>	GR	97	97	λ	as.	HB.	7	9	GR	Μ
16	17	18	20	20	33	24	25	26	27	28	31	32	33	34	32	36	37	38	39	41	42	43	45	49	20	51	54	22	59	09	61	62	63	64	92	99	29	89	69	70	7.1	72	73	74	74	75	76	9/
M2	PLISE BLOCK (J/B)	_	MSTUFW-CS				48 38	98 88 78 68 58			L	e Signal Name (Specification)				•						M6	CH Lidway		e TH80MW-CS16-TM4		999	3 (4) 2 (2) 3 (3) 4 (4) 4 (4) 4 (4)	S 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		2 8 9 9 9 9 9			Of Sinnal Nama [Snacification]					OT									
Connector No.	Connector Name		Connector Type	•			Ę	Ź			Terminal Color Of	. Wire	3	9 6	3 BG	٤ ٨	L	H	SB SB			Connector No.	I I	Connector Name	Connector Type			•		ЫE	ì			a	7		$\dashv$	┪	SHIELD	9	H		_	Н	5 BG	+	Н	9 2
Com	ě		Ē	-			_	1	ļ		Term	-Si	38	4B	2B	99	7B	8B	9B			Son	į	3	Conn					_	4			Term	ટ		2	က	4	2	∞	6	10	11	12	13	1	15
0.   F301	ame TCM (TRANSMISSION CONTROL MODILLE)	$\neg$	ype SP10FG	<	<b></b>		(1 2 3 4 5	6 7 0 0 10	0 0		Color Of		- IGNITION POWER SUPPLY	- BATTERY POWER SUPPLY	- CAN-H	- K-LINE	- GROUND	- IGNITION POWER SUPPLY	- BACK-UP LAMP RELAY	- CAN-L	- STARTER RELAY	- GROUND			o. M1	(di) ADO Id aSI Id	$\neg$	ype NS06FW-M2					0 A 7 B 6 B 5 B 4 B	5 5 5	]	•	lor Of Signal Name [Specification]	Wire	GR -	. 9		- ·	· ·	·	R -	L -	Ī	
Connector No.	Connector Name		Connector Type		1	•	Ę	ï			Terminal Col	S S	1	2	3	4	2	9			6	10			Connector No.	Connector Name	JI INCIONING	Connector Type			`		VIII/			ŀ	<u>e</u>	┪	_	2A	3A	L	5A	P49	Н	8A		
ENGINE CONTROL SYSTEM   Corrector No.	Connector Name KNOCK SENSOR (BANK 2)	(2.11.2)	Connector Type _EUZFG-KS-LG?		[		_				Ē	Signal Name [Specification]	1 W	2 SHIELD -			Connector No. F203	CAN COUNTY OF THE PROPERTY OF	COINECTOL MAILE INVOCA SENSOR (BAINN 1)	Connector Type E02FG-RS-LGY		_					Ď.		77	No. Wire ognial Marile [opecification]	1 W	2 SHIELD -		•			<u>≓</u>											

JRBWC2369GB

Corrector No. M36 Corrector Name coulenation syntch (spread, cast.E)	Connector Type TK08FGY-1V		33,25,36		31 32 34 34		Terminal Color Of Signal Name [Specification]	۲	Ë	26 B -	<b>-</b>	33 B -	34 °C	┨		Connector No. M53	Connector Name COMBINATION METER	Connector Type TH40FW-NH	1			7	112 125878291 3 83399			Signal Name [Specification]	t	COMM	3 GR COMMUNICATION SIGNAL (AMPMETER)	5 B GROUND	6 P ALTERNATOR SIGNAL	BR	G SEC	15 B GROUND	۵۵	œ	BG IGNITIO	2
							M94		DATA LINK CONNECTOR	BD16FW				14 16	3 4 5 6 7 8			Signal Name [Specification]		•		•			,													
H	+	¥ >	9 >	+	: œ		Connector No			Connector Type	•	1	Į	Ę	ì		201-0	Wire	t	Н	e	>	G	Ĥ	۵ ;	-												
88 88 06	92	93	95	8 8	66		Conne		Conne	Conne	-	J.		_	•		F	2	9	4	S 8	_	80	7	4 4	2												
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> ७ ≥ 8	g 9	SHELD	> >	· «	3	ď	SHIELD	۵	SB	7	a -	_ a	æ	>	٦	GR.	2 8	9 >	œ	۵	] HEI D	æ	g	SHIELD	g :	> 5	SHELD	Μ	O	Я	Μ	>	a 1	۵ و	5 8	91	œ	1
15 17	19 48	21 50	22	27	58	58	3 30	32	33	34	8	37	88	38	44	45	40	49	20	09	9 6	8	64	92	9 [	è %	69	20	73	74	75	92	  -	78	88	82	98	
ENGINE CONTROL SYSTEM 77 - With ICC  78 R - With ICC  78 R - With ICC  79 R - With ICC  70 R - With ICC  70 R - With ICC  71 R - With ICC  72 R - With ICC  73 R - With ICC  74 R - With ICC  75 R - With ICC  76 R - With ICC  77 R - With ICC  78 R - With ICC  79 R - With ICC  70 R - With ICC  70 R - With ICC  71 R - With ICC  71 R - With ICC  72 R - With ICC  73 R - With ICC  74 R - With ICC  75 R - With ICC  76 R - With ICC  77	- [Without ICC] - [Without ICC]	- [with ICC]	1			,	1 1							1						M7	WIRE TO WIRE	TH80MW-CS16-TM4			4 4 4	S S S S S S S S S S S S S S S S S S S				Complete Com	orginal realine [opecinication]		<ul> <li>[Without automatic drive positioner]</li> </ul>					
NE O	∝ ≥ :	≻ ®	SS S	3 >	. ტ	٦	≼ ⊿	GR	SHIELD	M	> 8	K d	GR	Μ	٦	SHIELD	> 8	9		Connector No.	Connector Name	Connector Type		1	•	3	į			Terminal Color Of	Wire	SB	>	9 G	2 ≥	: В	SB	

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ENGINE	ENGINE CONTROL SYSTEM								
24 BR	COMMUNICATION SIGNAL (LCD-AMP.)	Connector No.		M67	Connector No.	Ш	M107	Connector No.	M108
25 Y	COMMUNICATION SIGNAL (AMPLCD) VEHICLE SPEED SIGNAL (8-PH SE)	Connector Name	_	UNIFIED METER AND A/C AMP.	Connect	Connector Name	ECM	Connector Name	POWER STEERING CONTROL UNIT
╁		Connector Type	۳	TH32FW-NH	Connect	Connector Type	RH24FGY-RZ8-R-LH-Z	Connector Type	TH12FW-NH
28 W	BRAKE FLUID LEVEL SWITCH SIGNAL		1						
H	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)		7		_	7		_	
30 C		•	•			1	124		[
+	_ (	•	Ī		_	Į	123	Į	=+
30	SELECT SMITCH SIGNAL	•	7	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	•	4	400 122 114 110 116 116 116 116 116 116 116 116 116	\ \	3 5 6
+	ENTED SWITCH SIGNAL		Ī	20 28 20 10 27 20 20 20 82 92					8 10
╀	TRIP A/B RESET SWITCH SIGNAL								
39 B		Terminal	Color Of		Terminal	Color Of		Terminal Color Of	
40 BG		ģ	Wire	Signal Name [Specification]	Ź		Signal Name [Specification]	No. Wire	Signal Name [Specification]
		41	>	ACC POWER SUPPLY	6	œ	ACCELERATOR PEDAL POSITION SENSOR 1	1 LG	EPS SOL+
		42	>	FUEL LEVEL SENSOR SIGNAL	86	۵	ACCELERATOR PEDAL POSITION SENSOR 2 [Without ICC]	3	IGN
Connector No.	M66	43	œ	INTAKE SENSOR SIGNAL	86	>	ACCELERATOR PEDAL POSITION SENSOR 2 [With ICC]	2 B	EPS SOL-
		44	PI	IN-VEHICLE SENSOR SIGNAL	66	9	SENSOR POWER SUPPLY [With ICC]	9 9	GROUND
Connector Name	UNIFIED METER AND A/C AMP.	45	۵	AMBIENT SENSOR SIGNAL	66	7	SENSOR POWER SUPPLY [Without ICC]	8	VEHICLE SPEED(2P)
Connector Type	TH40FW-NH	46	BG	SUNLOAD SENSOR SIGNAL	100	Α	SENSOR GROUND	10 R	ENG TACHO
		47	9	EXHAUST GAS / OUTSIDE COOR DETECTING SENSOR SIGNAL	101	SB	ASCD/ICC STEERING SWITCH		
_		53	G	IGNITION POWER SUPPLY	102	97	EVAP CONTROL SYSTEM PRESS SENSOR		
		54	<b>&gt;</b>	BATTERY POWER SUPPLY	103	9	SENSOR POWER SUPPLY [Without ICC]	Connector No.	M116
•	ŀ	22	В	GROUND	103	_	SENSOR POWER SUPPLY [With ICC]	1	Light Of Light
Ę	7	99	7	CAN-H	104	BR	SENSOR GROUND [With ICC]	COLLINECTOL NATI	
	23 25 27 28 39 34 35	25	Μ	BRAKE FLUID LEVEL SWITCH SIGNAL	104	GR	SENSOR GROUND [Without ICC]	Connector Type	TK36MW-NS10
		28	BR	FUEL LEVEL SENSOR GROUND	105	٦	REFRIGERANT PRESS SENSOR		
		29	GR	INTAKE SENSOR GROUND	106	W	FUEL TANK TEMPERATURE SENSOR	_	
Terminal Color Of	Sized Nome [Secutions]	09	٦	IN-VEHICLE SENSOR GROUND	107	BG	SENSOR POWER SUPPLY		
No. Wire		61	BR	AMBIENT SENSOR GROUND	108	Υ.	SENSOR GROUND		<b>第</b>
2 F	MANUAL MODE SHIFT UP SIGNAL	62	SB	SUNLOAD SENSOR GROUND	109	G	PNP SIGNAL	S E N	9 30 (3 (3) (3) (4) (4) (4) (4)
7 GR		63	ч	•	110	ч	ENGINE SPEED OUTPUT SIGNAL		
7 8		65	BG	ECV SIGNAL	112	>	SENSOR GROUND		
BS 6	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)	69	٦	A/C LAN SIGNAL	113	Ь	CAN COMMUNICATION LINE		
$\dashv$	MANUAL MODE SIGNAL	20	œ	EACH DOOR MOTOR POWER SUPPLY	114	7	CAN COMMUNICATION LINE	la l	Of Sinnal Name [Specification]
$\dashv$	NON-MANUAL MODE SIGNAL	7.	ω (	GROUND	117	> .	DATA LINK CONNECTOR	No. Wire	
14 BK	COMMUNICATION SIGNAL (LCD-AMP.)	7.7		CAN-L	121	<u>ي</u>	EVAP CANISTER VENT CONTROL VALVE	2 6	
20 L	ION ONOFF SIGNAL				122	a (	STOP LAMP SWITCH	3	,
Z3 Y	AL SNOW SWITCH SIGNAL				123	20	ECM GROUND	+	
-					124	В	ECM GROUND	$\dashv$	
					125	æ	POWER SUPPLY FOR ECM	9 R	-
28 R	VEHICLE SPEED SIGNAL (8-PULSE)				126	BR	ASCD/ICC BRAKE SWITCH	10 R	
30 ^	PARKING BRAKE SWITCH SIGNAL				127	В	ECM GROUND	19 BG	
34 →					128	В	ECM GROUND	20 Y	
38 P	BLOWER MOTOR CONTROL SIGNAL							28 B	
								29 LG	
								Н	
								33 B	
								34 B	
								35 L	-

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ENGINE CONTROL SYSTEM		Connector No. M126	Connector No. M170
Н	65 B -	Connector Name WIRE TO WIRE	Connector Name WIRE TO WIRE
43 P	Т	Connector Type M03MW-LC	Connector Type TH24FW-NH
H	R	•	•
45 BG .	· A 69		
┨	71 SB		
	Н	\(\frac{1}{2}\)	987654321
Connector No. M117	Н	57	20 19 18 17 16 15 14 13
Connector Name WIRE TO WIRE	75 W		
	+		
Connector Type TH80MW-CS16-1M4	84 SB	Terminal Color Of Signal Name [Specification]	Terminal Color Of Signal Name [Specification]
	83 P	۲	t
	84 R	2 Y	2 R
	85 L	3 R	3 BR -
	- BG BG		Н
2 5 9 0 0 0 0 0	-		5 SB -
		Connector No. M134	6 GR -
	$\dashv$	Connector Name WIRE TO WIRE	$\dashv$
Terminal Color Of Signal Name [Specification]	92 G	-	+
. wire	+	COLLINGTON 1 ype 1724WW-177	+
- "	+	•	
+	2 2		* >
25 C	- da 00		- 0
+	+	1 2 3 4 5 6 7 8 9	+
10 W	. >	. s	Ŧ
Ŧ		13 T4 T5 T6 T/ T6 T8	+
╀	SB		20 R
H		Terminal Color Of	
26 BR -		No. Wire Signal Name [Specification]	
27 LG -	Connector No. M125	1 R	Connector No. M176
28 Y .	Connector Name WIRE TO WIRE	+	Connector Name SNOW MODE SWITCH
- 52 Y		3 BK	
+	Connector Type Intogravatio		Competed Type TAGGTW
+		ł	
0 88		7 B	
-	-	8 B	
L	<u> </u>	В 6	
L	3.2	13 W	1.3
		14 W	
		15 Y -	
59 SHIELD -	) lar	Н	) le
	0	17 B -	
61 LG -	+	18 L	_
62 BR -	+	4	2 B -
63 1	3 R	20 L	Y Y

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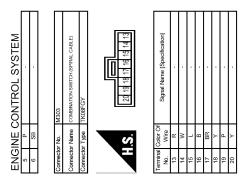
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JRBWC2373GB

### **ENGINE CONTROL SYSTEM SYMPTOMS**

< SYMPTOM DIAGNOSIS >

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## SYMPTOM DIAGNOSIS

### **ENGINE CONTROL SYSTEM SYMPTOMS**

Symptom Table EC

SYSTEM — BASIC ENGINE CONTROL SYSTEM

							S	/MPT	ОМ						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warrant	y symptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-510
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-631
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-507
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-97
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-528
	Incorrect idle speed adjustment						1	1	1	1		1			EC-14
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-418, EC-425
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-14
	Ignition circuit	1	1	2	2	2		2	2			2			EC-517
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			EC-164
Mass air	r flow sensor circuit	1			2										EC-188, EC-194
Engine	coolant temperature sensor circuit	,					3			3					EC-213, EC-220
Air fuel ı	ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-228, EC-232, EC-235, EC-478
Throttle	position sensor circuit						2			2					EC-216, EC-287, EC-414, EC-416, EC-427
Accelera	ator pedal position sensor circuit			3	2	1									EC-483, EC-487, EC-492
Knock s	ensor circuit			2								3			EC-297

[VQ37VHR]

						S	/MPT	ОМ						
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Engine oil temperature sensor			4		1						3			EC-285, EC-284
Crankshaft position sensor (POS) circuit	2	2												EC-300
Camshaft position sensor (PHASE) circuit	3	2												EC-304
Vehicle speed signal circuit		2	3		3						3			EC-361
Power steering pressure sensor circuit		2					3	3						EC-372
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-380, EC-382
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-185
Manifold absolute pressure (MAP) sensor											3			EC-200
Brake booster pressure sensor											3			EC-375
VVEL control module	3		4	4	3									EC- 468,EC- 470
VVEL actuator motor	3		4	4	3									EC-400
VVEL actuator motor relay	3		4	4	3									EC-404
VVEL actuator shaft position sensor	3		4	4	3									EC-396
PNP signal circuit			3		3		3	3			3			EC-388
Refrigerant pressure sensor circuit		2				3			3		4			EC-530
Electrical load signal circuit							3							EC-505
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-4
ABS actuator and electric unit (control unit)			4											BRC-5

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

### **ENGINE CONTROL SYSTEM SYMPTOMS**

< SYMPTOM DIAGNOSIS >

[VQ37VHR]

							S	/MPT	ОМ							А
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page	EC C
Warranty s	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА		F
Fuel	Fuel tank			7.0			7.11		7	7.0	7.11.1		7		FL-13	Г
	Fuel piping	5		5	5	5		5	5			5			FL-4	
	Vapor lock		_													G
	Valve deposit		5												_	
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_	Н
Air	Air duct														EM-27	
	Air cleaner														EM-27	
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			<u>EM-27</u>	
	Electric throttle control actuator	5			5		5			5					EM-28	J
	Air leakage from intake manifold/ Collector/Gasket														EM-32	K
Cranking	Battery														PG-100	
	Generator circuit	1	1	1		1		1	1					1	CHG-26, CHG-27	L
	Starter circuit	3										1			STR-2 (With GR8- 1200 NI), STR- 5(Without GR8-1200 NI)	M
	Signal plate	6													EM-129	IN
	PNP signal circuit	4	-												TM-75	
Engine	Cylinder head		-	-	_	-		_	-			-			EM 440	0
	Cylinder head gasket	5	5	5	5	5		5	5		4	5	3		<u>EM-116</u>	
	Cylinder block															Р
	Piston												4			1
	Piston ring	6	6	6	6	6		6	6			6			EM-129	
	Connecting rod	υ	U	O	U	υ		U	U			U			LIVI-129	
	Bearing															
	Crankshaft															

[VQ37VHR]

							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	symptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Valve	Timing chain														EM-64
mecha- nism	Camshaft														EM-103
	Intake valve timing control	5	5	5	5	5		5	5			5			EM-103
	Intake valve												3		EM-116
	Exhaust valve														<u> </u>
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			<u>EX-4, EX-6</u>
	Three way catalyst														
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			<u>LU-11, LU-</u> <u>13, LU-15</u>
	Oil level (Low)/Filthy oil														LU-7
Cooling	Radiator/Hose/Radiator filler cap														<u>CO-11</u> , <u>CO-11</u>
	Thermostat									5				•	<u>CO-23</u>
	Water pump	-	_	_	_	_		_	_		4	_			<u>CO-21</u>
	Water gallery	5	5	5	5	5		5	5		4	5			<u>CO-25</u>
	Cooling fan													•	<u>CO-18</u>
	Coolant level (Low)/Contaminated coolant									5					<u>CO-7</u>
IVIS (INFII NATS)	NITI Vehicle Immobilizer System —	1	1												SEC-5

<sup>1 - 6:</sup> The numbers refer to the order of inspection.

### NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS > [VQ37VHR]

### NORMAL OPERATING CONDITION

### FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. However, if the engine speed is above 4,500 rpm, fuel will be cut off in a few seconds. Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled. **NOTE:** 

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, <u>EC-48.</u> "System Description".

#### 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-285, "Component Inspection".

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< PRECAUTION > [VQ37VHR]

## **PRECAUTION**

### **PRECAUTIONS**

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

#### WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see "SRS AIR BAG".
- Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

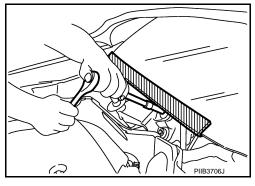
#### **WARNING:**

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the
  ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with
  a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing
  serious injury.
- When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.

Precaution for Procedure without Cowl Top Cover

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



Precautions For Xenon Headlamp Service

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#### **WARNING:**

Comply with the following warnings to prevent any serious accident.

- 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.

[VQ37VHR] < PRECAUTION >

(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.

Comply with the following cautions to prevent any error and malfunction.

- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.
- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

### On Board Diagnostic (OBD) System of Engine and A/T

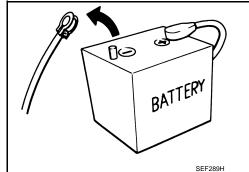
The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

#### **CAUTION:**

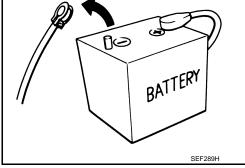
- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-90, "Description".
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

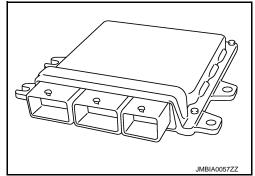
### General Precautions

- Always use a 12 volt battery as power source.
- · Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then 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





**EC-625** Revision: 2013 March 2014 QX50

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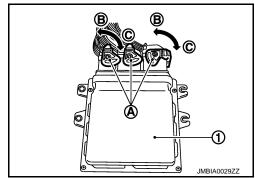
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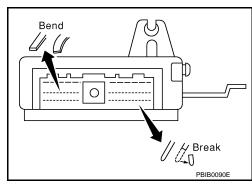
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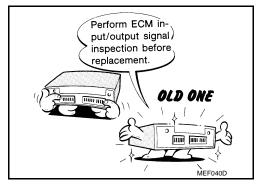
< PRECAUTION > [VQ37VHR]

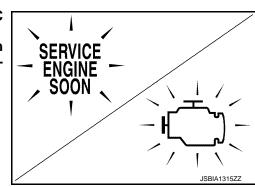
- When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.
- 1 : ECM - C : Loosen



- 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-535</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).
- 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.

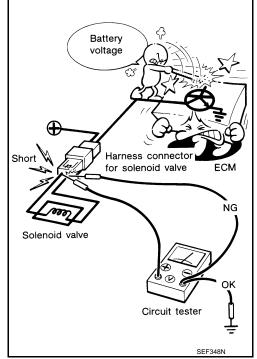




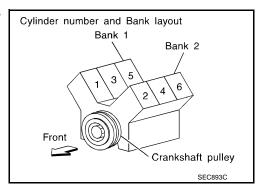


< PRECAUTION > [VQ37VHR]

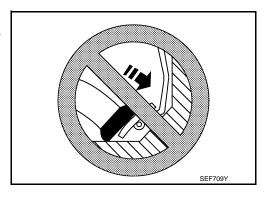
 When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
 Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



- 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.
- Immediately after starting, never rev up engine unnecessarily.
- Never rev up engine just prior to shutdown.



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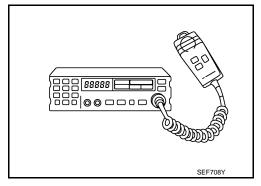
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### **PRECAUTIONS**

< PRECAUTION > [VQ37VHR]

 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 > [VQ37VHR]

## **PREPARATION**

### **PREPARATION**

## **Special Service Tools**

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### NOTE:

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name		Description
(J-44321) Fuel pressure gauge kit	LEC642	Checks fuel pressure

### **Commercial Service Tools**

	Description
	Locates the EVAP leak
S-NT703	
	Applies positive pressure through EVAP service port
S-NT704	
	Checks fuel tank vacuum relief valve opening pressure
S-NT815	
19 mm (0.75 in) More than 32 mm (1.26 in)	Removes and installs engine coolant temperature sensor
	S-NT703  S-NT704  S-NT704

S-NT705

### **PREPARATION**

< PREPARATION > [VQ37VHR]

Tool name (Kent-Moore No.)		Description
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	a Mating surface shave cylinder	Reconditions the exhaust system threads before installing a new oxygen sensor. Use with antiseize lubricant shown below.  a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor
Anti-seize lubricant i.e.: (Permatex <sup>TM</sup> 133AR or equivalent meeting MIL specifica- tion MIL-A-907)	S-NT779	Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

#### [VQ37VHR]

### PERIODIC MAINTENANCE

### **FUEL PRESSURE**

Inspection INFOID:00000000009064364 EC

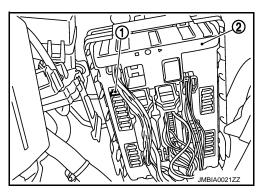
#### FUEL PRESSURE RELEASE

#### (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.
- Reinstall fuel pump fuse after servicing fuel system.



### **FUEL PRESSURE CHECK**

#### **CAUTION:**

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger. NOTE:

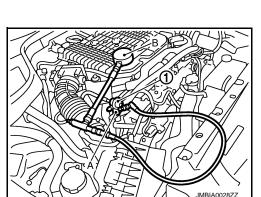
- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because this models do not have fuel return system.
- Use Fuel Pressure Gauge Kit (J-44321) to check fuel pressure.
- Release fuel pressure to zero. 1.
- Install the inline fuel quick disconnected fitting (A) between fuel damper (1) and injector tube.
- 3. Connect the fuel pressure test gauge (quick connector adapter hose) (B) to the inline fuel quick disconnected fitting.
- 4. Turn ignition switch ON and check for fuel leakage.
- Start engine and check for fuel leakage.
- 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.



**EC-631** Revision: 2013 March 2014 QX50

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### **EVAP LEAK CHECK**

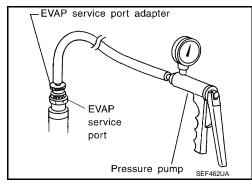
Inspection

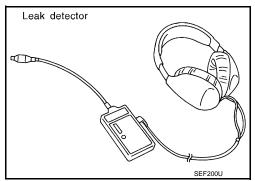
#### **CAUTION:**

- 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.

### (II) WITH CONSULT

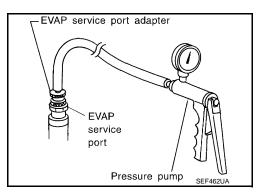
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
- 4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 5. Apply 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 <a href="EC-97">EC-97</a>, "System <a href="Diagram"</a>.





#### **®** 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).
- Remove EVAP service port adapter and hose with pressure pump.

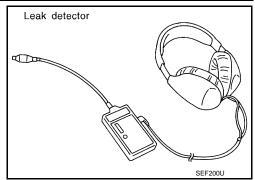


### **EVAP LEAK CHECK**

### < PERIODIC MAINTENANCE >

[VQ37VHR]

5. Locate the leak using a leak detector. Refer to <u>EC-97, "System Diagram"</u>.



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### **SERVICE DATA AND SPECIFICATIONS (SDS)**

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ37VHR]

# SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

Condition	Specification
No load* (in P or N position)	650 ± 50 rpm

<sup>\*:</sup> Under the following conditions

- · A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

### **Ignition Timing**

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Condition	Specification
No load* (in P or N position)	10 ± 5° BTDC

<sup>\*:</sup> Under the following conditions

- · A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

### Calculated Load Value

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Condition	Specification (Using CONSULT or GST)
At idle	5 – 35 %
At 2,500 rpm	5 – 35 %

### Mass Air Flow Sensor

INFOID:0000000009064369

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*

<sup>\*:</sup> Engine is warmed up to normal operating temperature and running under no load.