# **ENGINE CONTROL SYSTEM (M9R)**

# CONTENTS

#### M9R

BASIC INSPECTION7
DIAGNOSIS AND REPAIR WORKFLOW
INSPECTION AND ADJUSTMENT11
BASIC INSPECTION
ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT
IDLE SPEED13IDLE SPEED : Description13IDLE SPEED : Special Repair Requirement13
<b>ZFC VALUE RESET</b>
INJECTOR ADJUSTMENT VALUE REGISTRA- TION
EGR VOLUME CONTROL VALVE CLOSED POSI- TION LEARNING VALUE CLEAR

SITION LEARNING VALUE CLEAR : Description... 15

EGR VOLUME CONTROL VALVE CLOSED PO- SITION LEARNING VALUE CLEAR : Special Re- pair Requirement	.15
EGR VOLUME CONTROL VALVE CLOSED POSI- TION LEARNING	G .15
EGR VOLUME CONTROL VALVE CLOSED PO- SITION LEARNING : Description EGR VOLUME CONTROL VALVE CLOSED PO- SITION LEARNING : Special Repair Requirement	
THROTTLE VALVE CLOSED POSITION LEARN- ING VALUE CLEAR	16
THROTTLE VALVE CLOSED POSITION	J
LEARNING VALUE CLEAR : Description THROTTLE VALVE CLOSED POSITION	.16
LEARNING VALUE CLEAR : Special Repair Re- quirement	K .16
THROTTLE VALVE CLOSED POSITION LEARN-	16 L
ING THROTTLE VALVE CLOSED POSITION	.10
LEARNING : Description THROTTLE VALVE CLOSED POSITION	.16 Ⅳ
LEARNING : Special Repair Requirement	
SERVICE REGENERATION SERVICE REGENERATION : Description	
SERVICE REGENERATION : Special Repair Re- guirement	
DPF DATA CLEAR	.17
DPF DATA CLEAR : Description DPF DATA CLEAR : Special Repair Requirement	.17
AIR FUEL RATIO SENSOR LEARNING VALUE	
CLEAR AIR FUEL RATIO SENSOR LEARNING VALUE	.17
CLEAR : Description	.17
AIR FUEL RATIO SENSOR LEARNING VALUE	

CLEAR : Special Repair Requirement .....

D

Е

Component Parts Location Component Description	-
FUEL INJECTION CONTROL	C
System Description	
Component Derte Leastion	20 -
Component Parts Location	
Component Description	• ·
FUEL INJECTION TIMING CONTROL SYS-	Di
TEM	35 CO
System Diagram	35
System Description	
Component Parts Location	
•	
Component Description	<sup>40</sup> <b>U1</b>
AUTOMATIC SPEED CONTROL DEVICE	D.
(ASCD)	41 D
System Diagram	41
System Description	41 <b>P00</b>
Component Parts Location	
Component Description	47
	47 D
CAN COMMUNICATION	<sup>48</sup> P00
System Description	
COOLING FAN CONTROL	49 D
System Diagram	49
System Description	49 D
Component Parts Location	
Component Description	
DPF	56 D
System Diagram	56 -
System Description	
Component Parts Location	
Component Description	
	U
EGR SYSTEM	64 Di
System Description	64 C
Component Parts Location	
Component Description	70 -
ENGINE TORQUE CONTROL	71 <sup>D</sup>
System Diagram	71 D
System Description	
Component Parts Location	
•	
Component Description	
GLOW CONTROL	77 D
System Diagram	n
System Description	
Component Parts Location	
Component Description	<sup>82</sup> D
	00 D
IDLE SPEED CONTROL	83
System Diagram	<sup>83</sup> C
	ECR-2

FUNCTION DIAGNOSIS ...... 19

System Description
TURBOCHARGER BOOST CONTROL89System Description89Component Parts Location92Component Description96
ON BOARD DIAGNOSTIC (OBD) SYSTEM 97 Diagnosis Description
COMPONENT DIAGNOSIS111
POWER SUPPLY AND GROUND CIRCUIT111 Diagnosis Procedure
U1000 CAN COMM CIRCUIT         114           Description         114           DTC Logic         114           Diagnosis Procedure         114           P0016 CKP - CMP CORRELATION         115
DTC Logic
P0045 TC BOOST CONTROL SOLENOIDVALVE117Description117DTC Logic117Diagnosis Procedure117Component Inspection118
P0089 FUEL PUMP119DTC Logic119Diagnosis Procedure119Component Inspection120
P0090 FUEL PUMP121DTC Logic121Diagnosis Procedure121Component Inspection122
P0100 MAF SENSOR123Description123DTC Logic123Diagnosis Procedure123Component Inspection125
P0101 MAF SENSOR126Description126DTC Logic126Diagnosis Procedure127Component Inspection128
P0110 IAT SENSOR130Description130DTC Logic130Diagnosis Procedure130Component Inspection131

P0115 ECT SENSOR	132
Description	132
DTC Logic	132
Diagnosis Procedure	
Component Inspection	133
P0120 TP SENSOR	134
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	135
P0130 A/F SENSOR 1	407
Description	
Description	
Diagnosis Procedure	
·	
P0131 A/F SENSOR 1	
Description	
DTC Logic Diagnosis Procedure	
	139
P0133 A/F SENSOR 1	141
Description	141
DTC Logic	
Diagnosis Procedure	141
P0134 A/F SENSOR 1	143
Description	
DTC Logic	
Diagnosis Procedure	
P0135 A/F SENSOR 1 HEATER Description	
Description DTC Logic	
Diagnosis Procedure	
Component Inspection	
P0180 FUEL TEMPERATURE SENSOR	148
Description	
DTC Logic Diagnosis Procedure	
Component Inspection	
P0190 FRP SENSOR	
Description	
DTC Logic	
Diagnosis Procedure Component Inspection	
	101
P0200 FUEL INJECTOR	
DTC Logic	
Diagnosis Procedure	153
P0201, P0202, P0203, P0204 FUEL INJEC-	
TOR	155
Description	
DTC Logic	155
Diagnosis Procedure	155
Component Inspection	156

P0225 APP SENSOR 158	
Description158 DTC Logic158	
Diagnosis Procedure158	
Component Inspection160	
P0235 TC BOOST SENSOR 161	
Description161 DTC Logic161	
Diagnosis Procedure161	
P0263, P0266, P0269, P0272 FUEL INJEC-	D
TOR163 Description163	
DTC Logic	
Diagnosis Procedure163	
P0297 SERVICE REGENERATION 164	
Description164	
DTC Logic	
Diagnosis Procedure164	
P0300, P0301, P0302, P0303, P0304 MIS-	G
FIRE	
Diagnosis Procedure	
P0335 CKP SENSOR167	,
Description	
DTC Logic167 Diagnosis Procedure167	
Component Inspection	1
P0340 CMP SENSOR 169	J
Description169	
DTC Logic	
Diagnosis Procedure	
P0380 GLOW CONTROL SYSTEM 172 DTC Logic172	
Diagnosis Procedure	
Component Inspection174	
P0409 EGR VOLUME CONTROL VALVE	
CONTROL POSITION SENSOR 175	
Description	
DTC Logic175 Diagnosis Procedure175	1
Component Inspection	
P0470 EXHAUST GAS PRESSURE SENSOR. 178	;
Description178	
DTC Logic	
Diagnosis Procedure178	
P0487 EGR VOLUME CONTROL VALVE 180	
Description	
Diagnosis Procedure	
Component Inspection	

P0488 EGR SYSTEM182DTC Logic182Diagnosis Procedure182
P0500 VSS         184           Description         184           DTC Logic         184           Diagnosis Procedure         184
P0530 REFRIGERANT PRESSURE SENSOR
<b>185</b> Description
P0544 EGT SENSOR 1187Description187DTC Logic187Diagnosis Procedure187
P0560 BATTERY VOLTAGE 189 DTC Logic
P0564 ASCD STEERING SWITCH192Description192DTC Logic192Diagnosis Procedure192Component Inspection194
P0571 BPP SWITCH195Description195DTC Logic195Diagnosis Procedure195Component Inspection197
P0575 ASCD STEERING SWITCH198Description198DTC Logic198Diagnosis Procedure198Component Inspection199
P0606 ECM201Description201DTC Logic201Diagnosis Procedure201
P060B ECM203Description203DTC Logic203Diagnosis Procedure203
P0611 INJECTOR ADJUSTMENT VALUE       205         Description       205         DTC Logic       205         Diagnosis Procedure       205
P062B ECM207Description207DTC Logic207Diagnosis Procedure207

P062F ECM Description	
DTC Logic	209
Diagnosis Procedure	209
P0641 SENSOR POWER SUPPLY	
DTC Logic	
Diagnosis Procedure	211
P0651 SENSOR POWER SUPPLY	213
DTC Logic	
Diagnosis Procedure	213
P0670 GLOW CONTROL SYSTEM	216
DTC Logic	216
Diagnosis Procedure	
Component Inspection	217
P0685 ECM RELAY	218
DTC Logic	
Diagnosis Procedure	218
P0697 SENSOR POWER SUPPLY	220
DTC Logic	
Diagnosis Procedure	
P1201, P1202, P1203, P1204 FUEL INJEC-	
TOR	222
Description	
DTC Logic	222
Diagnosis Procedure	
Component Increation	
Component Inspection	223
P1435 DPF REGENERATION	224
P1435 DPF REGENERATION Description	<b>224</b> 224
P1435 DPF REGENERATION Description DTC Logic	<b>224</b> 224 224
P1435 DPF REGENERATION Description DTC Logic Diagnosis Procedure	<b>224</b> 224 224 225
P1435 DPF REGENERATION Description DTC Logic Diagnosis Procedure Component Inspection	224 224 224 225 225
P1435 DPF REGENERATION Description DTC Logic Diagnosis Procedure Component Inspection P1436 DPF REGENERATION	224 224 225 225 225
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description	224 224 225 225 225 226
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic	224 224 225 225 226 226 226
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Diagnosis Procedure         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure	224 224 225 225 226 226 226 227
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         Description         DTC Logic         Diagnosis Procedure         Component Inspection	224 224 225 225 225 226 226 227 227
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM	224 224 225 225 225 226 226 226 227 227 227
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description	224 224 225 225 225 226 226 227 227 227 228 228
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM	224 224 225 225 225 226 226 227 227 227 228 228 228 228
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Dascription         DTC Logic         Diagnosis Procedure         Diagnosis Procedure	224 224 225 225 225 226 226 227 227 227 228 228 228 228
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         Description         PTC Logic         Description         P2002 DPF	224 224 225 225 225 226 226 227 227 227 227 228 228 228 228 228
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         P1607 ECM         Description         DTC Logic         Description         DTC Logic         Description         DTC Logic         Description         DTC Logic         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure	224 224 225 225 225 226 226 226 227 227 227 228 228 228 228 228 228 229 229
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         Description         PTC Logic         Description         P2002 DPF	224 224 225 225 225 225 226 226 226 226 227 227 227 228 228 228 228 228 229 229 229 229
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         PTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         P2002 DPF         Description         DTC Logic         Description         DTC Logic         Description         DTC Logic	224 224 225 225 225 225 226 226 226 227 227 227 227 228 228 228 228 228 229 229 230
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         PTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         P2002 DPF         Description         DTC Logic         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure         Component Inspection	224 224 224 225 225 225 226 226 226 227 227 227 227 228 228 228 228 228 229 229 220 230 230
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         PTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         P2002 DPF         Description         DTC Logic         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection	224 224 225 225 225 225 226 226 227 227 227 227 228 228 228 228 228 229 229 229 230 230 231
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         PTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         P2002 DPF         Description         DTC Logic         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure         Component Inspection	224 224 225 225 225 225 226 226 227 227 227 227 228 228 228 228 228 228 229 229 229 230 231 231
P1435 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         P1436 DPF REGENERATION         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         P1607 ECM         Description         DTC Logic         Diagnosis Procedure         Description         DTC Logic         Diagnosis Procedure         P2002 DPF         Description         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         DTC Logic         Diagnosis Procedure         Component Inspection         Description         DTC Logic         Diagnosis Procedure         Component Inspection         Description         Description	224 224 225 225 225 225 226 226 226 227 227 227 227 227 228 228 228 228 228 228 228 229 229 230 231 231 231 232

P2080 EGT SENSOR 1	
Description	
DTC Logic	
Diagnosis Procedure	

#### P2100 ELECTRIC THROTTLE CONTROL

FUNCTION	
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	
Special Repair Requirement	

#### P2101 ELECTRIC THROTTLE CONTROL

FUNCTION	239
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	
Special Repair Requirement	

# P2120 APP SENSOR242Description242DTC Logic242Diagnosis Procedure242Component Inspection244

#### P2146, P2149 FUEL INJECTOR POWER

SUPPLY	
Component Description	
DTC Logic	
Diagnosis Procedure	

P2226 BARO SENSOR	
Description	
DTC Logic	
Diagnosis Procedure	

P2231 A/F SENSOR 1	
Description	
DTC Logic	
Diagnosis Procedure	

P2263 TC SYSTEM	
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	

P2293 FRP CONTROL SYSTEM	
Description	
DTC Logic	
Diagnosis Procedure	
Component Inspection	

P2299 ACCELERATOR/BRAKE PEDAL PO- SITION INCONSISTENCY	
Diagnosis Procedure	258
P2425 EGR COOLER BYPASS VALVE CON- TROL SOLENOID VALVE	EC
Description DTC Logic Diagnosis Procedure	262 262 C
Component Inspection	263 D
P242A EGT SENSOR 3 Description DTC Logic	<b>264</b> 264 264
Diagnosis Procedure Component Inspection	265 🗖
P242F DPF	267
DTC Logic Diagnosis Procedure Component Inspection	268 <sub>G</sub>
P2452 DIFFERENTIAL EXHAUST PRES- SURE SENSOR Description	269
DTC Logic Diagnosis Procedure	
P2453 DIFFERENTIAL EXHAUST PRES- SURE SENSOR	271
Description DTC Logic Diagnosis Procedure	271
P2505 ECM POWER SUPPLY	K 272 272
DTC Logic Diagnosis Procedure	272
P2600 TC COOLING PUMP         Description         DTC Logic         Diagnosis Procedure	274 M 274
Component Inspection (Turbocharger Cooling Pump) Component Inspection (Turbocharger Cooling	
Pump Relay)	0
P2A00 A/E SENSOR 1	278
P2A00 A/F SENSOR 1 Description DTC Logic Diagnosis Procedure	278 278 <sub>P</sub>
Description DTC Logic Diagnosis Procedure P3031 SERVICE REGENERATION	278 278 P 278 280
Description DTC Logic Diagnosis Procedure	278 278 P 278 <b>280</b> 280

ASCD INDICATOR .....

Description	.281
Component Function Check	
Diagnosis Procedure	.281
-	

CLUTCH PEDAL POSITION SWITCH	282
Description	
Component Function Check	
Diagnosis Procedure	
Component Inspection	

COOLING FAN	284
Description	284
Component Function Check	284
Diagnosis Procedure	284
Component Inspection (Cooling Fan Motor)	287
Component Inspection (Cooling Fan Relay)	287

<b>ECU DIAGNOSIS</b>	
ECU DIAGNOSIS	

ECM	289
Reference Value	
Wiring Diagram - ENGINE CONTROL SYSTE	EM305
Fail Safe	
DTC Inspection Priority Chart	317
DTC Index	

SYMPTOM DIAGNOSIS
ENGINE CONTROL SYSTEM SYMPTOMS321 Symptom Table
PRECAUTION
<b>PRECAUTIONS</b> 327         Precaution for Supplemental Restraint System       (SRS) "AIR BAG" and "SEAT BELT PRE-TEN-SIONER"         SIONER"       327         Precaution Necessary for Steering Wheel Rotation After Battery Disconnect       327         Precaution for Procedure without Cowl Top Cover. 328       328         On Board Diagnostic (OBD) System of Engine       329         Cleanliness       331
SERVICE DATA AND SPECIFICATIONS (SDS)

#### SERVICE DATA AND SPECIFICATIONS

(SDS)	
Idle Speed	

< BASIC INSPECTION >

**BASIC INSPECTION** DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

А

[M9R]

#### INFOID:000000001551214 ECR **OVERALL SEQUENCE** Inspection start D 1. Get information for symptom Get the detailed information about symptom from the customer. Е 2. Check DTC\*1 Check DTC\*1 Print out DTC\*1(or, write it down). F Check related service bulletins. Symptom is not described. DTC\*1 is detected. Symptom is described. Symptom is described. DTC\*1 is detected. DTC\*1 is not detected. 3. Confirm the symptom 4. Confirm the symptom Try to confirm the symptom described by the Try to confirm the symptom described by the Н customer. customer. Also study fail safe related to the symptom. 5. Perform DTC CONFIRMATION PROCEDURE 6. Perform BASIC INSPECTION 7. Detect malfunctioning system by Symptom Κ Table L 8. Detect malfunctioning part by Μ **Diagnosis Procedure** Ν 9. Repair or replace the malfunctioning part 10. Final check DTC\*1 is detected. Symptom remains. Make sure that the symptom is not detected. Perform DTC Confirmation Procedure again, and then make sure that the malfunction can be repaired securely. Ρ DTC\*1 is not detected. Symptom does not remain. **INSPECTION END**

\*1: Include 1st trip DTC.

DETAILED FLOW

ECR-7

JMBIA0558GB

< BASIC INSPECTION >

# **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>ECR-9</u>, "<u>Diagnostic Work</u> <u>Sheet</u>".)

>> GO TO 2.

# 2.CHECK DTC

- 1. Check DTC.
- 2. Perform the following procedure if DTC is displayed.
- Record DTC. (Print them out with CONSULT-III or GST.)
- Erase DTC. (Refer to ECR-97, "Diagnosis Description".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to <u>ECR-321, "Symptom Table"</u>.)
- 3. Check related service bulletins for information.

Is any symptom described and is any DTC detected?

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

#### **3.**CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MI ON). Also study the fail safe related to the symptom. Refer to <u>ECR-316</u>, "Fail Safe". Diagnosis Work Sheet is useful to verify the incident. Verify relation between the symptom and the condition when the symptom is detected.

#### >> GO TO 5.

#### **4.**CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer. Diagnosis Work Sheet is useful to verify the incident. Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

#### **5.**PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that 1st trip DTC is detected again.

If two or more 1st trip DTCs are detected, refer to <u>ECR-317, "DTC Inspection Priority Chart"</u> and determine trouble diagnosis order.

NOTE:

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 CONFIRMA-TION PROCEDURE.

#### Is DTC detected?

YES >> GO TO 8.

NO >> Check according to <u>GI-39, "Intermittent Incident"</u>.

6.PERFORM BASIC INSPECTION

Perform ECR-11, "BASIC INSPECTION : Special Repair Requirement".

#### >> GO TO 7.

7. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

#### ECR-8

#### **DIAGNOSIS AND REPAIR WORKFLOW**

#### BASIC INSPECTION -

[M9R]

< BASIC INSPECTION >	[M9R]	
Detect malfunctioning system according to <u>ECR-321</u> , "Symptom Tak step 4, and determine the trouble diagnosis order based on possible		А
>> GO TO 8.		
<b>8</b> . DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDUR	RE	ECF
Inspect according to Diagnosis Procedure of the system.		
<b>NOTE:</b> The Diagnosis Procedure in EC section described based on open cir is also required for the circuit check in the Diagnosis Procedure. Fo tion".		С
Is malfunctioning part detected?		D
YES >> GO TO 9. NO >> Monitor input data from related sensors or check voltag	e of related ECM terminals using CON-	
SULT-III. Refer to <u>ECR-289, "Reference Value"</u> .		E
9.REPAIR OR REPLACE THE MALFUNCTIONING PART		
<ol> <li>Repair or replace the malfunctioning part.</li> <li>Reconnect parts or connectors disconnected during Diagnosis P</li> </ol>	Procedure again after repair and replace-	F
ment. 3. Check 1st trip DTC. If 1st trip DTC is displayed, erase it. Refer to	ECR-97, "Diagnosis Description".	C
		G
>> GO TO 10. <b>10.</b> FINAL CHECK		
When DTC was detected in step 2, perform DTC CONFIRMATION	PROCEDURE or Component Eurotion	Η
Check again, and then make sure that the malfunction have been rep	aired securely.	
When symptom was described from the customer, refer to confirmed		
that the symptom is not detected. <u>Is DTC detected and does symptom remain?</u>		
YES-1 >> DTC is detected: GO TO 8.		J
YES-2 >> Symptom remains: GO TO 6. NO >> Before returning the vehicle to the customer, make sure t	o erase unnecessary DTC in ECM.	0
Diagnostic Work Sheet	INF01D:000000001551215	Κ
DESCRIPTION		
There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make trou-		L
bleshooting faster and more accurate.	KEY POINTS	
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a cus-	WHAT Vehicle & engine model	M
tomer complaint.	WHEN Date, Frequencies WHERE Road conditions	
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.	HOW Operating conditions,	Ν
Some conditions may cause the MIL to come on steady or blink and	Weather conditions, Symptoms	
<ul> <li>DTC to be detected. Examples:</li> <li>Vehicle ran out of fuel, which caused the engine to misfire.</li> </ul>		

- 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.

Ρ

Ο

SEF907L

# DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

#### WORKSHEET SAMPLE

Customer na	me MR/MS	Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date	•	Manuf. Date	In Service Date
Fuel and fuel	filler cap	<ul> <li>Vehicle ran out of fuel causing misfire</li> <li>Fuel filler cap was left off or incorrectly screwed on.</li> </ul>	
	☐ Startability	<ul> <li>Impossible to start</li> <li>No combustion</li> <li>Partial combustion</li> <li>Partial combustion affected by throttle position</li> <li>Partial combustion NOT affected by throttle position</li> <li>Possible but hard to start</li> <li>Others [</li> </ul>	
Symptoms	Idling	□ No fast idle □ Unstable □ H □ Others [	High idle ☐ Low idle ]
	Driveability	Stumble Surge Knock Intake backfire Exhaust backfi Others [	Lack of power re ]
	Engine stall	At the time of start While idling While accelerating While dece	lerating
Incident occu	irrence	Just after delivery     In the morning     At night	☐ In the daytime
Frequency		All the time Under certain cond	ditions 🗌 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	tions	Engine speed 0 2,000	4,000 6,000 8,000 rpm
Road condition	ons	🗌 In town 🗌 In suburbs 🗌 Hig	hway 🗌 Off road (up/down)
Driving condi	tions	While accelerating       While cruis         While decelerating       While turning	0
		Vehicle speed 0 10 20	30 40 50 60 MPH
Malfunction in	ndicator lamp	Turned on Not turned on	

MTBL0017

INSPECTION AND ADJUSTMENT	[M9R]
< BASIC INSPECTION >	נאפאז
INSPECTION AND ADJUSTMENT BASIC INSPECTION	A
BASIC INSPECTION : Special Repair Requirement	D:000000001530531
1.INSPECTION START	
<ol> <li>Check service records for any recent repairs that may indicate a related incident.</li> <li>Check the current need for scheduled maintenance, especially for fuel filter and air cleaner filte MA-7. "Periodic Maintenance".</li> <li>Open engine hood and check the following:         <ul> <li>Harness connectors for improper connections</li> <li>Vacuum hoses for splits, kinks, or improper connections</li> <li>Wiring for improper connections, pinches, or cuts</li> </ul> </li> <li>Start engine and warm it up to the normal operating temperature.         <ul> <li>&gt;&gt; GO TO 2.</li> </ul> </li> </ol>	er. Refer to
2.CHECK IDLE SPEED	Н
Check idle speed. For procedure, refer to <u>ECR-13</u> , "IDLE SPEED : Special Repair Requirement". For specification, refer to <u>ECR-333</u> , "Idle Speed". Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 3.	
<b>3.</b> CHECK FOR INTAKE AIR LEAK	
<ol> <li>Stop engine.</li> <li>Listen for an intake air leak after the mass air flow sensor.</li> <li><u>Is the inspection result normal?</u></li> <li>YES &gt;&gt; GO TO 4.</li> </ol>	K
NO >> Repair or replace. 4.BLEED AIR FROM FUEL SYSTEM	
Use priming pump to bleed air from fuel system. Refer to <u>FL-17, "Air Bleeding"</u> .	N
>> GO TO 5.	-
5. CHECK IDLE SPEED AGAIN	Ν
Check idle speed. For procedure, refer to <u>ECR-13, "IDLE SPEED : Special Repair Requirement"</u> . For specification, refer to <u>ECR-333, "Idle Speed"</u> .	(
Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 6.	I
6. DRAIN WATER FROM FUEL FILTER	
<ol> <li>Stop engine.</li> <li>Drain water from fuel filter. Refer to <u>FL-17, "Water Draining</u>".</li> </ol>	

2. Drain water from fuel filter. Refer to <u>FL-17, "Water Draining"</u>.

< BASIC INSPECTION >

**7.**CHECK IDLE SPEED AGAIN

Check idle speed.

For procedure, refer to <u>ECR-13</u>, "IDLE SPEED : <u>Special Repair Requirement</u>". For specification, refer to <u>ECR-333</u>, "Idle <u>Speed</u>".

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 8.

**8.**CHECK AIR CLEANER FILTER

1. Stop engine.

2. Check air cleaner filter for clogging or breaks.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace air cleaner filter.

**9.**CHECK BATTERY VOLTAGE

Check battery voltage.

#### Voltage: More than 12.13V

Is the inspection result normal?

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

**10.**CHECK BATTERY

Refer to PG-5, "Work Flow".

Is the inspection result normal?

YES >> Check charging system. Refer to CHG-3. "Work Flow".

NO >> Repair or replace.

**11.**CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-260, "Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Follow the instruction of "CHECKING COMPRESSION PRESSURE".

12.CHECK IDLE SPEED AGAIN

Check idle speed.

For procedure, refer to <u>ECR-13</u>, "IDLE SPEED : Special Repair Requirement". For specification, refer to <u>ECR-333</u>, "Idle Speed".

Is the inspection result normal?

#### YES >> INSPECTION END

- NO >> 1. Replace fuel injector.
  - 2. Perform <u>ECR-14</u>, "INJECTOR ADJUSTMENT VALUE REGISTRATION : Special Repair <u>Requirement"</u>.
  - 3. Perform ECR-14, "ZFC VALUE RESET : Special Repair Requirement".
  - 4. GO TO 2.

#### ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

#### ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:000000001307408

When replacing ECM, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Re-

#### [M9R]

#### ECR-12

INSPECTION AND ADJUSTMENT
< BASIC INSPECTION > [M9R]
quirement INFOID:000000001307409
1.PERFORM INJECTOR ADJUSTMENT VALUE REGISTRATION
Perform ECR-14, "INJECTOR ADJUSTMENT VALUE REGISTRATION : Special Repair Requirement".
>> GO TO 2. 2.PERFORM ZFC VALVE RESET
Perform ECR-14, "ZFC VALUE RESET : Special Repair Requirement".
>> GO TO 3.
3.PERFORM EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING
Perform <u>ECR-15, "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING : Special Repair</u> E <u>Requirement</u> ".
>> GO TO 4. F
4. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING
Perform ECR-16, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
>> GO TO 5.
5.PERFORM DPF DATA CLEAR
Perform ECR-17, "DPF DATA CLEAR : Special Repair Requirement".
>> GO TO 6.
6.PERFORM AIR FUEL RATIO LEARNING VALVE CLEAR
Perform ECR-18, "AIR FUEL RATIO SENSOR LEARNING VALUE CLEAR : Special Repair Requirement".
>> END
IDLE SPEED K
IDLE SPEED : Description
This describes how to check the idle speed. For the actual procedure, follow the instructions in "BASIC INSPECTION".
IDLE SPEED : Special Repair Requirement
1.CHECK IDLE SPEED
With CONSULT-III     N
Check idle speed in "DATA MONITOR" mode with CONSULT-III.
Check idle speed with Service \$01 of GST.
>> INSPECTION END
ZFC VALUE RESET
ZFC VALUE RESET : Description
Wear of injector opening portion (blocking or enlargement of the hall) due to secular change causes error of injected amount of fuel resulting in smoke or large poice.

To prevent these conditions, it is necessary to reset ZFC (Zero Fuel Calibration) and NVC (Nominal Voltage Calibration).

#### < BASIC INSPECTION >

The calibration shall be performed after the following operation.

- ECM replacement or reprogramming
- Injector replacement

#### ZFC VALUE RESET : Special Repair Requirement

## 1.START

- 1. Turn ignition switch ON.
- Perform "ZFC VALUE RESET" in WORK SUPPORT mode with CONSULT-III. 2.
- 3. Wait at least 10 seconds.

# >> END INJECTOR ADJUSTMENT VALUE REGISTRATION

#### **INJECTOR ADJUSTMENT VALUE REGISTRATION : Description**

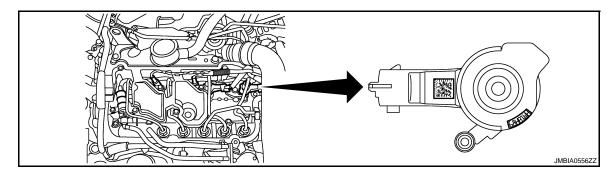
Injector adjustment value indicates manufacturing tolerance and the value is printed on the top of fuel injector. The injector adjustment value which is correctly stored in ECM is needed for precise fuel injection control. A performance of emission control and a drivability may effect when there is a mismatch between the following two values.

The injector adjustment value stored in ECM

The injector adjustment value of the injector which is installed on the vehicle

- Injector Adjustment Value Registration must be performed after the following cases.
- Injector(s) are replaced.
- ECM is replaced.

For the first case, Injector Adjustment Value Registration for the replaced fuel injector must be performed. And for the second case, Injector Adjustment Value Registration for all the fuel injectors must be performed.



Example: Injector adjustment value = 68HBLWH

#### INJECTOR ADJUSTMENT VALUE REGISTRATION : Special Repair Requirement

INFOID:000000001307411

# 1.START

#### NOTE:

#### Before performing this procedure, record injector adjustment value printed on a fuel injector.

- 1. Turn ignition switch ON (engine stopped).
- Select "INJ ADJ VAL REGIST" in "WORK SUPPORT" mode with CONSULT-III. 2.
- Touch "START". 3. NOTE: When touching "START", CONSULT-III reads injector adjustment values stored in ECM.
- 4. Select the number of the cylinder which needs Injector Adjustment Value Registration.
- 5. Input injector adjustment value, and touch "ENTER".
- NOTE: Input injector adjustment value is stored in CONSULT-III.

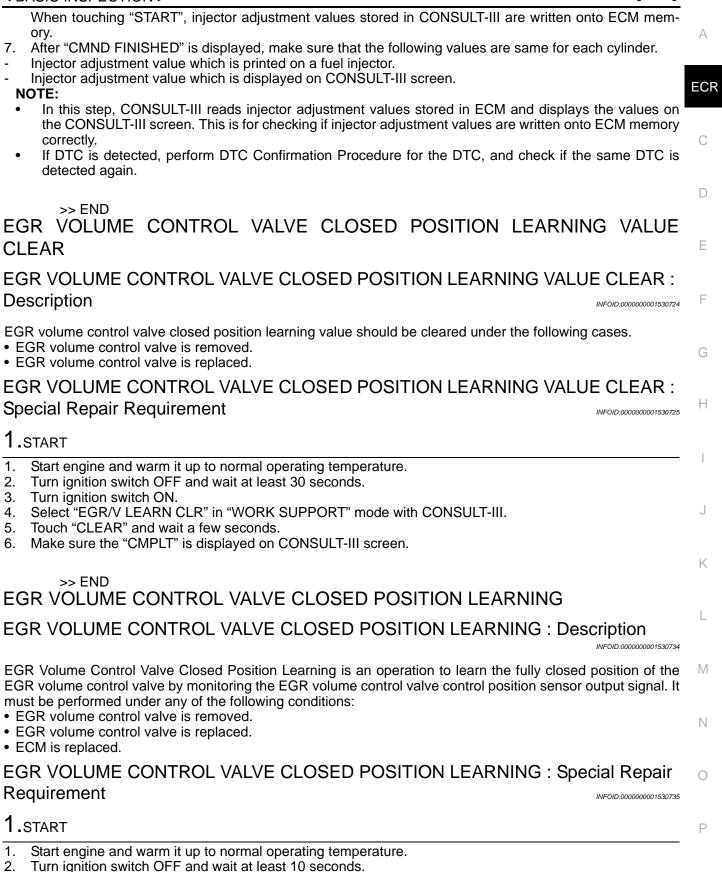
6. Repeat step 4 - 5 till there is no cylinder which needs Injector Adjustment Value Registration, and touch "START".

NOTE:



INFOID:000000001307410

< BASIC INSPECTION >



Make sure that EGR volume control valve moves during above 10 seconds by confirming the operating sound.

#### < BASIC INSPECTION >

#### THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR

# THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR : Description

-INFOID:000000001530738

[M9R]

Throttle valve closed position learning value should be cleared under the following cases.

- Electric throttle control actuator is removed.
- Electric throttle control actuator is replaced.

#### THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR : Special Repair Requirement

#### 1.START

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 30 seconds.
- 3. Turn ignition switch ON.
- 4. Select "TP POS LEARN CLR" in "WORK SUPPORT" mode with CONSULT-III.
- 5. Touch "CLEAR" and wait a few seconds.
- 6. Make sure the "CMPLT" is displayed on CONSULT-III screen.

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

THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:000000001530736

Throttle Valve Closed Position Learning is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

- Electric throttle control actuator is removed.
- Electric throttle control actuator is replaced.

• ECM is replaced.

#### THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:000000001530737

# **1.**START

- 1. Make sure that accelerator pedal is fully released.
- 2. Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds. Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

#### >> END SERVICE REGENERATION

#### **SERVICE REGENERATION : Description**

INFOID:000000001530744

Service Regeneration is performed with CONSULT-III to reduce particulate matter in DPF. Service Regeneration should be performed in the following cases.

• ECM enters fail-safe mode because the amount of particulate matter in DPF reaches the specified level. **NOTE:** 

When ECM enters fail-safe mode because the amount of particulate matter in DPF reaches the specified level, check whether or not DTC is stored in ECM. In the case of DTC stored, perform the Diagnostic Procedure for the DTC.

• ECM is replaced.

#### NOTE:

Based on the signal from sensors ECM measures the amount of particulate matter in DPF and stores the value in EEPROM (Electrically Erasable Programmable Read Only Memory). When ECM is replaced as new one, there is a difference between the actual amount of particulate matter and the value stored in new ECM, because the value stored in new ECM is initialized one. In the case above, ECM can not perform

# **ECR-16**

< BASIC INSPECTION >

	-
regeneration control correctly. So, perform service regeneration to make the amount of particulate matter DPF zero.	in
<ul> <li>Component Inspection for DPF is performed.</li> </ul>	
CAUTION: Always replace engine oil and engine oil filter after service regeneration. Fuel mixes with engine of during service regeneration. The mixture does not occur during the regeneration which is automatically performed under normal operation.	
SERVICE REGENERATION : Special Repair Requirement	0745
1.start	
<ol> <li>Turn ignition switch ON.</li> <li>Select "SERVC REGENERATION" in "WORK SUPPORT" mode with CONSULT-III.</li> <li>Touch "START".</li> </ol>	
<ol> <li>Wait until "CMPT" is displayed.</li> <li>NOTE:</li> </ol>	
<ul> <li>Make sure that accelerator pedal is fully released during service regeneration, or service regeneration canceled. When service regeneration is canceled, retry from step1.</li> <li>It will take approximately 40 minutes until "CMPLT" is displayed.</li> <li>Turn ignition switch OFF.</li> </ul>	is
6. Replace engine oil and engine oil filter.	
>> END	
DPF DATA CLEAR	
DPF DATA CLEAR : Description	0740
Perform "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III when oxidation catalyst wi DPF is replaced as new one. Based on the signal from sensors ECM estimates the amount of particulate matter ter in DPF and stores the value in EEPROM as DPF data. When oxidation catalyst with DPF is replaced a new one, there is a difference between DPF data stored in ECM and the actual amount of particulate matter	at- as
DPF, because no particulate matter is trapped in new DPF. In this case, ECM can not perform regeneration control correctly. So perform "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III to cle DPF data stored in ECM.	on
Never perform "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III when oxidation ca alyst with DPF is not replaced as new one. DPF may be damaged because regeneration is not pe formed at appropriate timing.	
DPF DATA CLEAR : Special Repair Requirement	0741
1.start	
<ol> <li>Turn ignition switch ON.</li> <li>Select "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III.</li> <li>Touch "CLEAR" and wait a few seconds.</li> </ol>	_
4. Make sure that "CMPLT" is displayed on CONSULT-III screen.	
>> END AIR FUEL RATIO SENSOR LEARNING VALUE CLEAR	
AIR FUEL RATIO SENSOR LEARNING VALUE CLEAR : Description	0742
ECM learns the output characteristic of A/F sensor 1 to perform the control of DPF regeneration precisely. A sensor learning value should be cleared under the following conditions. • A/F sensor 1 is changed.	/F
• ECM is replaced with used one which stores the A/F Sensor Learning Value of another A/F sensor 1.	

#### < BASIC INSPECTION >

# AIR FUEL RATIO SENSOR LEARNING VALUE CLEAR : Special Repair Requirement

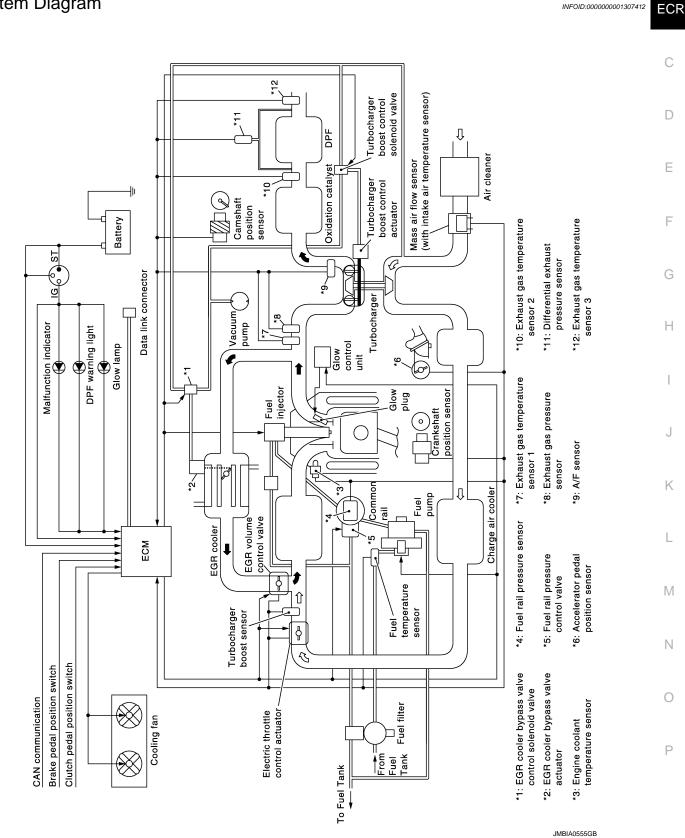
# 1.START

- 1. Turn ignition switch ON.
- 2. Select "A/F SEN LEAN CLR" in "WORK SUPPORT" mode with CONSULT-III.
- 3. Touch "CLEAR" and wait a few seconds.
- 4. Make sure that "CMPLT" is displayed on CONSULT-III screen.

>> END

# **FUNCTION DIAGNOSIS** ENGINE CONTROL SYSTEM

#### System Diagram



[M9R]

INFOID:000000001307412

< FUNCTION DIAGNOSIS >

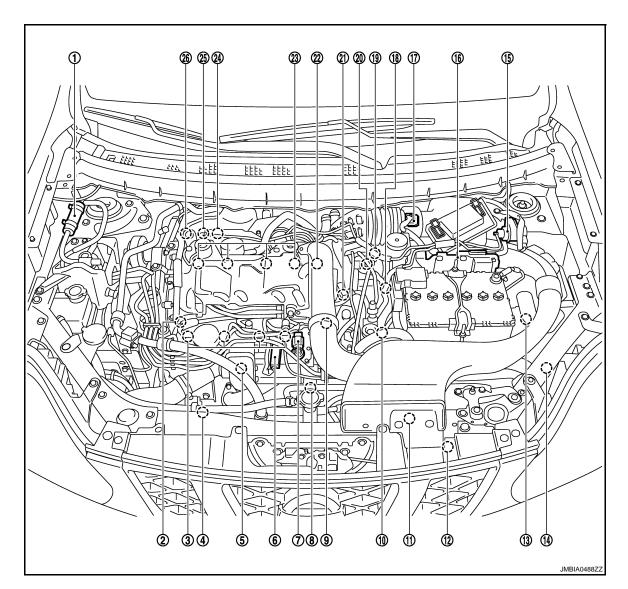
#### System Description

ECM performs various controls such as fuel injection control and furl pressure control.

#### **Component Parts Location**

INFOID:000000001307414

INFOID:000000001307413



- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

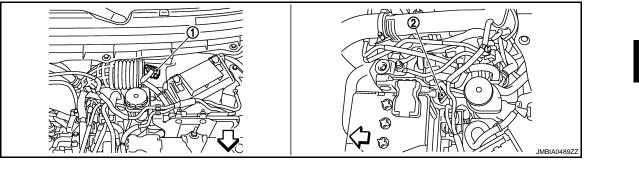
- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

- Glow plug 3.
- 6. Turbocharger boost sensor
- Fuel rail pressure sensor 9.
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

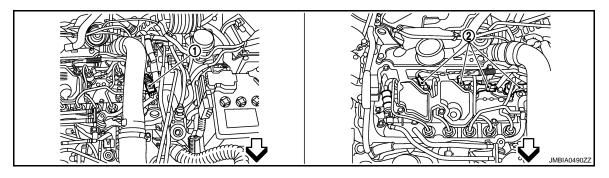
# **ENGINE CONTROL SYSTEM**

#### < FUNCTION DIAGNOSIS >

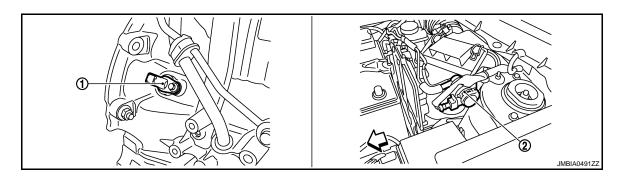
#### [M9R]



- C: Vehicle front
- 1. Mass air flow sensor (with intake air 2. Engine coolant temperature sensor temperature sensor)

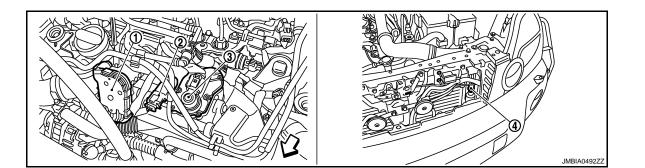


- C: Vehicle front
- 1. Camshaft Position Sensor
- 2. Fuel injector



C: Vehicle front

- 1. Crankshaft position sensor
- 2. Turbocharger boost control solenoid valve



# ECR

С

D

Ε

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

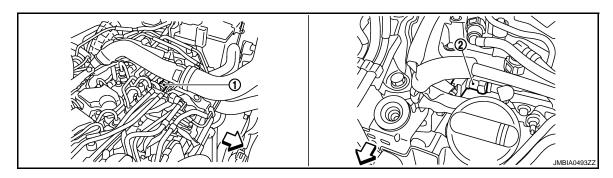
А

#### < FUNCTION DIAGNOSIS >

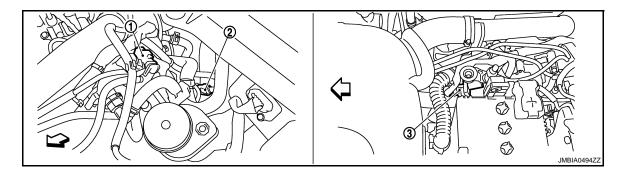
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



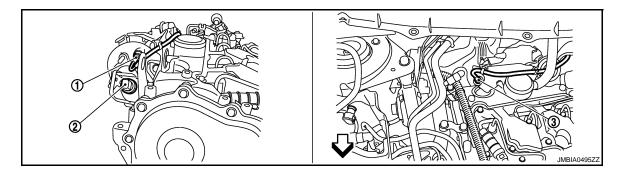
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve



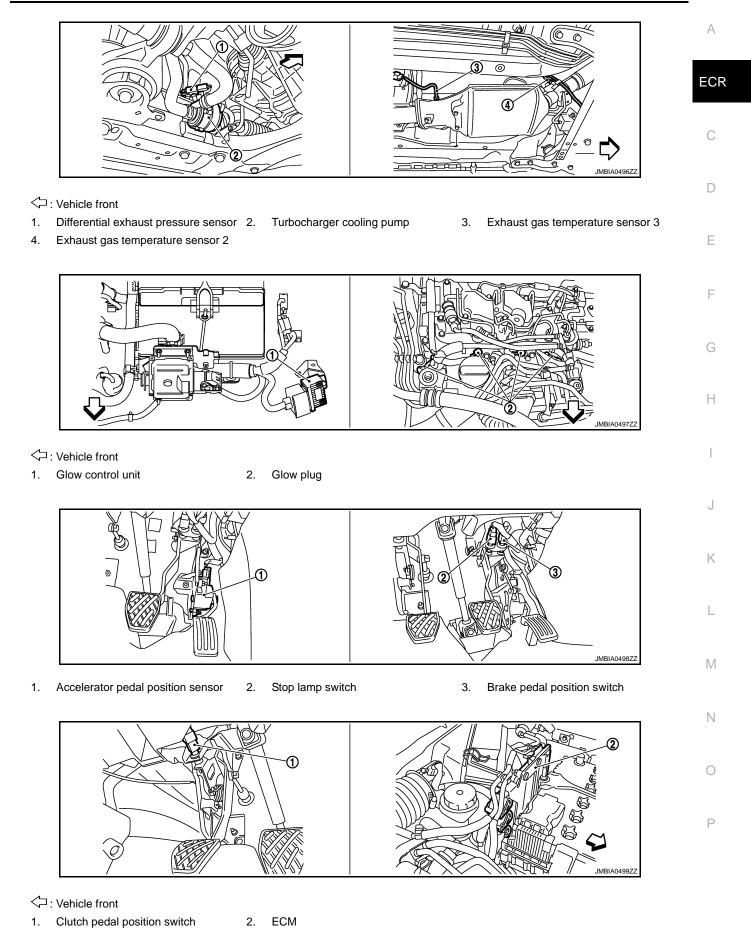
C: Vehicle front

- 1. Exhaust gas temperature sensor 1 2. Exhaust g
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

# **ENGINE CONTROL SYSTEM**

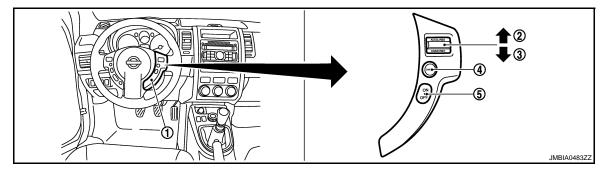
#### < FUNCTION DIAGNOSIS >

#### [M9R]



# **ENGINE CONTROL SYSTEM**

#### < FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

RESUME/ACCCELERATE switch 3.

# **Component Description**

INFOID:000000001307415

Component	Reference
A/F sensor 1	ECR-137, "Description"
A/F sensor 1 heater	ECR-145, "Description"
Accelerator pedal position sensor	ECR-158. "Description"
ASCD steering switch	ECR-192, "Description"
Barometric pressure sensor	ECR-247, "Description"
Brake pedal position switch	ECR-195, "Description"
Camshaft position sensor	ECR-169. "Description"
Cooling fan motor	ECR-284, "Description"
Crankshaft position sensor	ECR-167, "Description"
Clutch pedal position switch	ECR-282, "Description"
Differential exhaust pressure sensor	ECR-269. "Description"
EGR cooler bypass valve control solenoid valve	ECR-262, "Description"
EGR volume control valve	ECR-180, "Description"
EGR volume control valve control position sensor	ECR-175. "Description"
Engine coolant temperature sensor	ECR-132, "Description"
Exhaust gas pressure sensor	ECR-178, "Description"
Exhaust gas temperature sensor 1	ECR-187, "Description"
Exhaust gas temperature sensor 2	ECR-231, "Description"
Exhaust gas temperature sensor 3	ECR-264, "Description"
Fuel injector	ECR-155, "Description"
Fuel rail pressure control valve	ECR-256. "Description"
Fuel rail pressure sensor	ECR-150. "Description"
Fuel temperature sensor	ECR-148, "Description"
Intake air temperature sensor	ECR-130, "Description"
Mass air flow sensor	ECR-123. "Description"
Refrigerant pressure sensor	ECR-185. "Description"
Throttle position sensor	ECR-134, "Description"
Turbocharger boost control solenoid valve	ECR-117. "Description"
Turbocharger boost sensor	ECR-161, "Description"
Turbocharger cooling pump	ECR-274, "Description"
Vehicle speed sensor	ECR-184, "Description"



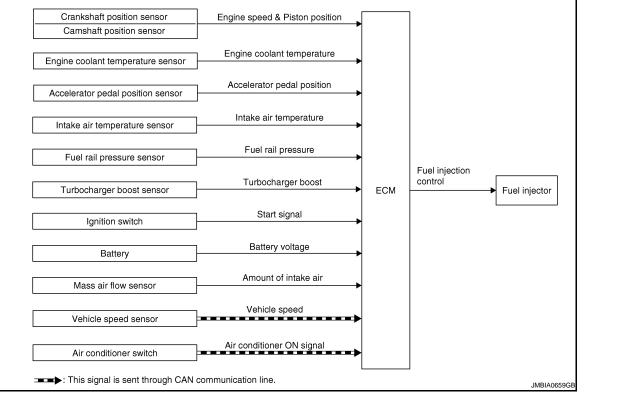
#### < FUNCTION DIAGNOSIS >

# FUEL INJECTION CONTROL

# System Description

#### FUEL INJECTION CONTROL

#### System Diagram



# System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed		
Camshaft position sensor	Piston position	tion	
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Fuel rail pressure sensor	Fuel rail pressure sensor		
Accelerator pedal position sensor	Accelerator pedal position	Fuel injection control	Fuel injector
Turbocharger boost sensor	Turbocharger boost		Fuerinjector
Ignition switch	Start signal		
Battery	Battery voltage		
Mass air flow sensor	Amount of intake air		
Vehicle speed sensor	Vehicle speed*		
Air conditioner switch	Air conditioner switch*		

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

#### SYSTEM DESCRIPTION

Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Above each control, the amount of fuel injected is adjusted to improve engine performance. Pulse signals are sent to fuel injectors according to the input signals to adjust the amount of fuel injected to preset value.

[M9R]

INFOID:000000001530571

А

ECR

D

F

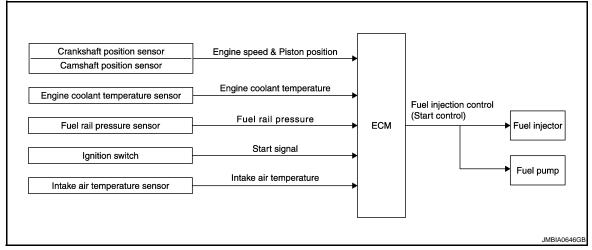
Н

**ECR-25** 

#### < FUNCTION DIAGNOSIS >

#### START CONTROL

System Diagram



# System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed		
Camshaft position sensor	Piston position		
Intake air temperature sensor	Intake air temperature	Fuel injection control	Fuel injector Fuel pump
Engine coolant temperature sensor	Engine coolant temperature	(Start control)	
Fuel rail pressure sensor	Fuel rail pressure sensor		
Ignition switch	Start signal		

#### SYSTEM DESCRIPTION

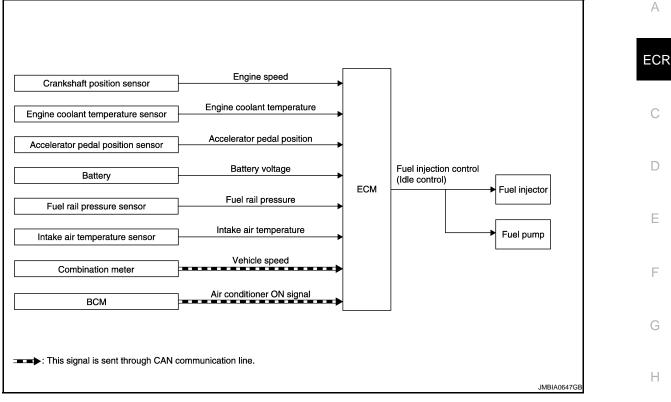
When ECM detected the engine revolution pulse at engine cranking, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed, engine coolant temperature, intake air temperature and fuel rail pressure. For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches the specific value, and shifts the control to the normal or idle control.

#### **IDLE CONTROL**

#### < FUNCTION DIAGNOSIS >

[M9R]

#### System Diagram



# System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor	Engine speed			J
Accelerator pedal position sensor	Accelerator pedal position			
Engine coolant temperature sensor	Engine coolant temperature			
Intake air temperature sensor	Intake air temperature	Fuel injection control	Fuel injector	K
Fuel rail pressure sensor	Fuel rail pressure sensor	(Idle control)	Fuel pump	
Battery	Battery voltage			1
Vehicle speed sensor	Vehicle speed*			
Air conditioner switch	Air conditioner switch*			

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

SYSTEM DESCRIPTION

When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature signal.

#### NORMAL CONTROL

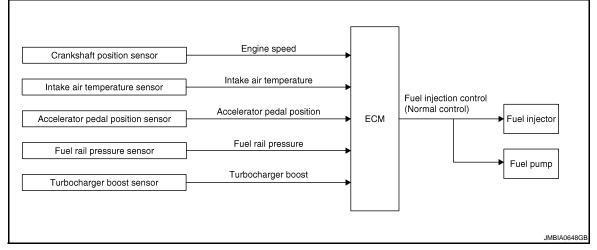
0

Μ

Ρ

#### < FUNCTION DIAGNOSIS >

#### System Diagram



# System Description INPUT/OUTPUT SIGNAL CHART

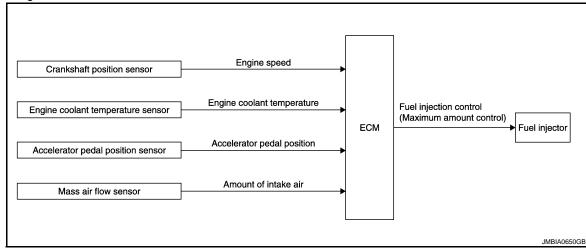
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed		Fuel injector
Accelerator pedal position sensor	Accelerator pedal position		
Fuel rail pressure sensor	Fuel rail pressure sensor	Fuel injection control (Normal control)	
Intake air temperature sensor	Intake air temperature		
Turbocharger boost sensor	Turbocharger boost		

#### SYSTEM DESCRIPTION

The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor detects engine speed, intake air temperature sensor detects intake air temperature, turbocharger boost sensor detects turbocharger boost, the accelerator pedal position sensor detects accelerator pedal position, fuel rail pressure sensor detects fuel rail pressure and other sensors detects each signal. These sensors send signals to the ECM. The fuel injection data, predetermined by correlation between various engine speeds, accelerator pedal position and fuel rail pressure are stored in the ECM memory, forming a map. The ECM detainees the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

#### MAXIMUM AMOUNT CONTROL

#### System Diagram



System Description INPUT/OUTPUT SIGNAL CHART

#### < FUNCTION DIAGNOSIS >

D

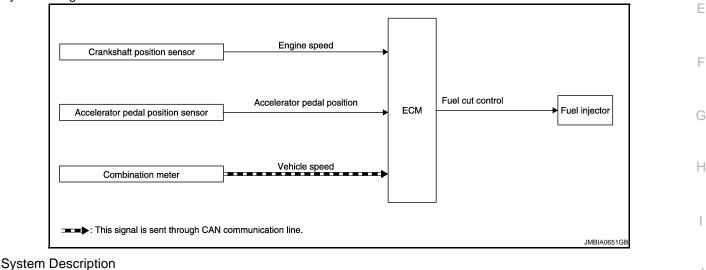
Sensor	Input Signal to ECM	ECM function	Actuator	А
Crankshaft position sensor	Engine speed	Fuel injection control (Maximum control)		
Accelerator pedal position sensor	Accelerator pedal position		Fuel injector	ECR
Engine coolant temperature sensor	Engine coolant temperature			
Mass air flow sensor	Amount of intake air			

#### SYSTEM DESCRIPTION

The maximum injection amount is controlled to an optimum by the engine speed, intake air amount, engine coolant temperature and accelerator opening in accelerator with the driving conditions. This prevents the over-supply of the injection amount caused by decreased air density at a high altitude or during a system failure.

#### FUELCUT CONTROL

System Diagram



#### INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	_
Vehicle speed sensor	Vehicle speed*			K
Crankshaft position sensor	Engine speed	Fuel injection control (Fuel cut control)	Fuel injector	
Accelerator pedal position sensor	Accelerator pedal position			L

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

#### SYSTEM DESCRIPTION

The ECM sends a fuel cut signal to the fuel injectors and fuel pump during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator pedal position sensor, crankshaft positions sensor and vehicle speed sensor.

Ν

 $\sim$ 

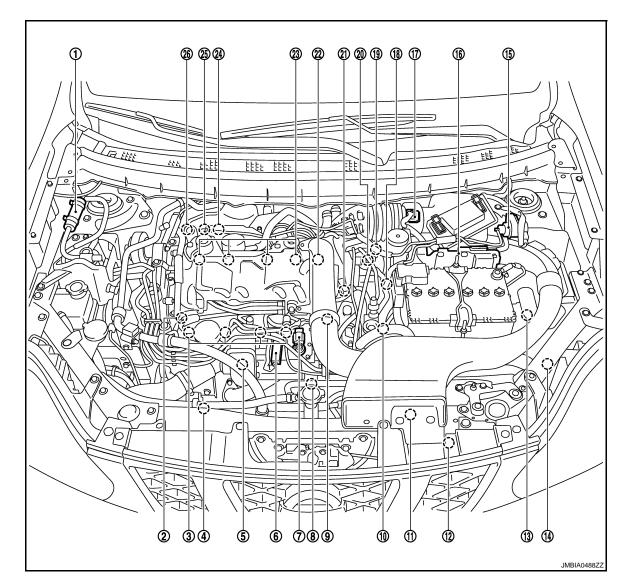
Ρ

#### < FUNCTION DIAGNOSIS >

#### **Component Parts Location**

INFOID:000000001542148

[M9R]



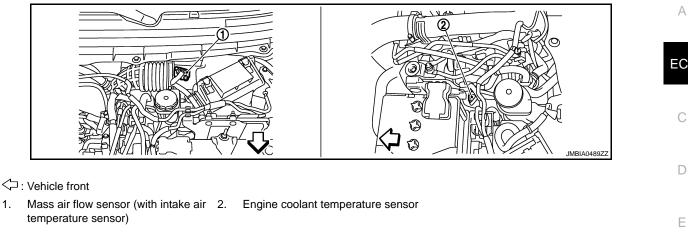
- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

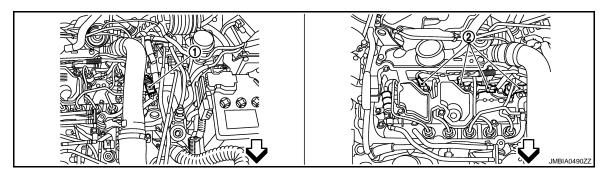
- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

#### < FUNCTION DIAGNOSIS >

#### [M9R]

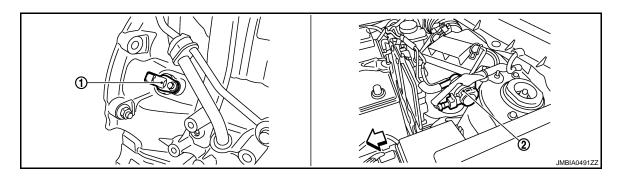




C: Vehicle front

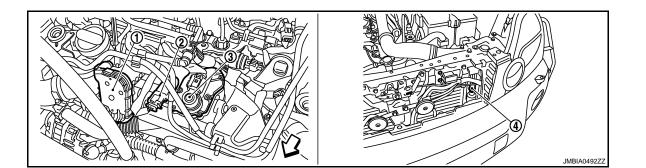
1.

- Camshaft Position Sensor 1.
- 2. Fuel injector



C: Vehicle front

- 1. Crankshaft position sensor
- Turbocharger boost control solenoid 2. valve



F

G

Н

J

Κ

L

Μ

Ν

Ο

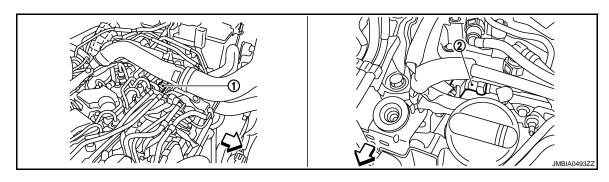
Ρ

#### < FUNCTION DIAGNOSIS >

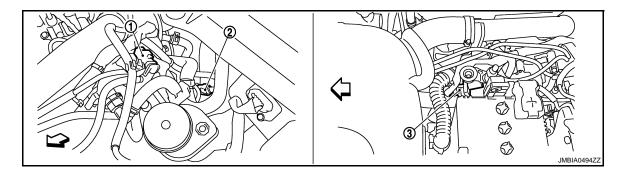
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



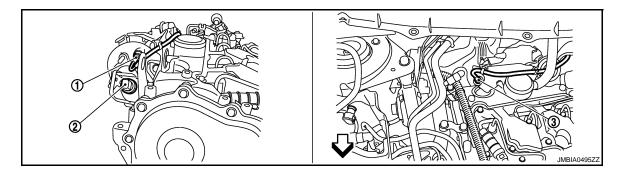
- <□: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve

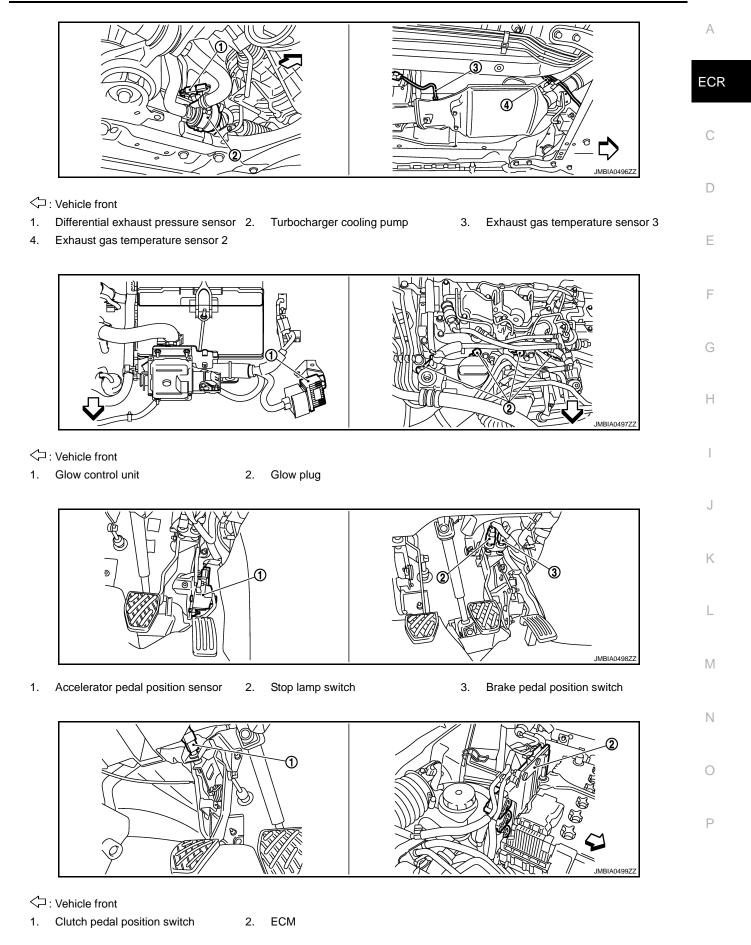


C: Vehicle front

- 1. Exhaust gas temperature sensor 1 2. Exhaust g
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

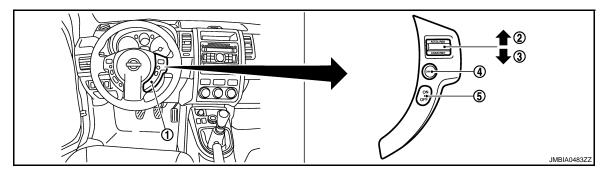
#### < FUNCTION DIAGNOSIS >

#### [M9R]



# **ECR-33**

#### < FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch 5. MAIN SWITCH
- **RESUME/ACCCELERATE** switch 3.

# **Component Description**

INFOID:000000001542427

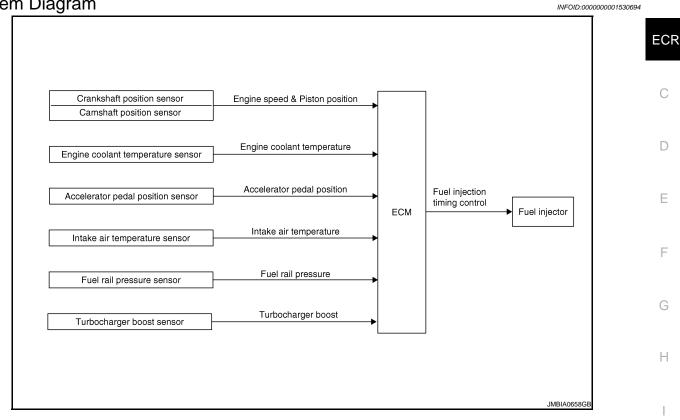
Component	Reference
Accelerator pedal position sensor	ECR-158, "Description"
Camshaft position sensor	ECR-169, "Description"
Crankshaft position sensor	ECR-167, "Description"
Clutch pedal position switch	ECR-282, "Description"
Engine coolant temperature sensor	ECR-132, "Description"
Fuel injector	ECR-155, "Description"
Fuel rail pressure sensor	ECR-150, "Description"
Mass air flow sensor	ECR-123, "Description"
Turbocharger boost sensor	ECR-161, "Description"
Vehicle speed sensor	ECR-184, "Description"

#### FUEL INJECTION TIMING CONTROL SYSTEM

#### < FUNCTION DIAGNOSIS >

# FUEL INJECTION TIMING CONTROL SYSTEM

System Diagram



#### System Description

INFOID:000000001530695

J

#### INPUT/OUTPUT SIGNAL CHART

Input signal to ECM	ECM function	ECM function	Actuator	k
Crankshaft position sensor	Engine speed		<sup>I-</sup> Fuel injector	
Camshaft position sensor	Plston position			
Engine coolant temperature sensor	Engine coolant temperature			L
Intake air temperature	Intake air temperature sensor	Fuel injection tim- ing control		
Fuel rail pressure	Fuel rail pressure			N
Accelerator pedal position sensor	Accelerator pedal position			IV
Turbocharger boost sensor	Turbocharger boost			

#### SYSTEM DESCRIPTION

The target fuel injection timing in accordance with the engine speed and the fuel injection amount are recorded as a map in the ECM beforehand. The ECM determines the optimum injection timing using sensor signals accordance with the map.

Р

Ν

0

[M9R]

А

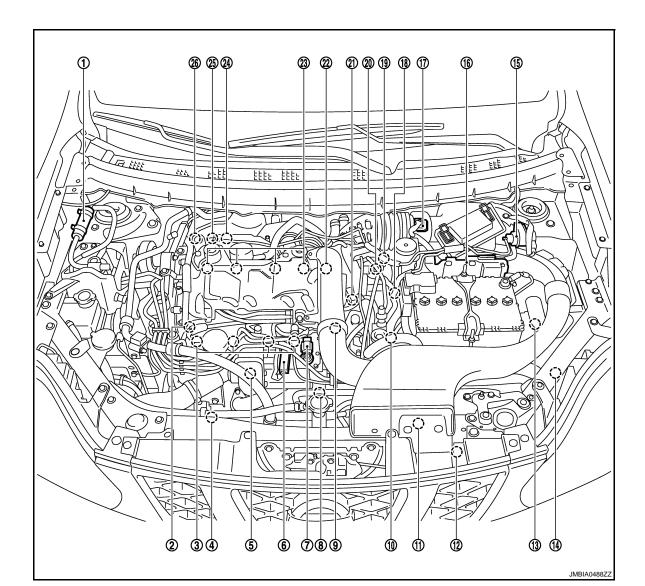
#### FUEL INJECTION TIMING CONTROL SYSTEM

#### < FUNCTION DIAGNOSIS >

#### **Component Parts Location**

INFOID:000000001542149

[M9R]



- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

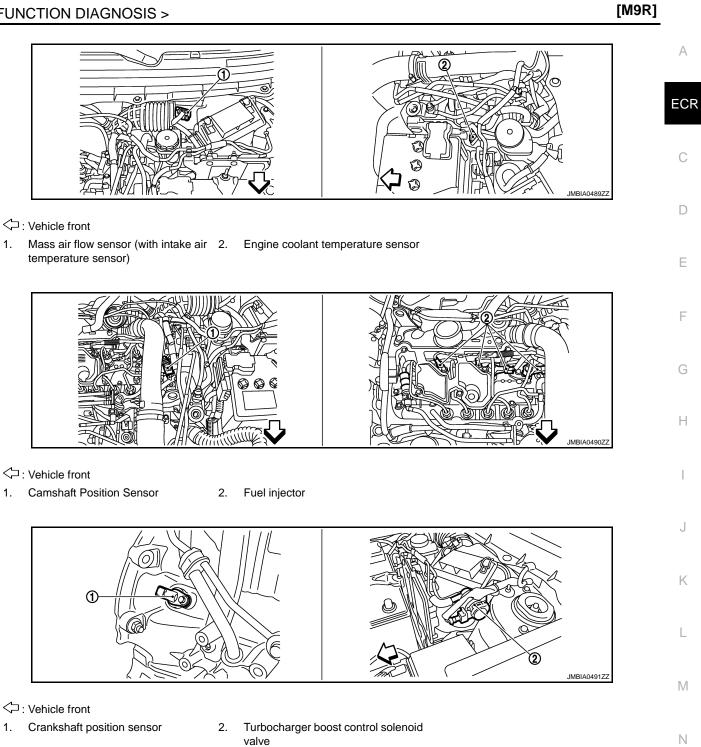
- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

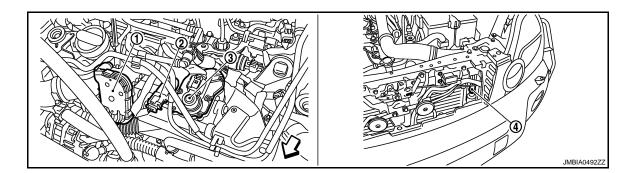
- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

### < FUNCTION DIAGNOSIS >

Ο

Ρ



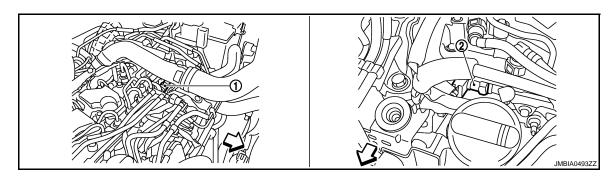


### < FUNCTION DIAGNOSIS >

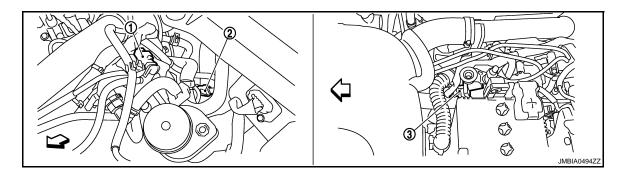
#### $\triangleleft$ : Vehicle front

- 1. Electric throttle control actuator
  - 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



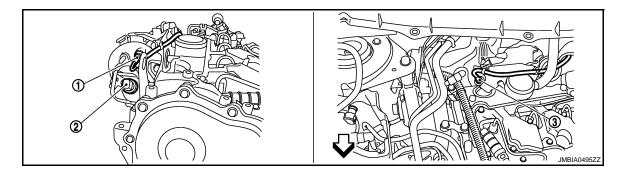
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve

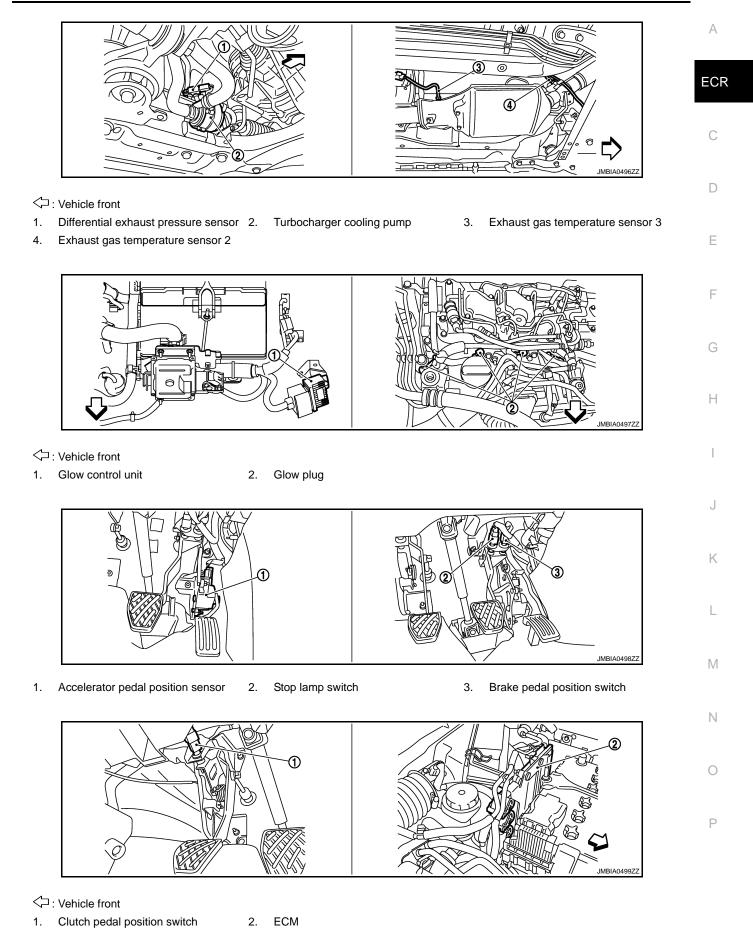


C: Vehicle front

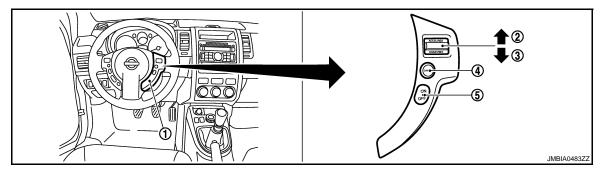
- 1. Exhaust gas temperature sensor 1 2. Exhaust
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

### < FUNCTION DIAGNOSIS >

[M9R]



### < FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

**RESUME/ACCCELERATE** switch 3.

### **Component Description**

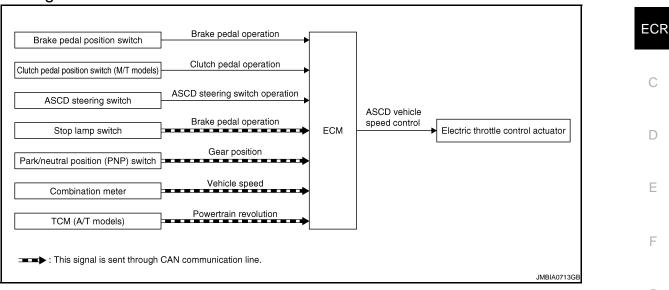
INFOID:000000001542429

Component	Reference
Accelerator pedal position sensor	ECR-158, "Description"
Camshaft position sensor	ECR-169, "Description"
Crankshaft position sensor	ECR-167, "Description"
Engine coolant temperature sensor	ECR-132, "Description"
Fuel injector	ECR-155, "Description"
Fuel rail pressure sensor	ECR-150, "Description"
Intake air temperature sensor	ECR-130, "Description"
Mass air flow sensor	ECR-123, "Description"
Turbocharger boost sensor	ECR-161, "Description"
Vehicle speed sensor	ECR-184, "Description"

#### < FUNCTION DIAGNOSIS >

### AUTOMATIC SPEED CONTROL DEVICE (ASCD)

### System Diagram



### System Description

### INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator		
Brake pedal position switch	Brake pedal operation			•	
Stop lamp switch	Brake pedal operation*	-			
Clutch pedal position switch (M/T models)	Clutch pedal operation	-			
ASCD steering switch	ASCD steering switch operation	ASCD vehicle speed control		Electric throttle control	
Park/neutral position (PNP) switch	Gear position*				
Wheel sensor	Vehicle speed*				
TCM (A/T models)	Powertrain revolution*	-			

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

#### BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/ h (25 MPH) and 200 km/h (124 MPH).

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

Operation status of ASCD is indicated by CRUISE lamp and SET lamp in combination meter. If any malfunc-

NOTE:

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

#### SET OPERATION

Press MAIN switch. (The CRUISE lamp in combination meter illuminates.) When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 200 km/h (124 PMPH). 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 keep the new set speed.

INFOID:000000001551301

INFOID:000000001551302

А

Н

#### < FUNCTION DIAGNOSIS >

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

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to neutral position. (M/T models)
- Selector lever is changed to N, P, R position (A/T models)
- Vehicle speed decreased to 12 km/h (8 MPH) lower than the set speed
- TCS system is operated

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

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

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

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

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

#### COAST OPERATION

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

#### RESUME OPERATION

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

- Brake pedal is released
- Clutch pedal is released (M/T models)
- Selector lever is in other than P and N positions (A/T models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 200 km/h (124 MPH).

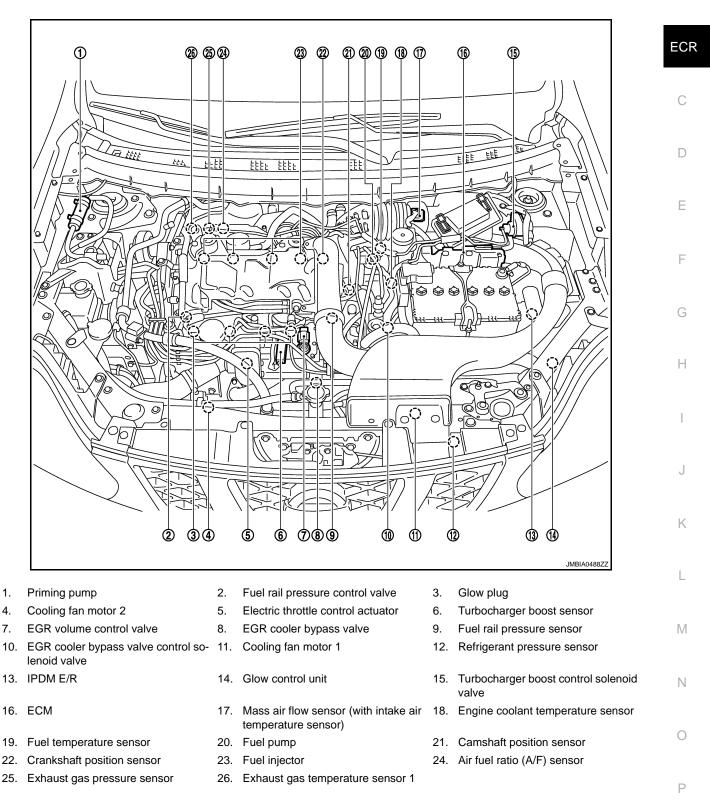
#### < FUNCTION DIAGNOSIS >

### Component Parts Location

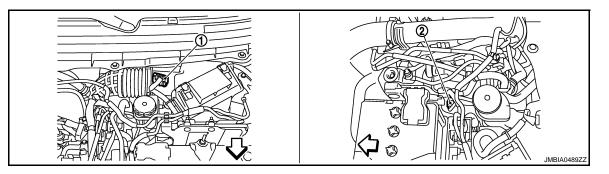
INFOID:000000001551303

[M9R]



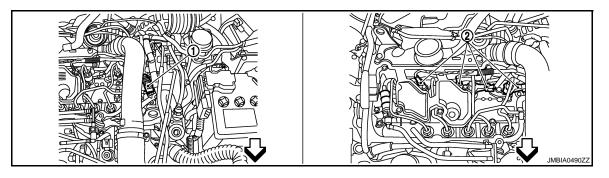


### < FUNCTION DIAGNOSIS >



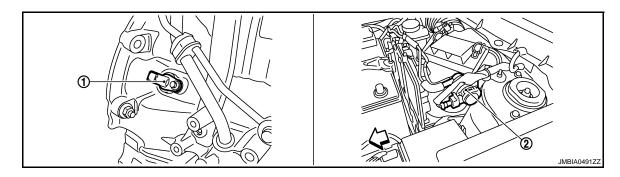
 $\triangleleft$  : Vehicle front

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



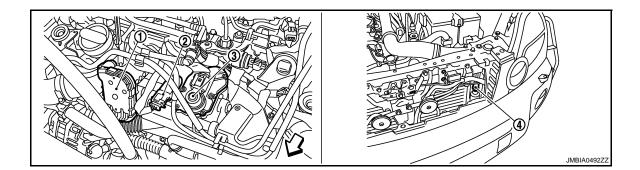
 $\diamondsuit: \mathsf{Vehicle front}$ 

- 1. Camshaft Position Sensor
- 2. Fuel injector



 $\triangleleft$  : Vehicle front

- 1. Crankshaft position sensor
- 2. Turbocharger boost control solenoid valve



### < FUNCTION DIAGNOSIS >

#### [M9R]

А

ECR

С

D

Ε

F

Н

J

Κ

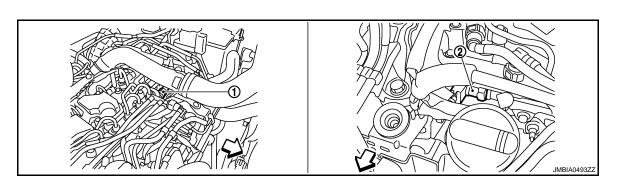
L

#### C: Vehicle front

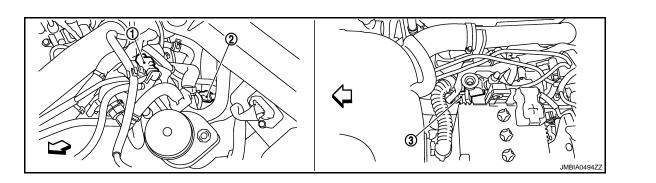
- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

- 4.

Refrigerant pressure sensor



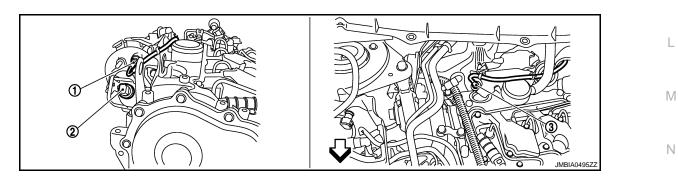
- C: Vehicle front
- Fuel rail pressure sensor 1.
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve



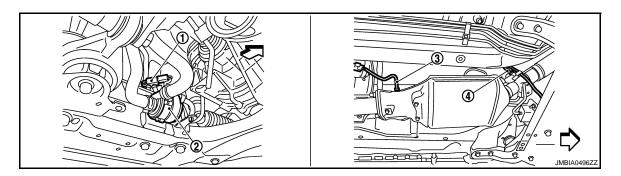
C: Vehicle front

- Exhaust gas temperature sensor 1 2. Exhaust gas pressure sensor 1.
- 3. Air fuel ratio (A/F) sensor

Ο

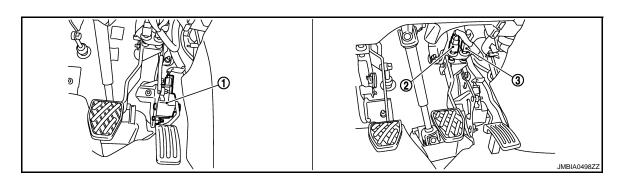
### < FUNCTION DIAGNOSIS >

[M9R]

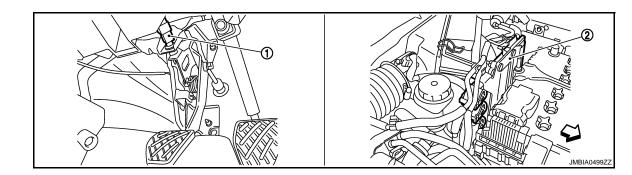


- $\Box$  : Vehicle front
- 1. Differential exhaust pressure sensor 2.
- Turbocharger cooling pump
- 3. Exhaust gas temperature sensor 3

- 4. Exhaust gas temperature sensor 2
- $\Box$  : Vehicle front
- 1. Glow control unit
- 2. Glow plug



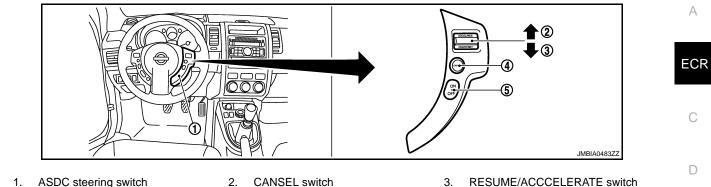
- 1. Accelerator pedal position sensor 2.
- 2. Stop lamp switch
- 3. Brake pedal position switch



- C: Vehicle front
- 1. Clutch pedal position switch 2. ECM

#### < FUNCTION DIAGNOSIS >

[M9R]



- ASDC steering switch 1. 4. SET/COAST switch
- 2. CANSEL switch
  - 5. MAIN SWITCH

INFOID:000000001551304

Ε

J

Κ

L

Μ

Ν

Ο

Ρ

### **Component Description**

Component	Reference	
ASCD steering switch	ECR-192, "Description"	
Clutch pedal position switch	ECR-282, "Description"	
Brake pedal position switch	ECR-195, "Description"	(
Electric throttle control actuator	ECR-236, "Description"	
ASCD indicator	ECR-281, "Description"	

### CAN COMMUNICATION

### System Description

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

Refer to LAN-25. "CAN Communication Signal Chart", about CAN communication for detail.

INFOID:000000001307432

### < FUNCTION DIAGNOSIS >

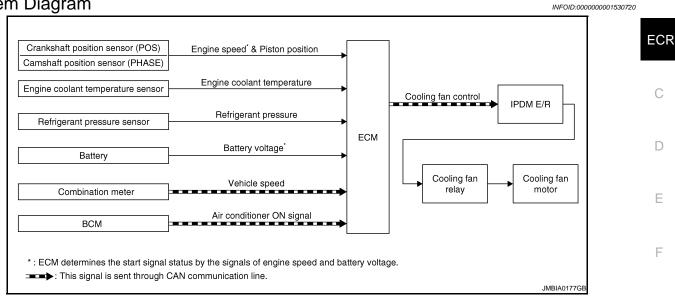
### COOLING FAN CONTROL



INFOID:000000001530721

А

### System Diagram



### System Description

### INPUT/OUTPUT SIGNAL CHART

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

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

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

#### SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, refrigerant pressure, air conditioner ON signal. Then control system has 4-step control [HIGH/MIDDLE/LOW/OFF].

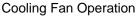
Ν

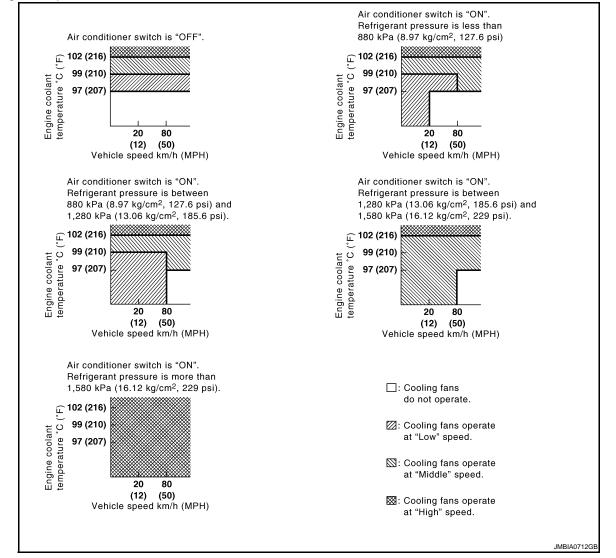
Н

 $\bigcirc$ 



### < FUNCTION DIAGNOSIS >





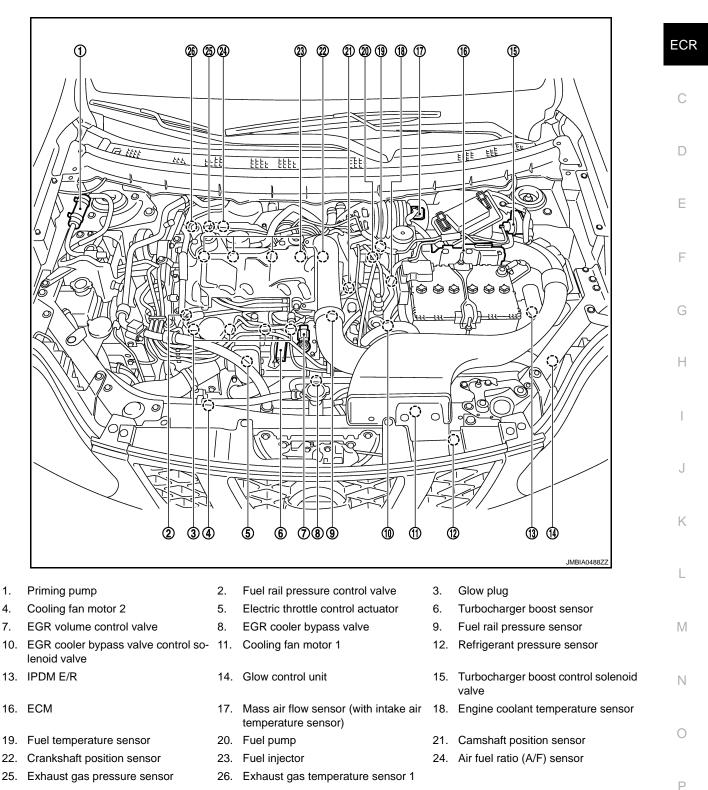
#### Cooling Fan Relay Operation The ECM controls cooling fan relays through CAN communication line.

Cooling fan speed	Cooling fan relay				
	1	2	3	4	5
Stop (OFF)	OFF	OFF	OFF	OFF	OFF
Low (LOW)	OFF	OFF	OFF	ON	OFF
Middle (MID)	ON	OFF	OFF	OFF	ON
High (HI)	ON	ON	ON	OFF	ON

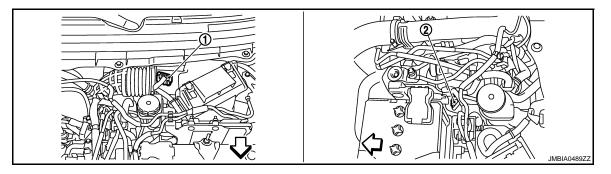
#### < FUNCTION DIAGNOSIS >

### **Component Parts Location**

[M9R]

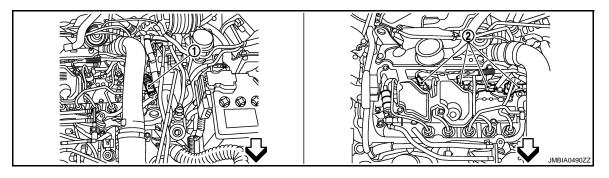


### < FUNCTION DIAGNOSIS >



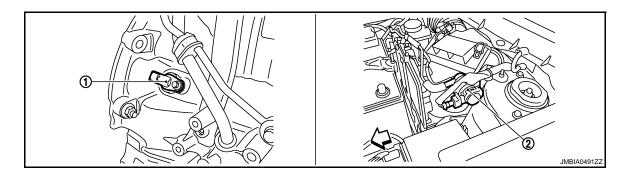
 $\triangleleft$  : Vehicle front

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



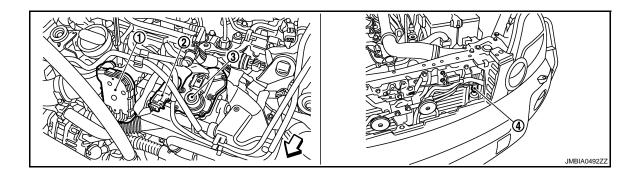
 $\diamondsuit: \mathsf{Vehicle front}$ 

- 1. Camshaft Position Sensor
- 2. Fuel injector



 $\triangleleft$ : Vehicle front

- 1. Crankshaft position sensor
- 2. Turbocharger boost control solenoid valve



#### < FUNCTION DIAGNOSIS >

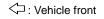
### [M9R]

#### C: Vehicle front

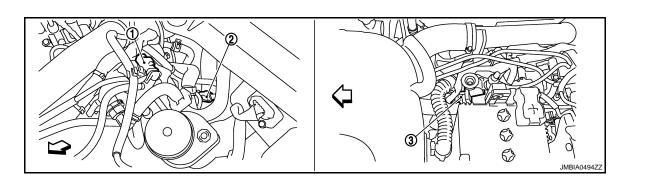
- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor





- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve

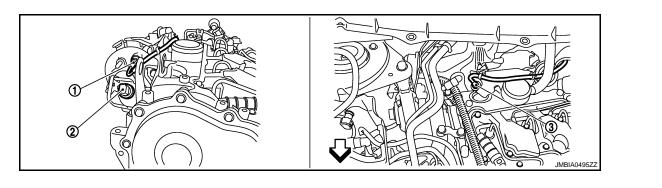


C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve

3. Air fuel ratio (A/F) sensor



C: Vehicle front

1. Exhaust gas temperature sensor 1 2. Exhaust gas pressure sensor

Ο

А

ECR

С

D

Ε

F

Н

J

Κ

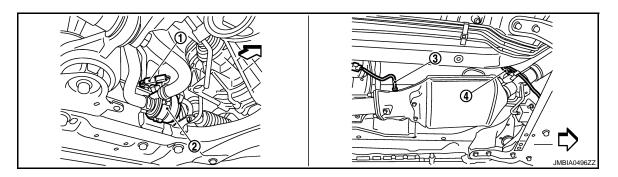
L

Μ

Ν

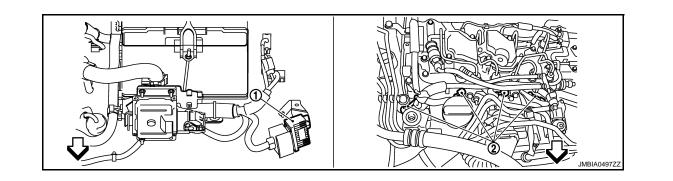
JMBIA0493ZZ

### < FUNCTION DIAGNOSIS >

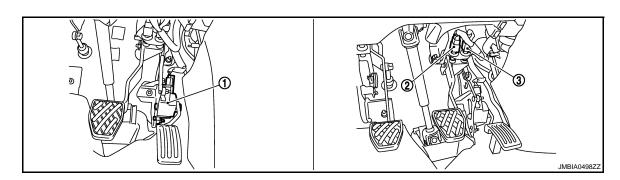


- $\Box$  : Vehicle front
- 1. Differential exhaust pressure sensor 2.
- Turbocharger cooling pump
- 3. Exhaust gas temperature sensor 3

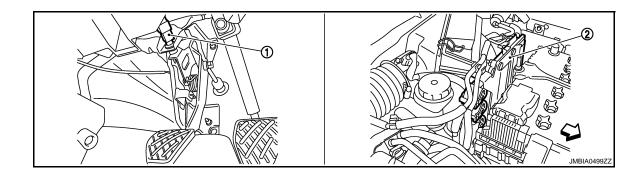
4. Exhaust gas temperature sensor 2



- $\triangleleft : \mathsf{Vehicle front} \\$
- 1. Glow control unit
- 2. Glow plug

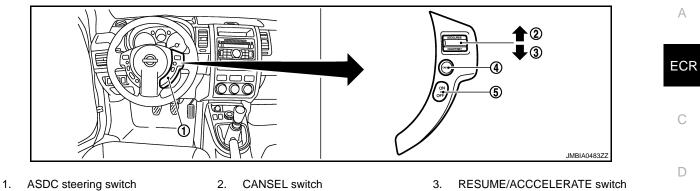


- 1. Accelerator pedal position sensor 2.
- 2. Stop lamp switch
- 3. Brake pedal position switch



- C: Vehicle front
- 1. Clutch pedal position switch 2. ECM

#### < FUNCTION DIAGNOSIS >



- 4. SET/COAST switch
- 2. CANSEL switch
  - 5. MAIN SWITCH

INFOID:000000001542431

Ε

### **Component Description**

Component	Reference	F
Camshaft position sensor	ECR-169, "Description"	
Cooling fan motor	ECR-284, "Description"	0
Crankshaft position sensor	ECR-167, "Description"	G
Engine coolant temperature sensor	ECR-132, "Description"	
Refrigerant pressure sensor	ECR-185, "Description"	Н
Vehicle speed sensor	ECR-184, "Description"	

J

L

Μ

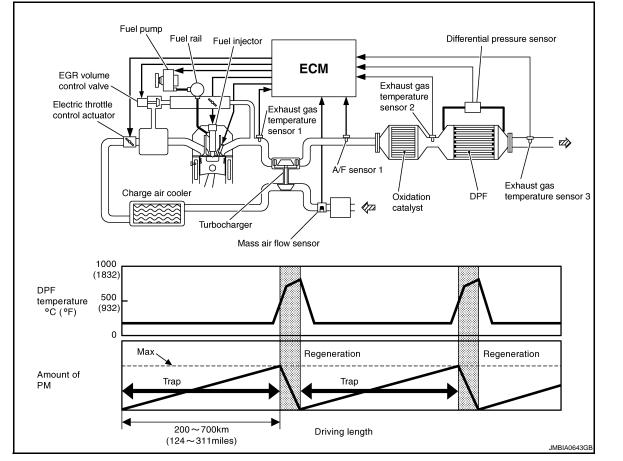
Ν

Ο

Ρ

# < FUNCTION DIAGNOSIS > DPF

### System Diagram



#### INFOID:000000001542226

#### System Description

INFOID:000000001527693

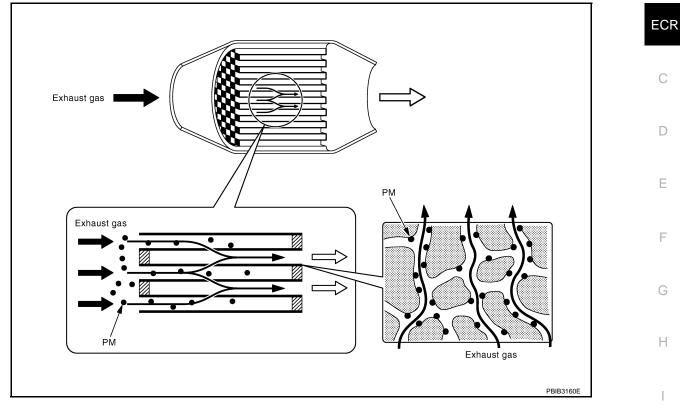
[M9R]

J

Κ

L

#### COMPONENT DESCRIPTION



DPF

DPF (Diesel Particulate Filter) is placed after the oxidation catalyst and traps PM (Particulate Matter) in exhaust gas. DPF is formed in a honeycomb form made of ceramic. This structure facilitates to trap particulate matter.

When the amount of particulate matter in the DPF reaches the specified level, the particulate matter needs to be reduced through burning to maintain the DPF function. This reducing of particulate matter is called Regeneration and should be performed periodically. DPF can be effective for a long time through the cycle of trapping particulate matter and regeneration.

#### SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator	
Crankshaft position sensor	Engine speed	_		
Camshaft position sensor	Piston position			
Engine coolant temperature sensor	flow sensor     Amount of intake air       tion meter     Vehicle speed*       al exhaust pressure sensor     Differential exhaust pressure			
Mass air flow sensor		<ul> <li>Fuel injector</li> </ul>		
Combination meter			Electric throttle control actuator	
Differential exhaust pressure sensor				
A/F sensor 1				
Exhaust gas temperature sensor 2	Exhaust gas temperature before DPF	-		
Exhaust gas temperature sensor 3	Exhaust gas temperature after DPF			

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

#### NOTE:

In addition to the controls described above, ECM performs fuel injection control and EGR volume control for the regeneration. ECM estimates the amount of particulate matter in DPF based on the mileage and the differential exhaust pressure. ECM automatically performs regeneration when the amount of particulate matter in DPF reaches the specified level. When performing regeneration, ECM raise the exhaust gas temperature to activate Oxidation Catalyst. ECM performs the followings to raise exhaust gas temperature.

#### < FUNCTION DIAGNOSIS >

Closing throttle valve to reduce intake air volume

- Retarding fuel injection timing
- Injecting additional fuel into combustion chamber during exhaust stroke (post injection)
- Performing EGR control

When exhaust gas temperature reaches the specified value, oxidation catalyst is activated. The trapped particulate matter is burned through a catalytic reaction using exhaust gas heat at 600 °C.

During regeneration ECM performs a feedback control to keep emission levels low and burn particulate matter safely and efficiently. This feedback control is performed based on the air fuel mixture ratio and the exhaust gas temperature.

When performing regeneration, ECM raise the exhaust gas temperature to activate Oxidation Catalyst. If the vehicle is driven in the driving pattern in which the exhaust gas temperature can not be raised, DPF warning light as shown in the figure lights up. DPF warning light is located on combination meter.

When DPF warning light lights up, drive the vehicle under any of the following condition to complete regeneration.

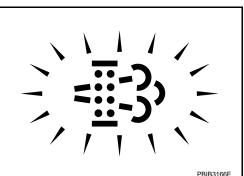
- The vehicle is driven continuously at 60km/h for 30 minutes\*
- The vehicle is driven continuously 15km or more without being caught in traffic jam

If the vehicle is driven in the driving pattern in which the exhaust gas temperature can not be raised after DPF warning light lights up, ECM performs the following to protect DPF.

- ECM enters fail-safe mode and limits engine speed to 3,000 rpm with fuel cut.
- ECM stores DTC P2002 in the memory.

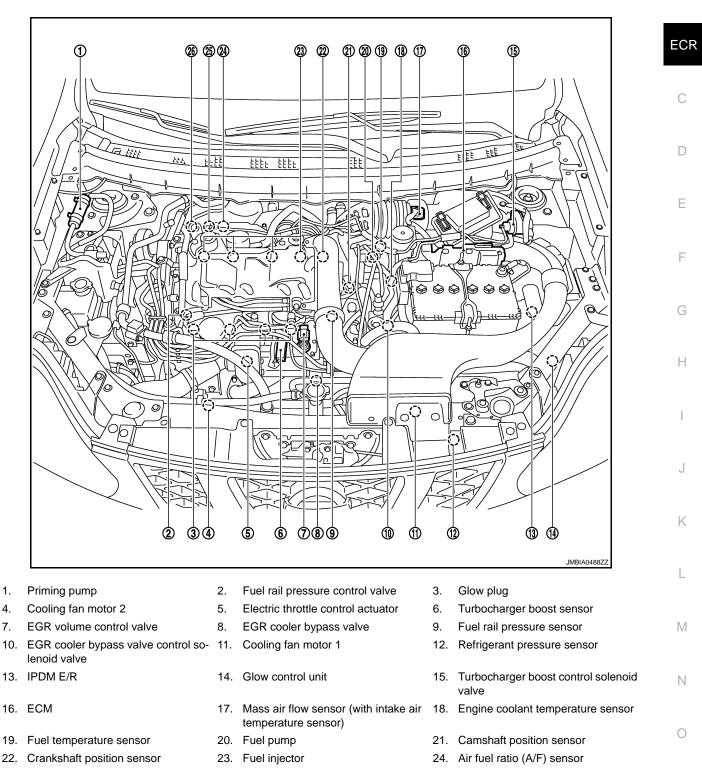
To recover from the condition described above, perform "Service Regeneration" with CONSULT-III to reduce the particulate matter through burning. Refer to <u>ECR-16, "SERVICE REGENERATION : Description"</u>.

\*: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.



### **Component Parts Location**

Ρ

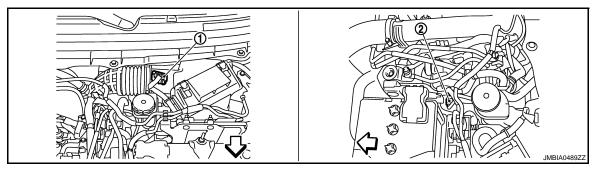


25. Exhaust gas pressure sensor

4.

26. Exhaust gas temperature sensor 1

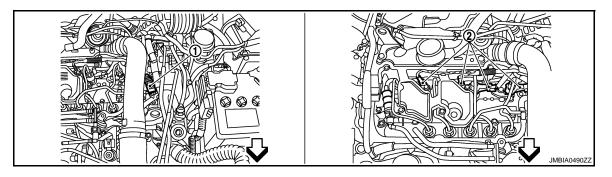
### < FUNCTION DIAGNOSIS >



DPF

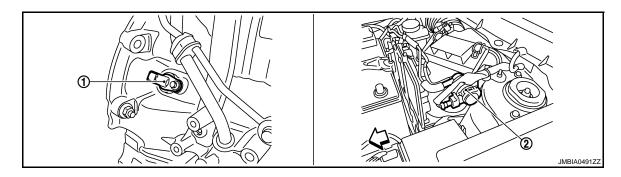
└□: Vehicle front

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



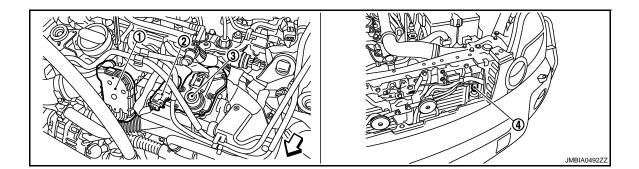
└□: Vehicle front

- 1. Camshaft Position Sensor
- 2. Fuel injector



 $\triangleleft$ : Vehicle front

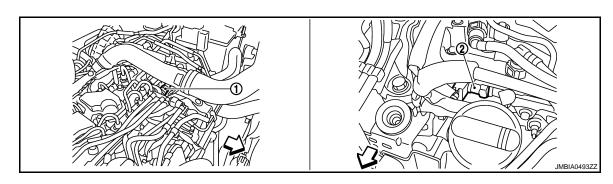
- 1. Crankshaft position sensor
- 2. Turbocharger boost control solenoid valve



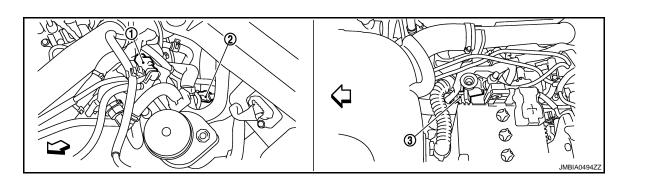
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



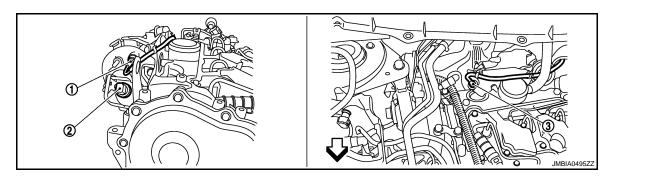
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve



C: Vehicle front

- 1. Exhaust gas temperature sensor 1 2. Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

Ο

А

ECR

С

D

Ε

F

G

Н

J

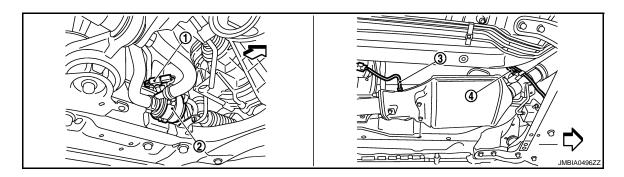
Κ

L

Μ

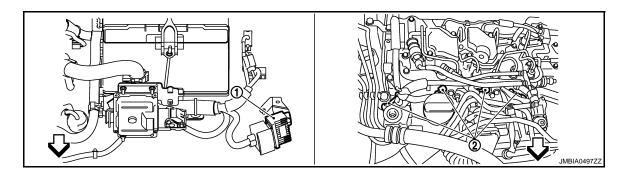
Ν

### < FUNCTION DIAGNOSIS >

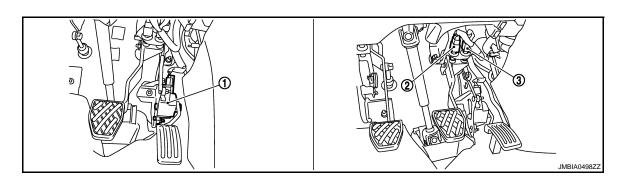


- $\diamondsuit: \mathsf{Vehicle front}$
- 1. Differential exhaust pressure sensor 2.
- Turbocharger cooling pump
- 3. Exhaust gas temperature sensor 3

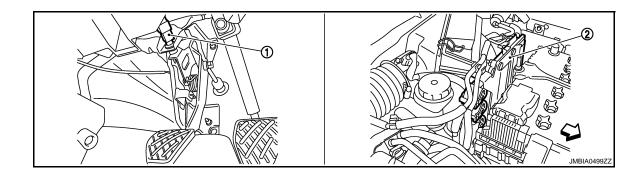
4. Exhaust gas temperature sensor 2



- $\triangleleft$  : Vehicle front
- 1. Glow control unit
- 2. Glow plug

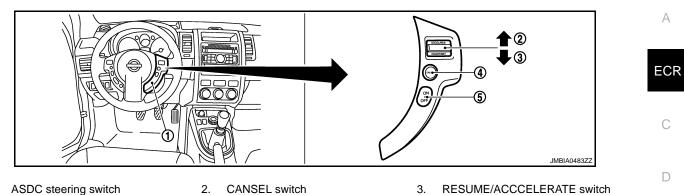


- 1. Accelerator pedal position sensor 2.
- 2. Stop lamp switch
- 3. Brake pedal position switch



- C: Vehicle front
- 1. Clutch pedal position switch 2. ECM

### < FUNCTION DIAGNOSIS >



DPF

ASDC steering switch 1. SET/COAST switch

4.

- CANSEL switch 2.
- 5. MAIN SWITCH

INFOID:000000001542432

Ε

### **Component Description**

Component	Reference	F
A/F sensor 1	ECR-137, "Description"	
Camshaft position sensor	ECR-169, "Description"	
Crankshaft position sensor	ECR-167, "Description"	G
Differential exhaust pressure sensor	ECR-269, "Description"	
Engine coolant temperature sensor	ECR-132, "Description"	Н
Exhaust gas temperature sensor 2	ECR-231, "Description"	
Exhaust gas temperature sensor 3	ECR-264, "Description"	
Fuel injector	ECR-155, "Description"	
Mass air flow sensor	ECR-123, "Description"	
Throttle position sensor	ECR-134, "Description"	J
Vehicle speed sensor	ECR-184, "Description"	

L

Μ

Ν

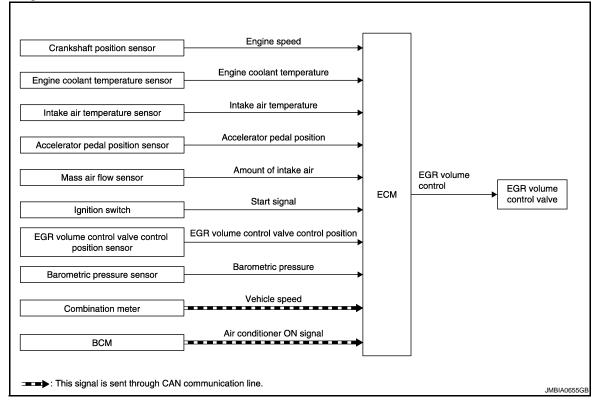
Ο

Ρ

System Description

### EGR VALVE CONTROL

#### System Diagram



#### System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator		
Crankshaft position sensor	Engine speed				
Engine coolant temperature sensor	Engine coolant temperature		EGR volume con- trol valve		
Intake air temperature sensor	Intake air temperature				
Mass air flow sensor	Amount of intake air	EGR volume control			
Accelerator pedal position sensor	Accelerator pedal position				
Ignition switch	Start signal				
EGR volume control valve control position sensor	EGR volume control valve control position				
Barometric pressure sensor	Barometric pressure				
Vehicle speed sensor	Vehicle speed*				
Air conditioner switch	Air conditioner operation*				

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

SYSTEM DESCRIPTION

This system controls the flow rate of EGR led from exhaust manifold to intake manifold.

The opening of the EGR passage in the EGR volume control valve changes to control the EGR flow rate.

A built-in DC motor moves the valve continuously corresponding to the ECM output signal.

The EGR volume control valve control position sensor detects the valve position and sends the voltage signals to the ECM.

The ECM judges the current opening angle of the valve from this signals and the ECM controls the DC motor to make the valve opening angle properly.

INFOID:000000001530699

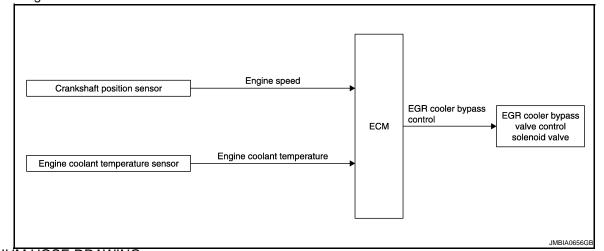
#### < FUNCTION DIAGNOSIS >

The opening angle of the valve varies for optimum engine control. The optimum value stored in the ECM is determined b7y considering various engine conditions.

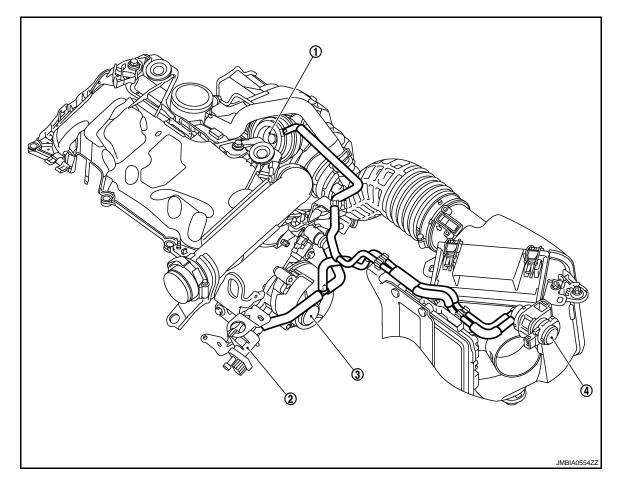
- The EGR volume control valve remains close under the following conditions.
- Engine stopped
- Engine starting
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Accelerator pedal fully depressed

#### EGR COOLER BYPASS CONTROL

System Diagram



#### VACUUM HOSE DRAWING



\_\_\_\_

ECR

D

Ε

F

Н

Κ

L

Μ

Ν

Ρ

А

### < FUNCTION DIAGNOSIS >

[M9R]

1. Turbocharger boost control actuator 2.

EGR cooler bypass valve control so- 3. Vacuum pump lenoid valve

4. Turbocharger boost control solenoid valve

# System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	EGR cooler bypass	EGR cooler bypass valve
Crankshaft position sensor	Engine speed	control	control solenoid valve

#### SYSTEM DESCRIPTION

ECM controls the bypass gas volume to EGR cooler at engine cold.

EGR cooler bypass valve control solenoid valve controls the vacuum signal to EGR cooler bypass valve control actuator.

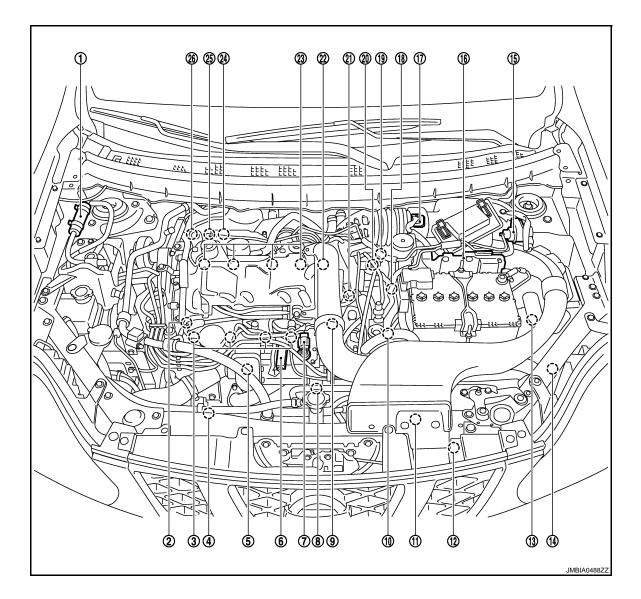
ERG amount is controlled by changing the EGR cooler bypass valve opening using the rod.

EGR cooler bypass valve control solenoid valve is operated by ON/OFF signals (pulse signals) sent from ECM.

The longer is the ON pulse duration, the larger becomes the bypass gas volume.

### Component Parts Location

INFOID:000000001542152



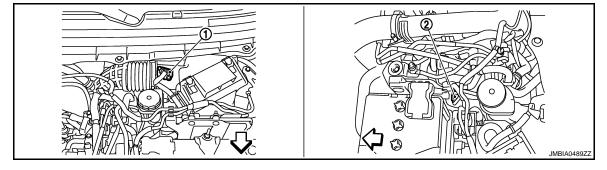
#### < FUNCTION DIAGNOSIS >

- 1. Priming pump
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
  - 1. Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

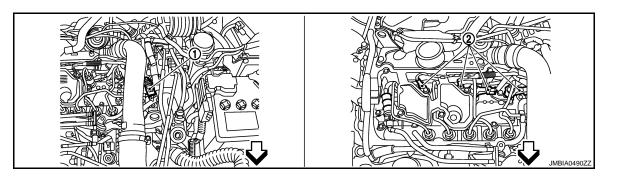
## Glow plug Turbocharger boost sensor

- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- Turbocharger boost control solenoid valve
   Engine coolant temperature sensor
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor



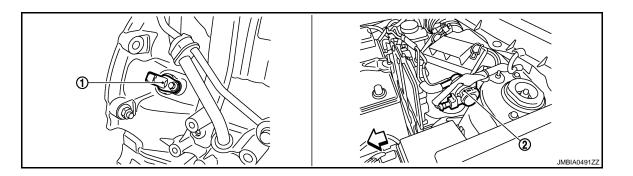
#### C: Vehicle front

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



#### C: Vehicle front

- 1. Camshaft Position Sensor
- 2. Fuel injector



#### C: Vehicle front

- 1. Crankshaft position sensor
- Turbocharger boost control solenoid valve

ECR-67

- [M9R]
- ECR

С

D

Ε

F

Н

Κ

L

Μ

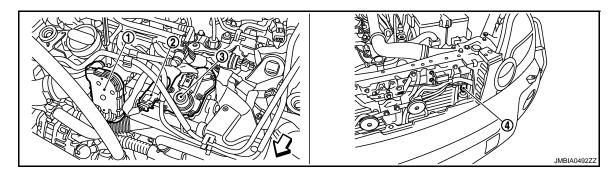
Ν

Ρ

А

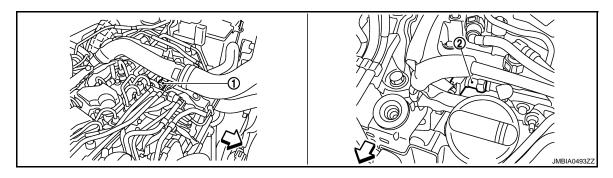
### < FUNCTION DIAGNOSIS >

### [M9R]

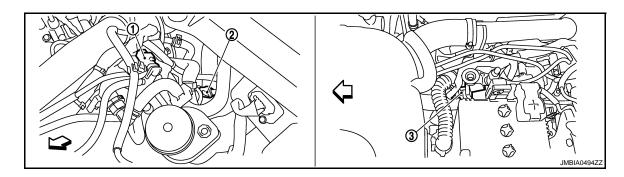


- $\triangleleft : \mathsf{Vehicle front} \\$
- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



- $\triangleleft$ : Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve

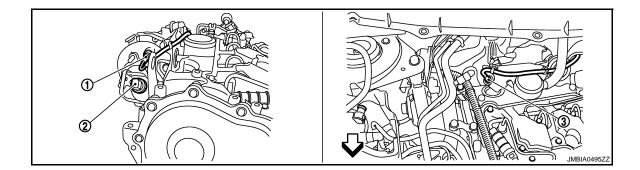


C: Vehicle front

1. Fuel temperature sensor

2. Fuel pump

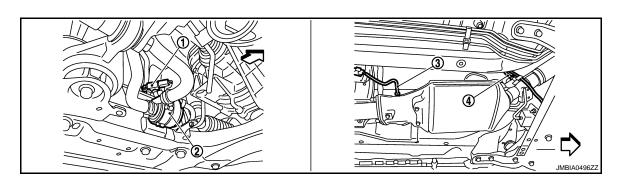
3. EGR cooler bypass valve control solenoid valve



### < FUNCTION DIAGNOSIS >

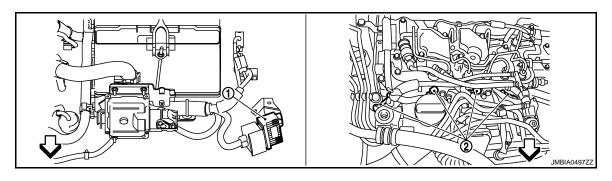
#### C: Vehicle front

- Exhaust gas pressure sensor 1. Exhaust gas temperature sensor 1 2.
- 3.
  - Air fuel ratio (A/F) sensor



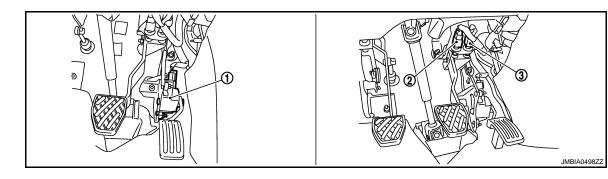
- C: Vehicle front
- 1. Differential exhaust pressure sensor 2. Turbocharger cooling pump
- 3. Exhaust gas temperature sensor 3

Exhaust gas temperature sensor 2 4.

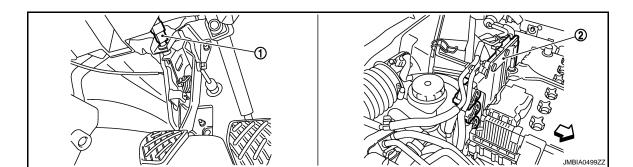


C: Vehicle front

- 1. Glow control unit
- 2. Glow plug



- 1. Accelerator pedal position sensor 2.
  - Stop lamp switch
- 3. Brake pedal position switch



ECR

С

D

Е

F

Н

Κ

L

Μ

Ν

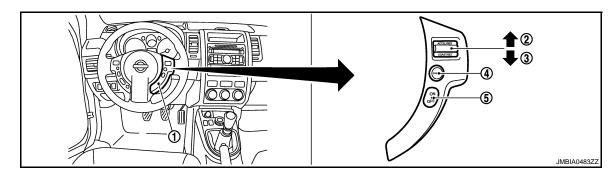
Ο

Ρ

### < FUNCTION DIAGNOSIS >

#### $\triangleleft$ : Vehicle front

1. Clutch pedal position switch 2. ECM



1. ASDC steering switch SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

3. **RESUME/ACCCELERATE** switch

### **Component Description**

INFOID:000000001542433

Component	Reference
Accelerator pedal position sensor	ECR-158. "Description"
Barometric pressure sensor	ECR-247, "Description"
Crankshaft position sensor	ECR-167, "Description"
EGR cooler bypass valve control solenoid valve	ECR-262, "Description"
EGR volume control valve	ECR-180. "Description"
EGR volume control valve control position sensor	ECR-175, "Description"
Engine coolant temperature sensor	ECR-132, "Description"
Intake air temperature sensor	ECR-130. "Description"
Mass air flow sensor	ECR-123, "Description"
Vehicle speed sensor	ECR-184, "Description"

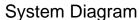
### ENGINE TORQUE CONTROL

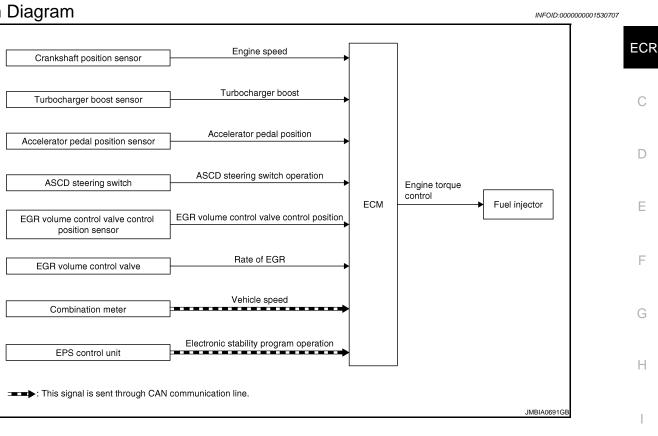
#### < FUNCTION DIAGNOSIS >

### ENGINE TORQUE CONTROL

[M9R]

А





### System Description

#### INFOID:000000001530708

P

### **INPUT/OUTPUT SIGNAL CHART**

Sensor	Input Signal to ECM	ECM function	Actuator	-	
Crankshaft position sensor	Engine speed			-	
Accelerator pedal position sensor	Accelerator pedal position           Turbocharger boost pressure	Engine torque control			
Turbocharger boost pressure sensor					
EGR volume control valve control position sensor	EGR volume control valve control position		Fuelinisates		
EGR volume control valve	Rate of EGR		Fuel injector		
ASCD steering switch	ASCD steering switch operation				
Vehicle speed sensor	Vehicle speed*	_			
EPS control unit	Electronic stability program opera- tion*				

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

#### SYSTEM DESCRIPTION

The torque structure is the system which translates the driver's request into a torque supplied by the engine. It is required for certain functions such as the electronic stability program (ESP), the automatic gearbox or the sequential gearbox if fitted.

Each inter-system (ESP, automatic gearbox, sequential gearbox) sends the ECM a torque request via the CAN communication. The ECM arbitrates between the inter-system torque requests and the driver's request (comprised of the accelerator pedal or the ASCD function). The result of the arbitration gives the torque setpoint.

From this torque setpoint, the ECM determines the quantity of fuel to be injected (injection duration and number of injections) and the amount of air required (turbocharging pressure and EGR rate) so that the engine is

### **ENGINE TORQUE CONTROL**

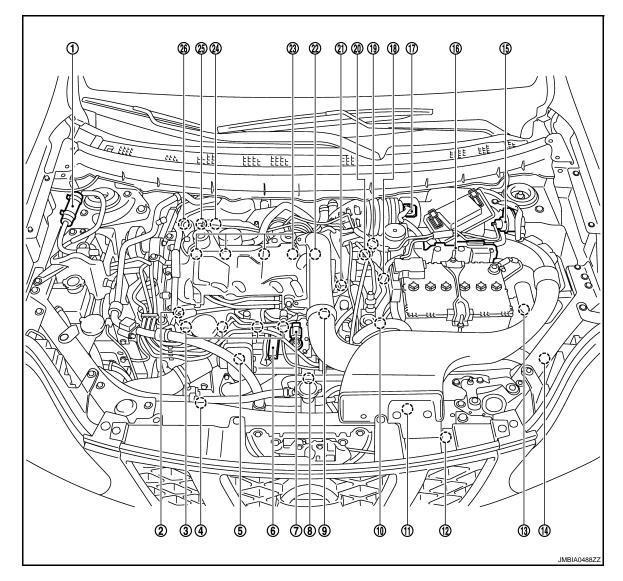
#### < FUNCTION DIAGNOSIS >

[M9R]

able to provide the torque required in the best possible conditions (in terms of smooth running performance, pollutant emissions, etc.).

### **Component Parts Location**

INFOID:000000001542153



- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

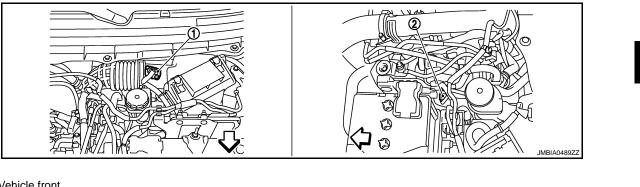
- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

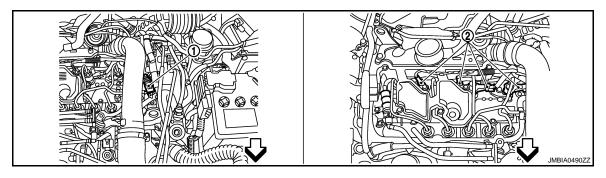
## **ENGINE TORQUE CONTROL**

#### < FUNCTION DIAGNOSIS >

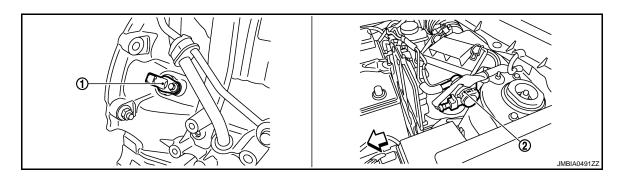
## [M9R]



- C: Vehicle front
- 1. Mass air flow sensor (with intake air 2. Engine coolant temperature sensor temperature sensor)

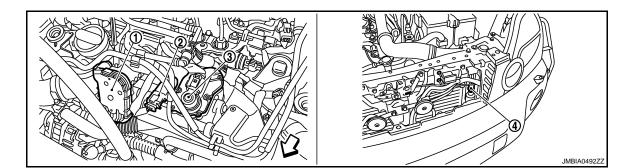


- C: Vehicle front
- 1. Camshaft Position Sensor
- 2. Fuel injector



C: Vehicle front

- 1. Crankshaft position sensor
- 2. Turbocharger boost control solenoid valve



**ECR-73** 

## ECR

С

А

D

Ε

G

Н

J

Κ

L

Μ

Ν

Ο

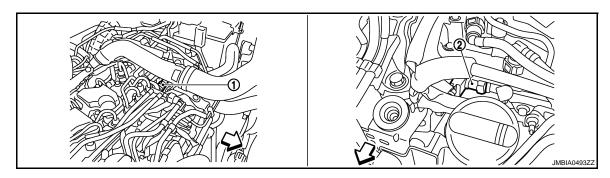
Ρ

## < FUNCTION DIAGNOSIS >

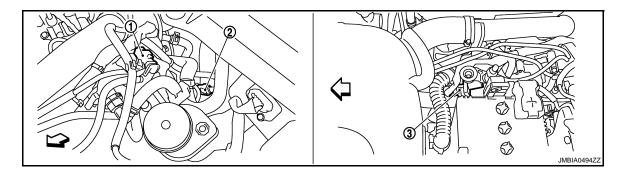
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



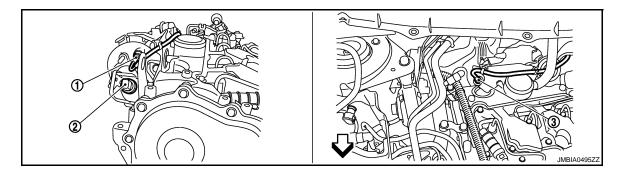
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve



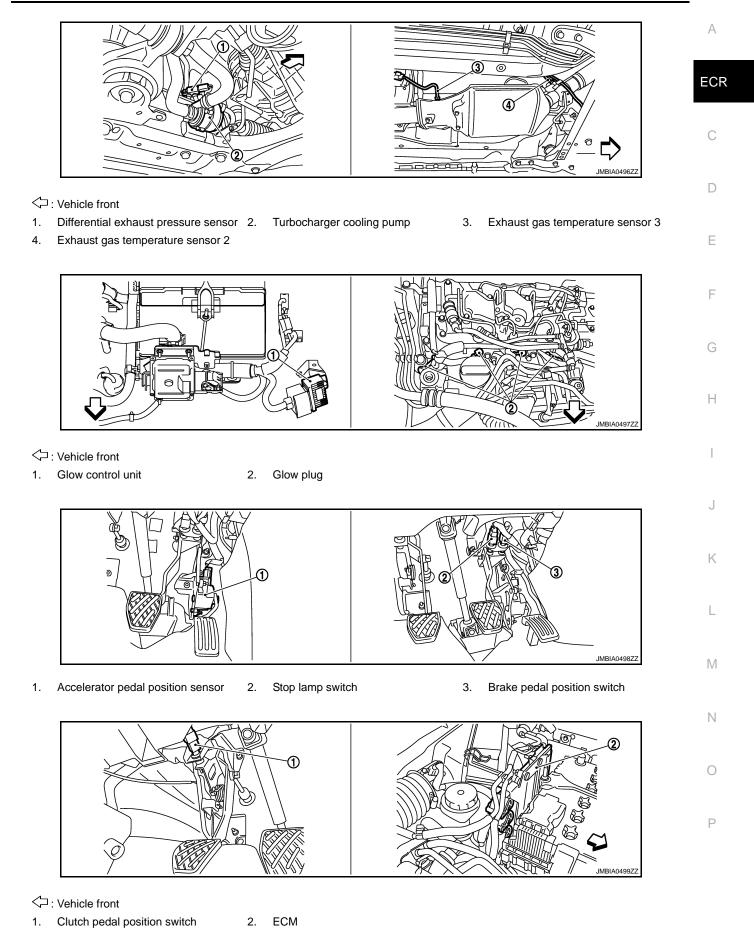
C: Vehicle front

- 1. Exhaust gas temperature sensor 1 2. Exhaust
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

## **ENGINE TORQUE CONTROL**

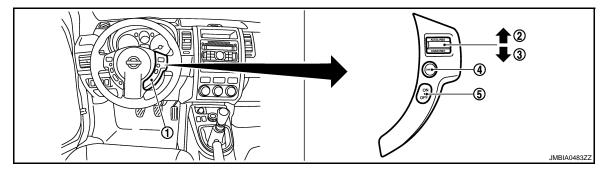
#### < FUNCTION DIAGNOSIS >

## [M9R]



## **ENGINE TORQUE CONTROL**

## < FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

**RESUME/ACCCELERATE** switch 3.

## **Component Description**

INFOID:000000001542434

Component	Reference
Accelerator pedal position sensor	ECR-158, "Description"
ASCD steering switch	ECR-192, "Description"
Crankshaft position sensor	ECR-167, "Description"
EGR volume control valve	ECR-180, "Description"
EGR volume control valve control position sensor	ECR-175, "Description"
Fuel injector	ECR-155, "Description"
Turbocharger boost sensor	ECR-161, "Description"
Vehicle speed sensor	ECR-184. "Description"

## < FUNCTION DIAGNOSIS > **GLOW CONTROL**

А

Е

F

System Diagram INFOID:000000001530711 ECR Engine coolant temperature Engine coolant temperature sensor Intake air temperature Intake air temperature sensor Glow control ECM Glow control unit D Battery voltage Battery Barometric pressure Glow plug Barometric pressure sensor JMBIA0657GI

## System Description

INFOID:000000001530712

## INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	Н
Engine coolant temperature sensor	Engine coolant temperature			_
Intake air temperature sensor	Intake air temperature	Glow control	Grow control unit	1
Battery	Battery voltage	Glow control	✓ Glow plug	1
Barometric pressure sensor	Barometric pressure			

#### SYSTEM DESCRIPTION

When ignition switch is turned ON while cooling temperature is lower than the specified value, ECM actuates glow plug through glow control unit. Because of this, combustion chamber is warmed and stabilized combustion at starting can be obtained under low cooling temperature. The preheating time is determined according Κ to cooling temperature, inlet air temperature and battery voltage.

L

J

Μ

Ν

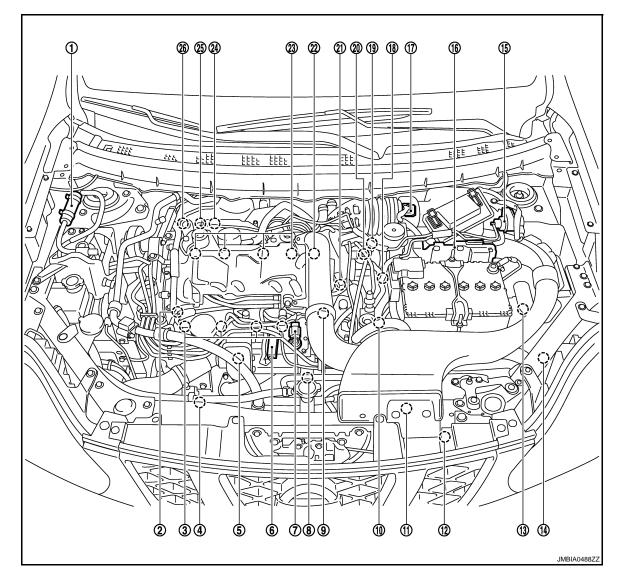
Ρ

## < FUNCTION DIAGNOSIS >

## **Component Parts Location**

INFOID:000000001542154

[M9R]



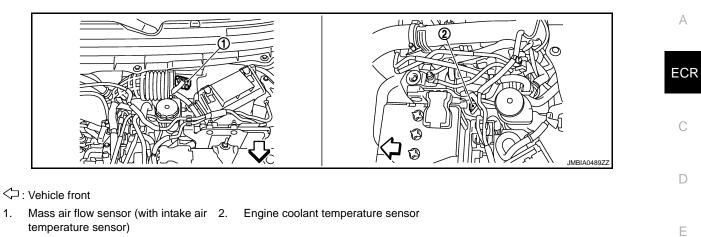
- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

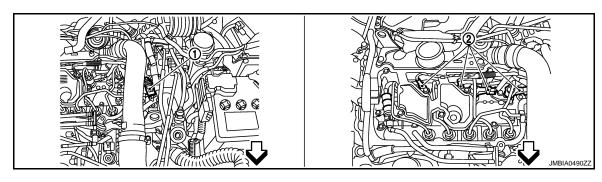
- 2. Fuel rail pressure control valve
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

## < FUNCTION DIAGNOSIS >

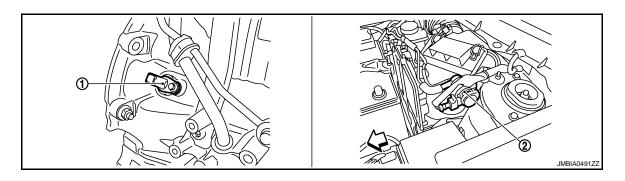
## [M9R]





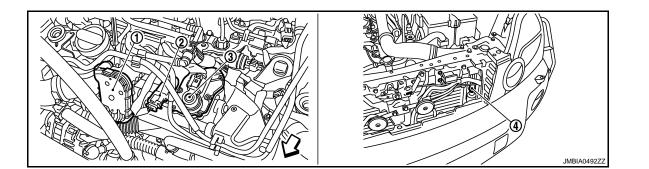
C: Vehicle front

- Camshaft Position Sensor 1.
- 2. Fuel injector



C: Vehicle front

- 1. Crankshaft position sensor
- Turbocharger boost control solenoid 2. valve



**ECR-79** 

G

Н

J

Κ

L

Μ

Ν

Ο

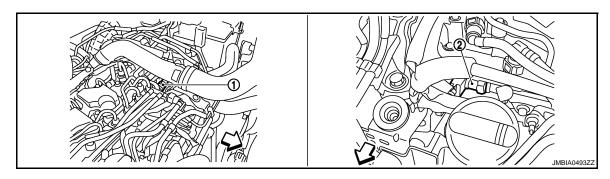
Ρ

## < FUNCTION DIAGNOSIS >

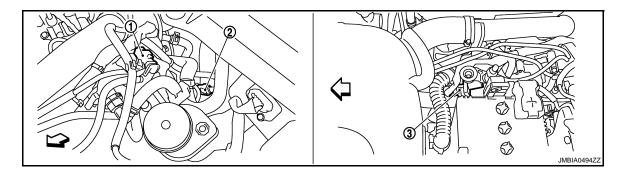
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



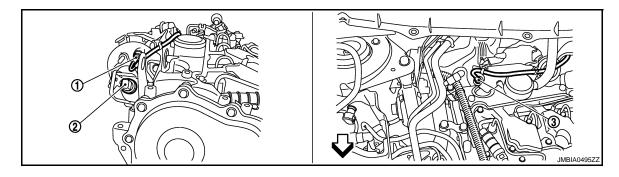
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C : Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve

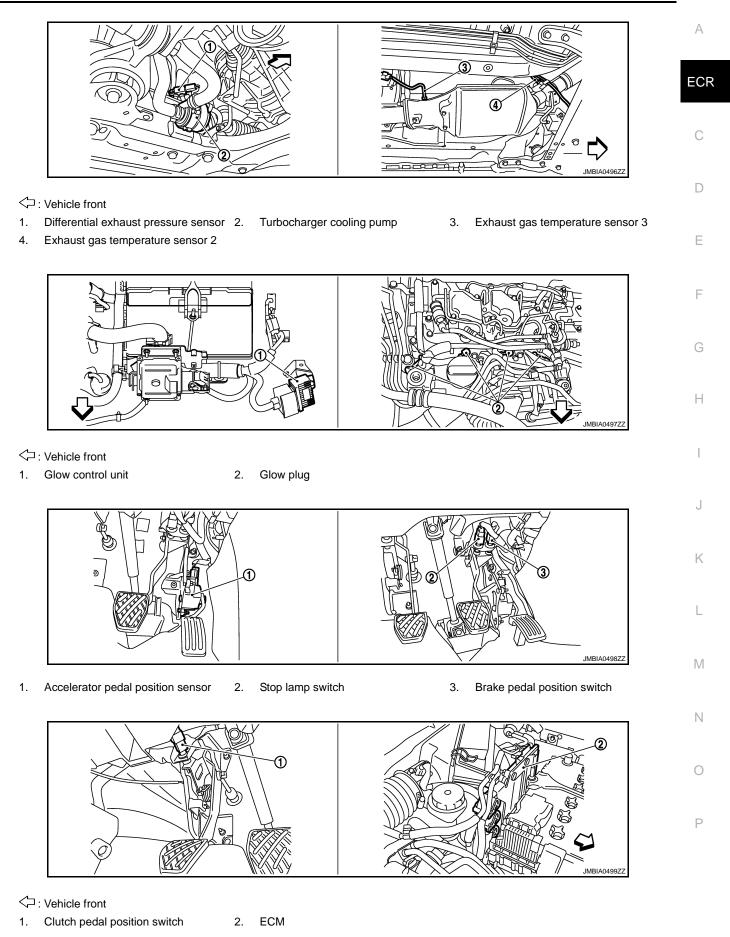


C: Vehicle front

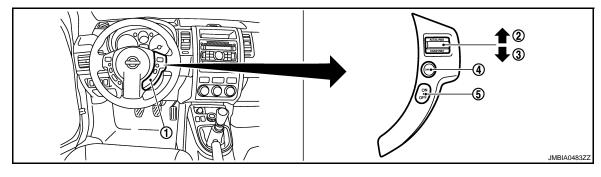
- 1. Exhaust gas temperature sensor 1 2. Exhau
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

## < FUNCTION DIAGNOSIS >

## [M9R]



## < FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

RESUME/ACCCELERATE switch 3.

## **Component Description**

INFOID:000000001542435

Component	Reference
Barometric pressure sensor	ECR-247, "Description"
Engine coolant temperature sensor	ECR-132, "Description"
Intake air temperature sensor	ECR-130, "Description"

## < FUNCTION DIAGNOSIS >

## **IDLE SPEED CONTROL**



А System Diagram INFOID:000000001530715 ECR Engine coolant temperature Engine coolant temperature sensor Battery voltage Battery С Power steering operation Idle speed control EPS control unit ECM Fuel injector D Headlamp switch \_oad signal Fuel pump Rear defogger switch Air conditioner ON signal всм Е This signal is sent through CAN communication line. F JMBIA0660GE

## System Description

INFOID:000000001530716

## **INPUT/OUTPUT SIGNAL CHART**

Sensor	Input Signal to ECM	ECM function	Actuator	
Engine coolant temperature sensor	Engine coolant temperature			_
Battery	Battery voltage			
Headlamp switch	Lood simpl*	Idle speed con-	Fuel injector	
Rear defogger switch	Load signal*	trol	Fuel pump	
EPS control unit	Power steering operation*			
Air conditioner switch	Air conditioner operation*			

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

## SYSTEM DESCRIPTION

The ECM is responsible for regulating the idle speed as a function of the idle speed setpoint which it calculates.

Μ

Ν

Ο

Κ

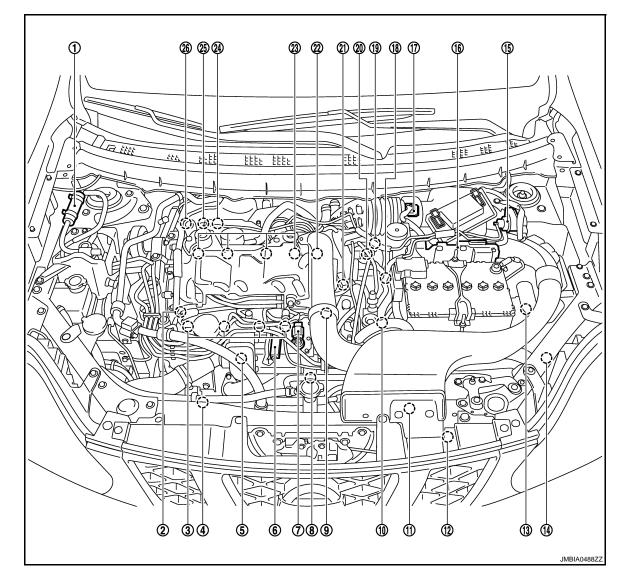
Ρ

#### < FUNCTION DIAGNOSIS >

## **Component Parts Location**

INFOID:000000001542155

[M9R]



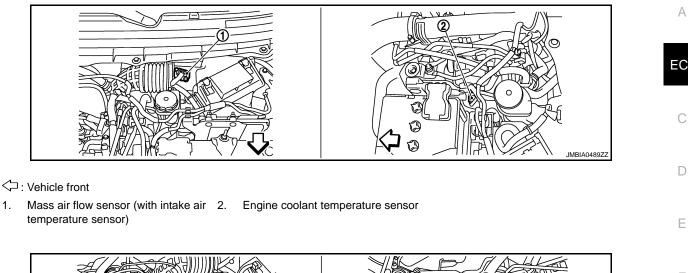
- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

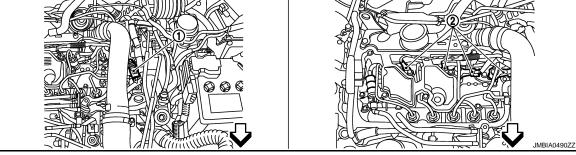
- 2. Fuel rail pressure control valve
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

## < FUNCTION DIAGNOSIS >

## [M9R]

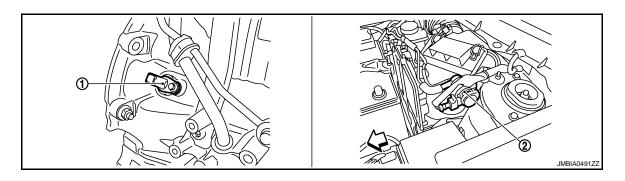




C: Vehicle front

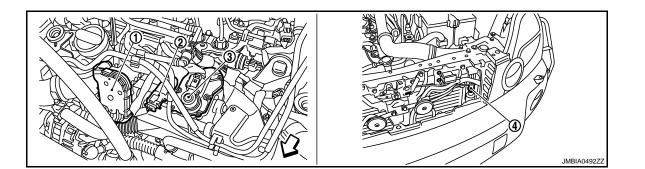
1.

- Camshaft Position Sensor 1.
- 2. Fuel injector



C: Vehicle front

- 1. Crankshaft position sensor
- Turbocharger boost control solenoid 2. valve



# ECR

D

Κ

Μ

Ν

Ο

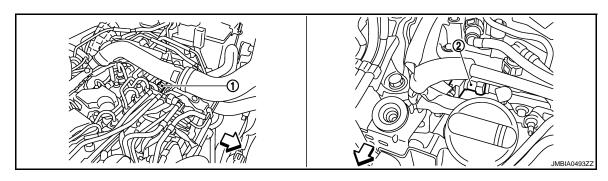
Ρ

## < FUNCTION DIAGNOSIS >

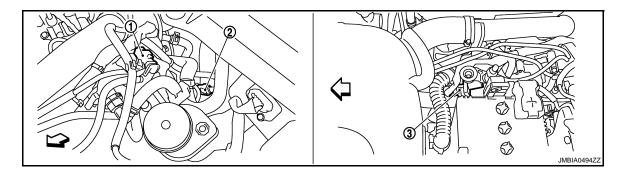
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



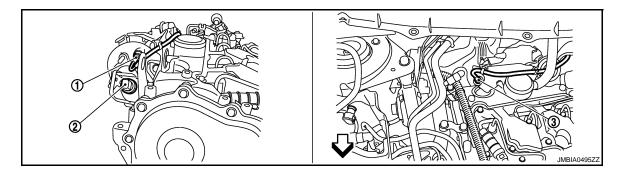
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve

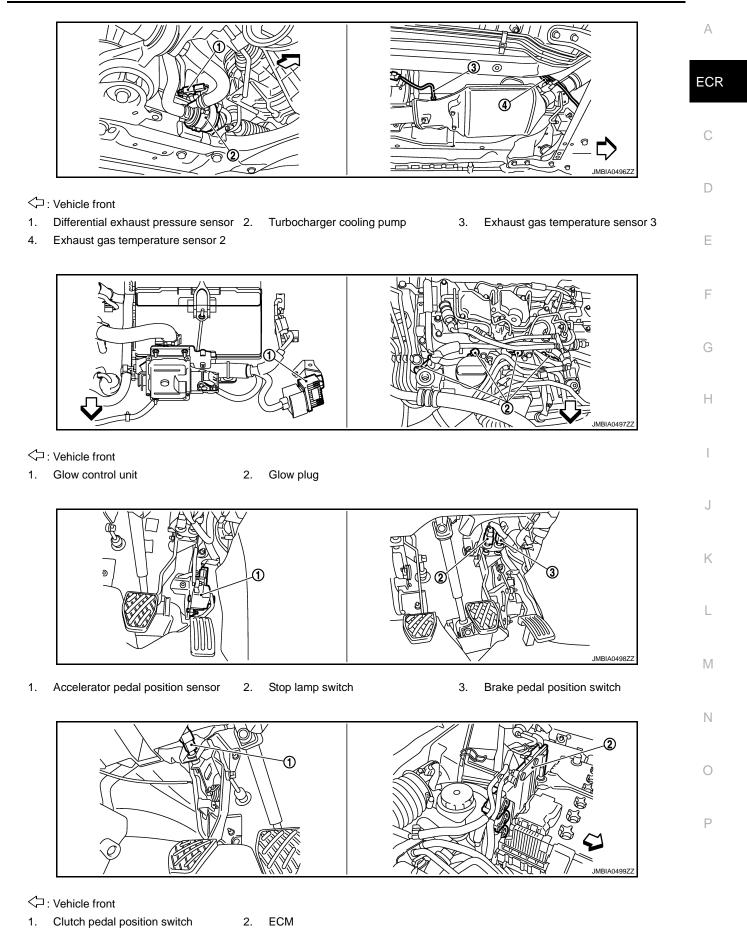


C: Vehicle front

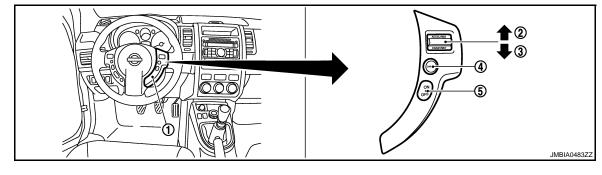
- 1. Exhaust gas temperature sensor 1 2. Exhaust
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

## < FUNCTION DIAGNOSIS >

## [M9R]



## < FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

**RESUME/ACCCELERATE** switch 3.

## **Component Description**

INFOID:000000001542436

Component	Reference
Engine coolant temperature sensor	ECR-132, "Description"
Fuel injector	ECR-155, "Description"

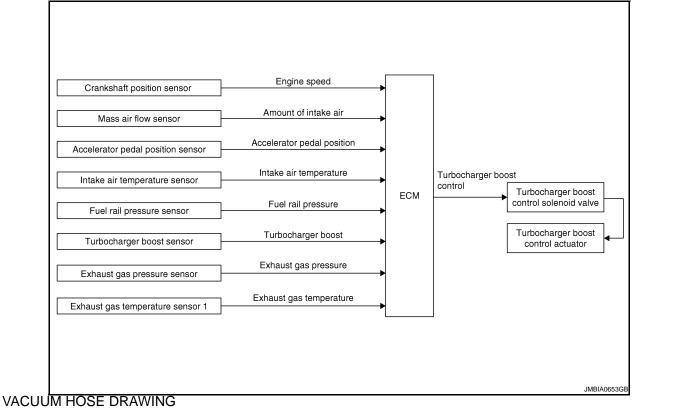
#### < FUNCTION DIAGNOSIS >

## TURBOCHARGER BOOST CONTROL

## System Description

## TURBOCHARGER BOOST CONTROL

#### System Diagram



#### [M9R]

А

ECR

D

Ε

F

Н

Κ

L

Μ

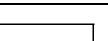
Ν

0

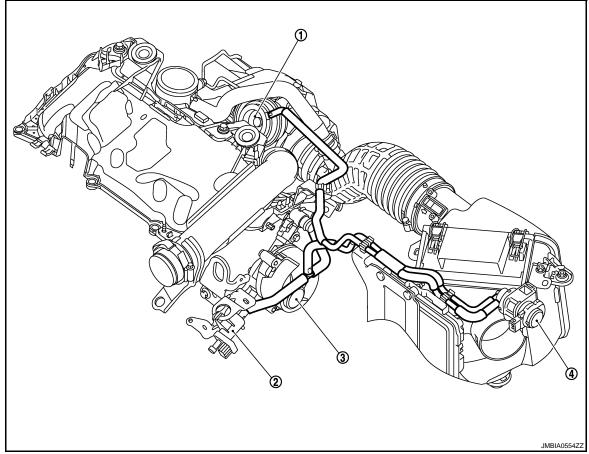
Ρ

INFOID:000000001530703

#### < FUNCTION DIAGNOSIS >



[M9R]



1. Turbocharger boost control actuator 2.

EGR cooler bypass valve control so- 3. Vacuum pump lenoid valve

4. Turbocharger boost control solenoid valve

## System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Sensor Input Signal to ECM		Actuator
Mass air flow sensor	Amount of intake air		
Crankshaft position sensor	Engine speed		
Intake air temperature sensor	Intake air temperature		Turbocharger boost
Accelerator pedal position sensor	Accelerator pedal position	Turbocharger boost	control solenoid valve
Fuel rail pressure sensor	Fuel rail pressure	control	<ul> <li>↓</li> <li>Turbocharger boost</li> </ul>
Turbocharger boost sensor	Turbocharger boost		control actuator
Exhaust gas pressure sensor	Exhaust gas pressure		
Exhaust gas temperature sensor 1	Exhaust gas temperature		

#### SYSTEM DESCRIPTION

Turbocharger boost control solenoid valve is operated by ON/OFF signals (pulse signals) from ECM.

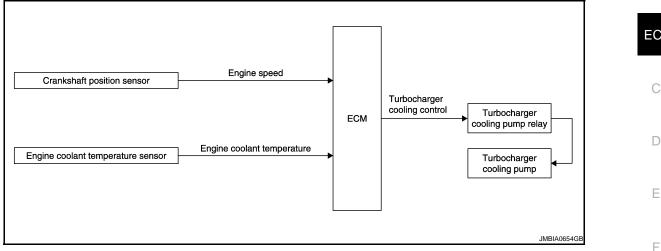
Output signal to turbocharger boost control solenoid valve is feedback controlled to obtain the optimum boost pressure so that the amount of intake air detected by mas air flow sensor is equal to the target amount decided by engine revolution and injected amount of fuel.

Under the driving condition of increasing boost pressure, ON time rate of turbocharger boost control solenoid valve is increased by ECM signal to shift the nozzle vane in closing direction. Under the driving condition of decreasing boost pressure, ON time rate of turbocharger boost control solenoid valve is decreased by ECM signal to shift the nozzle vane in opening direction.

#### < FUNCTION DIAGNOSIS >

#### TURBOCHARGER COOLING CONTROL

System Diagram



#### System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	C
Engine coolant temperature sensor	Engine coolant temperature		Turbocharger cooling pump	
Crankshaft position sensor	Engine speed	Turbocharger cooling control	relay ↓ Turbocharger cooling pump	ŀ

#### SYSTEM DESCRIPTION

To prevent high oil temperature around turbine bearing, cooling water is circulated around the bearing using turbocharger cooling pump.

Excessively high oil temperature causes the change of oil viscosity property resulting in bearing seizure. Therefore, ECM actuates the cooling pump when the cooling water temperature exceeds the specified value.

Κ

J

Μ

Ν

0

Ρ

ECR

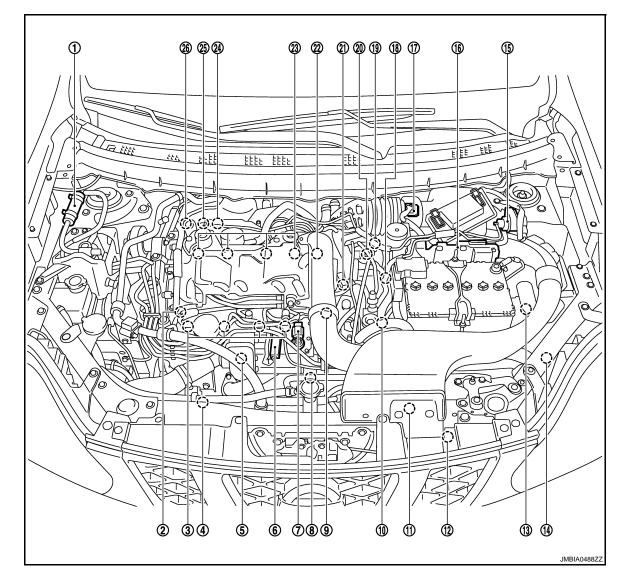
А

#### < FUNCTION DIAGNOSIS >

## **Component Parts Location**

INFOID:000000001542156

[M9R]



- Priming pump 1.
- 4. Cooling fan motor 2
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. lenoid valve
- 13. IPDM E/R
- 16. ECM
- 19. Fuel temperature sensor
- 22. Crankshaft position sensor
- 25. Exhaust gas pressure sensor

- 2. Fuel rail pressure control valve
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
  - Cooling fan motor 1
- 14. Glow control unit
- 17. Mass air flow sensor (with intake air 18. Engine coolant temperature sensor temperature sensor)
- 20. Fuel pump
- 23. Fuel injector
- 26. Exhaust gas temperature sensor 1

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. Refrigerant pressure sensor
- 15. Turbocharger boost control solenoid valve
- 21. Camshaft position sensor
- 24. Air fuel ratio (A/F) sensor

## < FUNCTION DIAGNOSIS >

## [M9R]

Н

J

Κ

L

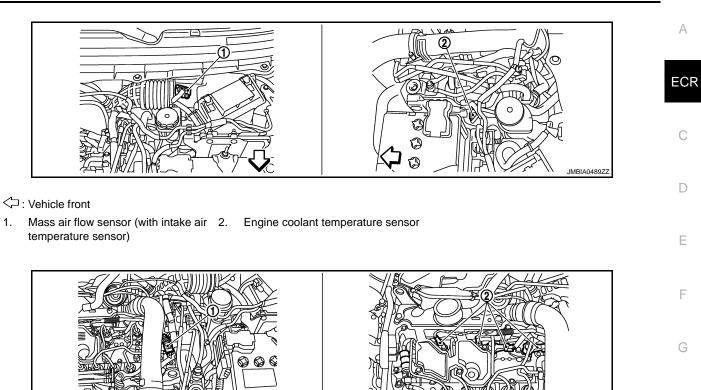
Μ

Ν

Ο

Ρ

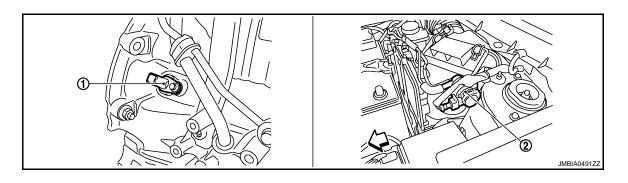
JMBIA0490ZZ



C: Vehicle front

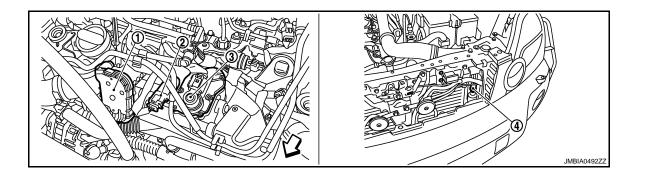
- 1. Camshaft Position Sensor
- 2. Fuel injector

للل



C: Vehicle front

- 1. Crankshaft position sensor
- 2. Turbocharger boost control solenoid valve

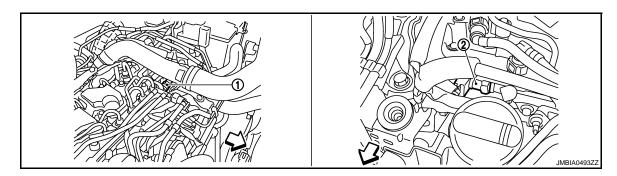


## < FUNCTION DIAGNOSIS >

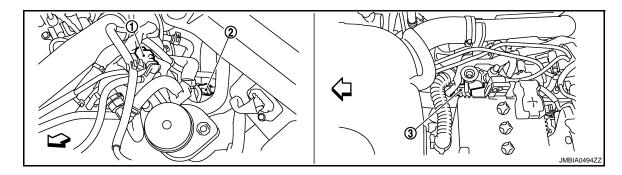
#### C: Vehicle front

- 1. Electric throttle control actuator
- 2. Turbocharger boost sensor
- 3. EGR volume control valve

4. Refrigerant pressure sensor



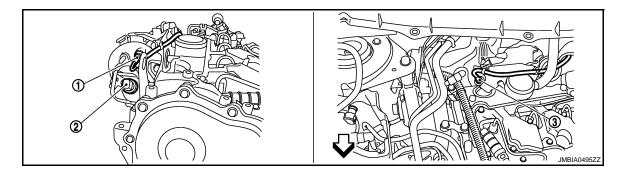
- C: Vehicle front
- 1. Fuel rail pressure sensor
- 2. Fuel rail pressure control valve



C: Vehicle front

- 1. Fuel temperature sensor
- 2. Fuel pump

3. EGR cooler bypass valve control solenoid valve

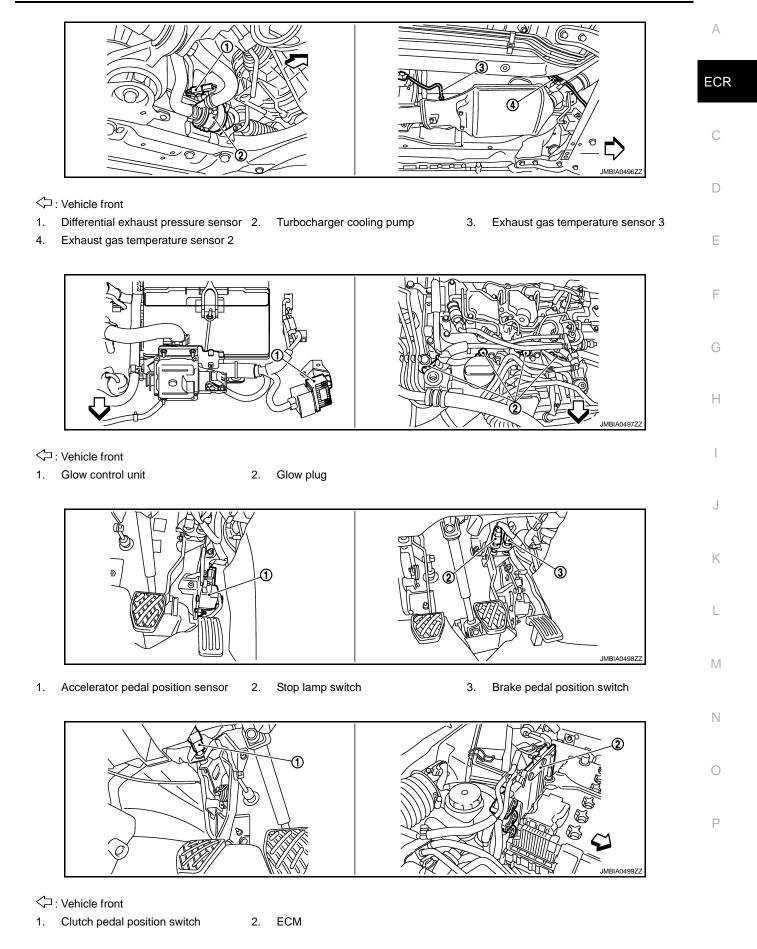


C: Vehicle front

- 1. Exhaust gas temperature sensor 1 2. Exhaust
  - Exhaust gas pressure sensor
- 3. Air fuel ratio (A/F) sensor

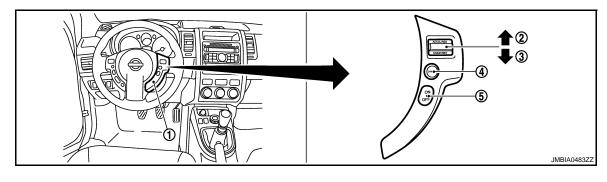
#### < FUNCTION DIAGNOSIS >

### [M9R]



#### < FUNCTION DIAGNOSIS >

[M9R]



ASDC steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch 5. MAIN SWITCH
- 3.
- RESUME/ACCCELERATE switch

## **Component Description**

INFOID:000000001542437

Component	Reference
Accelerator pedal position sensor	ECR-158. "Description"
Crankshaft position sensor	ECR-167, "Description"
Engine coolant temperature sensor	ECR-132, "Description"
Exhaust gas pressure sensor	ECR-178. "Description"
Exhaust gas temperature sensor 1	ECR-187, "Description"
Fuel rail pressure sensor	ECR-150, "Description"
Intake air temperature sensor	ECR-130, "Description"
Mass air flow sensor	ECR-123. "Description"
Turbocharger boost control solenoid valve	ECR-117, "Description"
Turbocharger boost sensor	ECR-161, "Description"
Turbocharger cooling pump	ECR-274. "Description"

## ON BOARD DIAGNOSTIC (OBD) SYSTEM

## **Diagnosis Description**

INTRODUCTION

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

		(C
Emission-related diagnostic information	ISO Standard	
Diagnostic Trouble Code (DTC)	Service \$03 of ISO 15031-5	
1st/2nd Trip Diagnostic Trouble Code (1st/2nd Trip DTC)	Service \$07 of ISO 15031-5	D
Calibration ID	Service \$09 of ISO 15031-5	

The above information can be checked using procedures listed in the table below.

	cked daing procedures is		-: Applicable —: Not applicable	E
	DTC	1st trip DTC	2nd trip DTC	
CONSULT-III	×	×	×	F
GST	×	×	×	

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in three consecutive trips (Three trip detection logic).

#### THREE TRIP DETECTION LOGIC

When a malfunction is detected for the first time, 1st trip DTC is stored in the ECM memory. MI does not illuminate at this stage. <1st trip>

When the same malfunction is detected again during the next driving, 2nd trip DTC is stored in the ECM memory and 1st trip DTC is cleared from the ECM memory. MI does not illuminate at this stage. <2nd trip> When the same malfunction is detected again at the third driving, DTC is stored in the ECM memory and 2nd trip DTC is cleared from the ECM memory. MI illuminates at the same time when DTC is stored. <3rd trip> In other words, DTC is stored and MI illuminates when the same malfunction occurs in 3 consecutive trips. This is called "Three Trip Detection Logic".

## DTC AND 1ST/2ND TRIP DTC

The number of 1st/2nd trip DTC is the same as the number of DTC.

When a malfunction is detected during 1st trip, 1st trip DTC is stored in the ECM memory. MI does not illuminate at this time. When the same malfunction is detected in the next trip (2nd trip), 2nd trip DTC is stored in the ECM memory and 1st trip DTC is cleared from the ECM memory. MI does not illuminate at this time. In addition, DTC is stored in the ECM memory and MI lights up when the same malfunction is detected during the following consecutive trip (3rd trip).

The procedure for erasing DTC, 1st trip DTC, and 2nd trip DTC from the ECM memory is described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

For malfunctions in which 1st/2nd trip DTC are displayed, Refer to "Emission-related Diagnostic Information". 1st/2nd trip DTC is specified in Service \$07 of ISO15031-5. 1st/2nd trip DTC detection occurs without lighting up MI and therefore does not warn the driver of a malfunction.

When 1st/2nd trip DTC is detected, check, print out or write down, and erase 1st/2nd trip DTC as specified with step II of Work Flow, refer to <u>ECR-7</u>, "<u>Work Flow</u>". Then perform DTC Confirmation Procedure or Overall Function Check to try to duplicate the malfunction. If the malfunction is duplicated, it is necessary to investigate the cause again.

How to Read DTC and 1st/2nd Trip DTC

DTC and 1st/2nd trip DTC can be read by the following procedures.

#### (P) With CONSULT-III

#### () With GST

CONSULT-III or GST (Generic Scan Tool): Examples: P0016, P0335, P1409, etc.

These numbers are prescribed by ISO 15031-6.

(CONSULT-III also displays the malfunctioning parts and systems.)

How to Erase DTC

With CONSULT-III

INFOID:000000001307433

А

ECR

Н

Ρ

#### < FUNCTION DIAGNOSIS >

The emission related diagnostic information in the ECM can be erased by selecting "All Erase" in the Description" of "FINAL CHECK" mode with CONSULT-III.

#### With GST

The emission related diagnostic information in the ECM can be erased by selecting Service \$04 with GST.

- 1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 30 seconds and then turn it ON (engine stopped) again.
- 2. Select Service \$04 with GST (Generic Scan Tool).
- If the battery is disconnected, the emission-related diagnostic information will be lost within 24 hours.
- The following data are cleared when the ECM memory is erased.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- 2nd trip diagnostic trouble codes

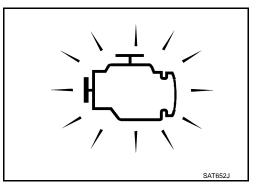
Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

## MALFUNCTION INDICATOR (MI)

#### Description

The MI is located on the instrument panel.

- 1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- When the engine is started, the MI should go off. If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



#### On Board Diagnostic System Function

The on board diagnostic system has the following three functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a mal- function, the MI will light up to inform the driver that a mal- function has been detected.

Diagnostic Test Mode I — Bulb Check

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb.

#### Diagnostic Test Mode I — Malfunction Warning

MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

#### **OBD SYSTEM OPERATION CHART**

#### < FUNCTION DIAGNOSIS >

Relationship Between MI, 1st/2nd Trip DTC, DTC, and Detectable Items

- When the malfunction is detected for the first time, 1st trip DTC is stored in the ECM memory.
- When the same malfunction is detected during 2nd consecutive trip, 2nd trip DTC is stored and 1st trip DTC is cleared.
- When the same malfunction is detected during 3rd consecutive trip, DTC is stored and MI illuminates. Refer to "Tree Trip Detection Logic" for details. 1st/2nd trip DTC is cleared from the ECM memory.
- MI will go off after the vehicle is driven 5 consecutive times with no malfunction (Driving pattern A).
- 1st/2nd trip DTC, DTC will be stored until the vehicle is driven 41 times (Driving pattern B) without the same malfunction recurring. "TIME" data displayed in the "SELF-DIAG RESULTS" mode of CONSULT-III shows the number of times the vehicle is driven without the same malfunction recurring.

#### Summary Chart

Items	Trip	Counter	Driving Pattern	•
MI (goes off)	5	0	А	_
DTC (clear)	41	0	В	
1st/2nd Trip DTC (clear)	41	0	В	-

Refer to "RELATIONSHIP BETWEEN MI, DTC, 1ST/ 2NDTRIP DTC AND DRIVING PATTERNS" for details of pattern A and B.

**ECR-99** 

Relationship Between MI, DTC, 1st/ 2ndtrip DTC and Driving Patterns

F

## Н

[M9R]

А

С

D

## .

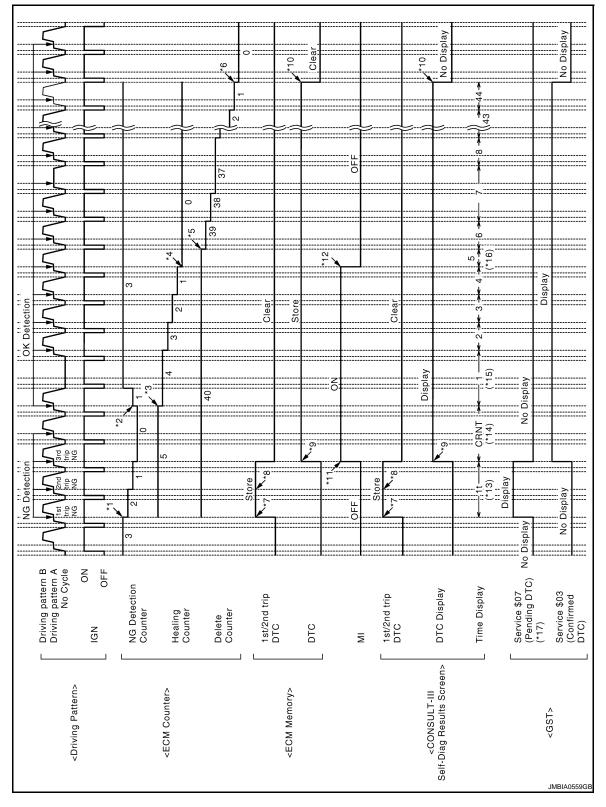
K

L

Ν

Ρ

< FUNCTION DIAGNOSIS >



- \*1: When the ECM satisfies driving pat- \*2: tern A and detects the NG detection, the NG detection counter is decrement.
- \*4: When the ECM detects OK detec-\*5: tion and elapses 4 driving cycles, the healing counter will be reached to 0.
- When the ECM satisfies driving pat-\*3: tern A and detects OK detection, the NG detection counter is increment.
- When the ignition switch OFF after the ECM satisfies driving pattern B and detects OK detection, the delete counter is decrement.
- When the ECM satisfies driving pattern A and detects OK detection, the healing counter is decrement.
- When the ECM detects OK detec-\*6: tion and elapses 40 driving pattern B, the delete counter will be reached to 0.

#### < FUNCTION DIAGNOSIS >

< FUN	CTION DIAGNOSIS >					_
*7:	When the malfunction is detected for the first time, 1st trip DTC is stored in the ECM memory.	*8:	When the sam malfunction is detect- ed during 2nd consecutive trip, 2nd trip DTC is stored and 1st trip DTC is cleared.	*9:	When the ECM detects NG detec- tion, DTC is stored.	А
*10:	When the detect counter is reached to 0, DTC is cleared.	*11:	When the same malfunction is de- tected in 3 consecutive trips, MI will light up.	*12:	MI will go off after vehicle is driven 5 times (driving pattern A) without any malfunctions.	ECR
*13:	When the ECM detects 1st/2nd trip NG detection, the time "1t" will be displayed in the CONSULT-III Self diagnostic screen.	*14:	When the ECM detects 3rd trip NG detection, the time "CRNT" will be displayed in the CONSULT-III Self diagnostic screen.	*15:	When the healing counter is 4, the time "1" will be displayed in the CONSULT-III Self diagnostic screen.	С
*16:	When the healing counter is 0 and the delete counter is 40, the time "5" will be displayed in the CONSULT-III Self diagnostic screen.	*17:	The 1st/2nd trip DTC (pending DTC) is displayed in Service \$07 of GST.			D
<drivin< td=""><td>g Pattern A&gt;</td><td></td><td></td><td></td><td></td><td>Е</td></drivin<>	g Pattern A>					Е
Engine • The h • The h • The h	nealing counter will be set whe nealing counter will be decrem VI will go off when the healing	m at en the ent v	least 5 seconds and the DTC C e malfunction is detected. when the same malfunction is n		rmation Procedure is performed. etected.	F
	g Pattern B> pattern B means the vehicle of	opera	ation as follows:			G
	pattern A and (1)-(3) are satis					
	Engine °C (°F) coolant I temperature		(3) Ignition switch should be char (1) Engine coolant temperature sho	-		Η
	70 (158)	A				I

(2) Engine coolant temperature should change more than

22°C (72°F) after starting engine.

• The delete counter will be cleared when the malfunction is detected. The delete counter will be decrement when the same malfunction is not detected.

The DTC will not be displayed after the delete counter reaches 0.

## **CONSULT-III** Function

42 (108) 20 (68)

IGN ON

INFOID:000000001551224

Κ

L

PBIB2049E

[M9R]

## **FUNCTION**

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-III unit.
Self-diagnostic results	Self-diagnostic results such as DTC can be read and erased quickly.*
Data monitor	Input/Output data in the ECM can be read.
Active test	Diagnostic Test Mode in which CONSULT-III drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
ECM part number	ECM part number and homologation number can be read.
: The following emission-related	diagnostic information is cleared when the ECM memory is erased.

time

IGN OFF

Diagnostic trouble codes

• 1st trip diagnostic trouble codes

· 2nd trip diagnostic trouble codes

## ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

#### < FUNCTION DIAGNOSIS >

			DIAGNOSTIC TEST MODE			
	ltem	WORK SUPPORT	SELF-DIAG RESULTS (DTC)	DATA MON- ITOR	ACTIVE TEST	
	Crankshaft position sensor		×	×		
	Camshaft position sensor		×	×		
	Engine coolant temperature sensor		×	×		
	Vehicle speed signal		×			
	Accelerator pedal position sensor 1		×	×		
	Accelerator pedal position sensor 2		×	×		
	Throttle position sensor	×	×			
	Fuel rail pressure sensor		×	×		
	Mass air flow sensor		×	×		
	Intake air temperature sensor		×	×		
	Fuel temperature sensor		×	×		
	Turbocharger boost sensor		×	×		
	Battery voltage		×	×		
INPUT	Stop lamp switch			×		
	Brake pedal position switch		×	×		
	Clutch pedal position switch		×	×		
	ASCD steering switch		×			
	EGR volume control valve control position sensor		×	×		
	Refrigerant pressure sensor		×	×		
	Barometric pressure sensor (built-into ECM)		×	×		
	A/F ratio sensor 1	×	×			
	Exhaust gas pressure sensor		×	×		
	Exhaust gas temperature sensor 1		×			
	Exhaust gas temperature sensor 2		×	×		
	Exhaust gas temperature sensor 3		×	×		
	Differential exhaust pressure sensor		×	×		
	Fuel pump		×	×	×	
	Fuel injector	×	×	×		
	Fuel rail pressure control valve		×	×	×	
	Glow control unit		×	×	×	
OUTPUT	Turbocharger boost control solenoid valve		×	×	×	
OUTPUT	Turbocharger cooling pump		×	×	×	
	EGR volume control valve	×	×	×		
	EGR cooler bypass valve control solenoid valve		×	×	×	
	Throttle control motor		×		х	
	Cooling fan motor		×	×	×	

X: Applicable

WORK SUPPORT MODE

Work Item

#### < FUNCTION DIAGNOSIS >

ſ	M9R]	
L		

WORK ITEM	DESCRIPTION	USAGE	А
CONFIG INITIALIZE	In this mode vehicle configuration is initialized.	When ECM is replaced	
INJ ADJ VAL REGIST	<ul> <li>In this mode, fuel injector adjustment value is registered.</li> </ul>	When ECM or fuel injector(s) is replaced	EC
CYL OPERATION DIAG	In this mode, the diagnosis of each cylinder is performed.	To detect malfunctioning cylinder	
HI PRESS CIRC DIAG	<ul> <li>In this mode, the diagnosis of high pressure fuel circuit is per- formed.</li> </ul>	To detect malfunctioning portion of high pressure fuel circuit	С
EGR/V LEARN CLR	• In this mode, EGR volume control valve closed position learning is cleared.	When EGR volume control valve is removed or replaced	
TP POS LEARN CLR	In this mode, throttle valve closed position learning is cleared.	When electric throttle control actuator is removed or replaced	D
DPF DATA CLEAR	In this mode, estimated PM amount in DPF is cleared.	When DPF is replaced	
ZFC VALUE RESET	<ul> <li>In this mode, ZFC (Zero Fuel Calibration) and NVC (Nominal Volt- age Calibration) are reset.</li> </ul>	When ECM or fuel injector(s) is re- placed When ECM is reprogrammed	E
A/F LARN CLR	<ul> <li>In this mode, A/F sensor learning value is cleared.</li> </ul>	When A/F sensor 1 is replaced When ECM is replaced with used one which stores the A/F sensor learning value of another A/F sen- sor 1	F
COMPRESSION TEST	<ul> <li>This mode is used to: Find out the general condition of the combustion chamber (automatic mode). Take cylinder compression measurement without disconnecting fuel injector harness connector or crankshaft position sensor (man- ual mode).</li> </ul>		Η
SERVC REGENERATION	<ul> <li>In this mode, service regeneration is performed.</li> </ul>	When DPF is replaced with new one CAUTION: Never perform when DPF is not replaced with new one. PDF may be damaged because re- generation is not performed at appropriate timing.	J

## SELF-DIAGNOSTIC MODE

Self Diagnostic Item Regarding items detected in "SELF-DIAG RESULTS" mode, refer to — <u>ECR-318</u>, "<u>DTC Index</u>".

## DATA MONITOR MODE

N	/

L

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION	
IGN SW	ABSENT/PRESENT	<ul> <li>Ignition switch condition is displayed.</li> <li>ABSENT: Ignition switch OFF</li> <li>PRESENT: Ignition switch ON</li> </ul>		Ν
NATS	INACT/ACTIV	NATS condition is displayed.     INACT: Inactive     ACTIV: Active		0
GLOW CONT	INACT/ACTIV	Glow control condition is displayed.     INACT: Glow is OFF.     ACTIV: Glow is ON.		Ρ
A/C RELAY	NODON/DONE	<ul> <li>A/C relay condition is displayed.</li> <li>NODON: A/C relay is OFF.</li> <li>DONE: A/C relay is ON.</li> </ul>		
CLUTCH STATUS	NO/YES	<ul> <li>Clutch condition is displayed NO: Clutch pedal is released. YES: Clutch pedal is depressed.</li> </ul>		

## < FUNCTION DIAGNOSIS >

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION
ENGINE STATUS	'+APC/RUN/OFF	<ul> <li>Engine status is displayed.</li> <li>'+APC: Ignition switch ON</li> <li>RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	
BPP SW	RELSD/PRSSD	<ul> <li>Brake pedal condition is displayed.</li> <li>RELSD: Brake pedal is released.</li> <li>PRSSD: Brake pedal is depressed.</li> </ul>	
ENGINE START	PRHBT/ATHRD	<ul> <li>Engine stating authority is displayed.</li> <li>PRHBT: Prohibited</li> <li>ATHRD: Authorized</li> </ul>	
IMPACT DETECTED	NO/YES	<ul> <li>Impact detection is displayed.</li> <li>NO: Impact is not detected.</li> <li>YES Impact is detected.</li> </ul>	
A/C APPLD	NO/YES	<ul> <li>A/C application is displayed.</li> <li>NO: A/C is not applied.</li> <li>YES: A/C is applied.</li> </ul>	
GLOW CONT SIGNAL	ABSENT/PRESENT	<ul> <li>Glow control signal is displayed.</li> <li>ABSENT: Glow control is OFF.</li> <li>PRESENT: Glow control is ON.</li> </ul>	
COOLING FAN LOW	INACT/ACTIV	Cooling fan low speed control is displayed. INACT: Low circuit is OFF. ACTIV: Low circuit is ON.	
COOLING FAN HIGH	INACT/ACTIV	<ul> <li>Cooling fan high speed control is displayed.</li> <li>INACT: High circuit is OFF.</li> <li>ACTIV: High circuit is ON.</li> </ul>	
CKP CMP SYNCHRO	NODON/DONE	<ul> <li>Crankshaft position sensor and camshaft position sensor synchronization is displayed.</li> <li>NODON: Not synchronized</li> <li>DONE: Synchronized</li> </ul>	
ECM-TCM COMM	ABSENT/PRESENT	ECM-TCM communication condition is displayed.     ABSENT: Not communicated     PRESENT: Communicated	
A/C COMP	INACT/ACTIV	A/C compressor status is displayed.     INACT: A/C compressor is OFF.     ACTIV: A/C compressor is ON.	
NATS CODE RGST	NO/YES	<ul> <li>NATS code registration condition is displayed.</li> <li>NO: Not registered.</li> <li>YES Registered.</li> </ul>	
CPP SW	INACT/ACTIV	<ul> <li>Clutch pedal condition is displayed.</li> <li>INACT: Clutch pedal is released.</li> <li>ACTIV: Clutch pedal is depressed.</li> </ul>	
EGR BYPAS S/V	INACT/ACTIV	<ul> <li>EGR cooler bypass valve control solenoid valve condition is displayed.</li> <li>INACT: EGR cooler bypass valve control solenoid valve is not operated.</li> <li>ACTIV: EGR cooler bypass valve control solenoid valve is operated.</li> </ul>	
TURBO COOL PUMP	INACT/ACTIV	Turbocharger cooling pump condition is displayed.     INACT: Turbocharger cooling pump is not operated.     ACTIV: Turbocharger cooling pump is operated.	

#### < FUNCTION DIAGNOSIS >

## [M9R]

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION
A/T GEAR POS	STAT1/1/2/3/4/5/6/BACK	<ul> <li>A/T gear position is displayed.</li> <li>STAT1: Neutral</li> <li>1: 1st gear</li> <li>2: 2nd gear</li> <li>3: 3rd gear</li> <li>4: 4th gear</li> <li>5: 5th gear</li> <li>6: 6th gear</li> <li>Back: Reverse gear</li> </ul>	EC C
RGN INCMP STAT1	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 1 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	D
RGN INCMP STAT2	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 2 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	F
RGN INCMP STAT3	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 3 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	G
RGN INCMP STAT4	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 4 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	H
RGN INCMP STAT5	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 5 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	J
RGN INCMP STAT6	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 6 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	K
RGN INCMP STAT7	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 7 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	M
RGN INCMP STAT8	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 8 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	N
RGN INCMP STAT9	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 9 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	P
RGN INCMP STAT10	'+APC/RUN/OFF	<ul> <li>Incomplete status No. 10 of DPF regeneration is displayed.</li> <li>'+APC: Ignition switch ON RUN: Engine is running.</li> <li>OFF: During self shut-off</li> </ul>	

## < FUNCTION DIAGNOSIS >

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION
RGN REQ STAT1	STAT1/STAT2/STAT3/ STAT4	Request status No. 1 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT2	STAT1/STAT2/STAT3/ STAT4	Request status No. 2 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT3	STAT1/STAT2/STAT3/ STAT4	Request status No. 3 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT4	STAT1/STAT2/STAT3/ STAT4	Request status No. 4 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT5	STAT1/STAT2/STAT3/ STAT4	Request status No. 5 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT6	STAT1/STAT2/STAT3/ STAT4	<ul> <li>Request status No. 6 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off</li> </ul>	
RGN REQ STAT7	STAT1/STAT2/STAT3/ STAT4	Request status No. 7 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT8	STAT1/STAT2/STAT3/ STAT4	Request status No. 8 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off	
RGN REQ STAT9	STAT1/STAT2/STAT3/ STAT4	<ul> <li>Request status No. 9 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off</li> </ul>	
RGN REQ STAT10	STAT1/STAT2/STAT3/ STAT4	<ul> <li>Request status No. 10 of DPF regeneration is displayed.</li> <li>STAT1: Engine stopped</li> <li>STAT2: Engine starting</li> <li>STAT3: Engine running</li> <li>STAT4: During self shut-off</li> </ul>	
EGR COOL BYPAS/V	INACT/ACTIV	<ul> <li>EGR cooler bypass valve control solenoid valve status is displayed.</li> <li>INACT: EGR cooler bypass valve control solenoid valve is not operated.</li> <li>ACTIV: EGR cooler bypass valve control solenoid valve is operated.</li> </ul>	
EGR/V TRG ANGLE	%	EGR volume control valve target opening angle is dis- played.	

## < FUNCTION DIAGNOSIS >

## [M9R]

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION	
TRG RAIL PRES	bar	Target fuel rail pressure is displayed.		A
TRG BOOST PRES	bar or mbar	Target turbocharger boost pressure is displayed.		-
INJ VOLUME	mg/cp	Fuel injection volume is displayed.		ECR
ACCEL PDL POS	%	Accelerator pedal position is displayed.		-
BARO PRES	bar or mbar	Barometric pressure is displayed.		-
RFRG PRES	mbar	Refrigerant pressure is displayed.		С
FUEL RAIL PRES	bar	Fuel rail pressure is displayed.		-
TC BOOST PRES	bar or mbar	Turbocharger boost pressure is displayed.		D
EGR VALVE POS	%	• EGR volume control valve control position is displayed.		-
ENG SPEED	tr/min	Engine speed computed from crankshaft position sen- sor is displayed.		E
INT AIR TEMP	٥°	Intake air temperature is displayed.		-
FUEL TEMP	°C	Fuel temperature is displayed.		-
ENG COOLAN TEMP	°C	Engine coolant temperature is displayed.		F
BAT VOLT	V	Battery voltage is displayed.		-
EGR POS/S VOLT	V	• EGR volume control valve control position sensor sig- nal voltage is displayed.		G
BARO SEN VOLT	V	• Barometric pressure sensor signal voltage is displayed.		-
FRP SEN VOLT	V or mV	• Fuel rail pressure sensor signal voltage is displayed.		Н
FUEL TEMP/S VOLT	V or mV	• Fuel temperature sensor signal voltage is displayed.		-
IAT SEN VOLT	V or mV	Intake air temperature sensor signal voltage is dis- played.		
ECT SEN VOLT	V or mV	Engine coolant temperature sensor signal voltage is displayed.		-
APP SEN1 VOLT	V or mV	<ul> <li>Accelerator pedal position sensor 1 signal voltage is displayed.</li> </ul>		J
APP SEN2 VOLT	V or mV	Accelerator pedal position sensor 2 signal voltage is displayed.		K
MASS AIR FLOW	kg/h	Mass air flow is displayed.		-
TRG INJ VOLUME	mg/cp	Target fuel injection volume is displayed.		-
TRG EGR VOLUME	mg/cp	Target EGR volume is displayed.		
VSP/ENG SP RATIO	— or %	Vehicle speed/engine speed ratio is displayed.		-
TRG IDLE SPD	tr/min	Target idle speed is displayed.		Μ
TC BST PR/S VOLT	V or mV	<ul> <li>Turbocharger boost pressure sensor signal voltage is displayed.</li> </ul>		
MAF SEN VOLT	V or mV	Mass air flow sensor signal voltage is displayed.		N
RFRG PRE/S VOLT	V or mV	Refrigerant pressure sensor signal voltage is displayed.		-
INJ1 ADJ VALUE	mg/cp	Injector No. 1 adjustment value is displayed.		
INJ4 ADJ VALUE	mg/cp	Injector No. 4 adjustment value is displayed.		0
MIL		Malfunction indicator status is displayed.		_
EXH GAS TEMP3	°C	• Exhaust gas temperature computed from exhaust gas temperature sensor 3 is displayed.		Р
EXH GAS TEMP2	°C	Exhaust gas temperature computed from exhaust gas temperature sensor 2 is displayed.		-
INJ2 ADJ VALUE	mg/cp	Injector No. 2 adjustment value is displayed.		-
INJ3 ADJ VALUE	mg/cp	Injector No. 3 adjustment value is displayed.		-
DIFF EXH PRES	mbar	Differential exhaust pressure is displayed.		-

#### < FUNCTION DIAGNOSIS >

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION
ASCD SET SPEED	km/h	ASCD set speed is displayed.	
EXH GAS PRES	mbar	Exhaust gas pressure is displayed.	
EX GAS PR/S VOLT	V	<ul> <li>Exhaust gas pressure sensor signal voltage is dis- played.</li> </ul>	

#### NOTE:

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

#### ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
TC BST CONT S/V	<ul> <li>Ignition switch: ON</li> <li>Turn turbocharger boost control solenoid valve ON and OFF with the CONSULT-III and listen to op- eration sound.</li> </ul>	Turbocharger boost control sole- noid valve makes an operating sound.	<ul> <li>Harness and connector</li> <li>Turbocharger boost control valve</li> </ul>
FRP CONTROL VALVE	<ul> <li>Ignition switch: ON</li> <li>Turn fuel rail pressure control valve ON and OFF with the CON- SULT-III and listen to operation sound.</li> </ul>	Fuel rail pressure control valve makes an operating sound.	<ul> <li>Harness and connector</li> <li>Fuel rail pressure control valve</li> </ul>
COOLING FAN LOW*	<ul> <li>Ignition switch: ON</li> <li>Operate cooling fan at LOW speed and turn OFF.</li> </ul>	Cooling fan moves at LOW speed and stops.	<ul><li>Harness and connector</li><li>Cooling fan</li></ul>
COOLING FAN HIGH*	<ul> <li>Ignition switch: ON</li> <li>Operate cooling fan at HIGH speed and turn OFF.</li> </ul>	Cooling fan moves at HIGH speed and stops.	<ul><li>Harness and connector</li><li>Cooling fan</li></ul>
GLOW CONTROL UNIT	<ul> <li>Ignition switch: ON (Engine stopped)</li> <li>Turn the glow control unit ON and OFF using CONSULT-III and check voltage between glow plug terminals and ground.</li> </ul>	Battery voltage should exist when glow control unit is ON.	<ul><li>Harness and connector</li><li>Glow control unit</li></ul>
EGR COOLER BY- PASS CONT S/V	<ul> <li>Ignition switch: ON</li> <li>Turn EGR cooler bypass valve control solenoid valve ON and OFF with the CONSULT-III and listen to operation sound.</li> </ul>	EGR cooler bypass valve control solenoid valve makes an operat- ing sound.	<ul> <li>Harness and connector</li> <li>EGR cooler bypass valve control solenoid valve</li> </ul>
THROTTLE VALVE	<ul> <li>Ignition switch: ON</li> <li>Turn throttle control motor ON and OFF with the CONSULT-III and confirm the operation.</li> </ul>	Throttle valve is operated.	<ul><li>Harness and connector</li><li>Electric throttle control actuator</li></ul>
FUEL PUMP	<ul> <li>Ignition switch: ON</li> <li>Change EGR volume control valve opening angle using CON- SULT-III</li> </ul>	The opening angle of EGR vol- ume control valve is changed properly.	<ul><li>Harness and connector</li><li>EGR volume control valve</li></ul>
TURBOCHARGER COOLING PUMP	<ul> <li>Ignition switch: ON</li> <li>Turn turbocharger cooling pump ON and OFF with the CONSULT- III and listen to operation sound.</li> </ul>	Turbocharger cooling pump makes an operating sound.	<ul><li>Harness and connector</li><li>Turbocharger cooling pump</li></ul>

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

**Diagnosis Tool Function** 

INFOID:000000001551234

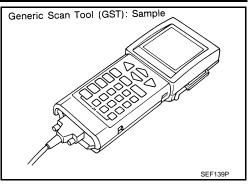
DESCRIPTION

# ON BOARD DIAGNOSTIC (OBD) SYSTEM

#### < FUNCTION DIAGNOSIS >

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained below. ISO9141 is used as the protocol.

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



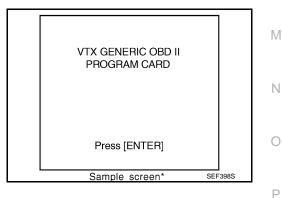
## FUNCTION

Dia	agnostic Service	Function
Service \$01	READINESS TESTS	This diagnostic service gains access to current emission-related data values, including an- alog inputs and outputs, digital inputs and outputs, and system status information.
Service \$03	DTCs	This diagnostic service gains access to emission-related power train trouble codes which were stored by ECM.
Service \$04	CLEAR DIAG INFO	<ul> <li>This diagnostic service can clear all emission-related diagnostic information. This includes:</li> <li>Clear number of diagnostic trouble codes (Service \$01)</li> <li>Clear diagnostic trouble codes (Service \$03)</li> <li>Clear trouble code for freeze frame data (Service \$01)</li> <li>Reset status of system monitoring test (Service \$01)</li> <li>Clear on board monitoring test results (Service \$07)</li> </ul>
Service \$06	(ON BOARD TESTS)	This diagnostic service accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
Service \$07	(ON BOARD TESTS)	This diagnostic service enables the off board test drive to obtain test results for emission- related powertrain components/systems that are continuously monitored during normal driving conditions.
Service \$09	(CALIBRATION ID)	This diagnostic service enables the off-board test device to request specific vehicle infor- mation such as Vehicle Identification Number (VIN) and Calibration IDs.

## INSPECTION PROCEDURE

- 1. Turn ignition switch OFF.
- Connect "GST" to data link connector, which is located under LH dash panel near the hood opener handle.
- 3. Turn ignition switch ON.
- 4. Enter the program according to instruction on the screen or in the operation manual.

(\*: Regarding GST screens in this section, sample screens are shown.)



А

ECR

С

D

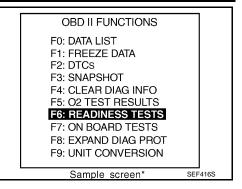
Κ

L

## < FUNCTION DIAGNOSIS >

5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



< COMPON	ENT DIAGNO	DSIS >	••••		[M9R]
COMP	ONENT	DIAGN	IOSIS		
				CUIT	A
Diagnosis	Procedure	•			INFOID:000000001307434
1.снеск с		NECTION			
			t least 20 second	ls. pection in <u>GI-41, "Circuit Inspection"</u> .	С
-	tion result nor			Section in <u>Gr-41, Circuit inspection</u> .	
YES >> (	GO TO 2.				D
•	Repair or repla	-			
			OR OPEN AND S	SHORI	——— E
	ect ECM harn the continuity b		rs. harness connec	tor and ground.	
	,			U U	F
	СМ	Ground	Continuity		I
Connector	Terminal				
	123 124	-			G
E60	121	Ground	Existed		
	128	-			Н
3. Also che	ck harness fo	r short to pow	ver.		
•	tion result nor	<u>mal?</u>			I
-	GO TO 3. Repair open ci	ircuit or short	to power in harn	ess or connectors.	
-	CM POWER				J
	ect ECM harne				
	ition switch Of		arness connector	terminals as follows.	K
J. CHECK II	le vollage bet		arriess connector		IX.
	(+)		(-)	Voltage	
Connector	Terminal	Connect	or Terminal	volage	L
E60	109	E60	128	Battery voltage	
	<u>tion result nor</u> GO TO 5.	mal?			M
	GO TO 4.				
4.DETECT	MALFUNCTIC	ONING PART			Ν
Check the fo	•				
<ul> <li>15A fuse (N</li> <li>Harness for</li> </ul>		rt between EC	CM and IPDM E/I	3	0
					Ŭ
_	· ·		•	rt to power in harness or connectors	P
<b>5.</b> CHECK E	CM POWER	SUPPLY CIR	CUIT-II		Ρ
1. Turn igni	ition switch O	F and wait a	t least 20 second	ls.	

POWER SUPPLY AND GROUND CIRCUIT

Check the voltage between ECM harness connector terminals as follows.

# POWER SUPPLY AND GROUND CIRCUIT

#### < COMPONENT DIAGNOSIS >

 (+)
 (-)
 Voltage

 Connector
 Terminal
 Connector
 Terminal

 F68
 93
 E60
 128
 After turning ignition switch OFF, battery voltage will exist for 20 seconds, then drop approximately 0V.

Is the inspection result normal?

YES >> GO TO 12.

NO-1 >> Battery voltage does not exist: GO TO 6.

NO-2 >> Battery voltage exists for more than 20 seconds: GO TO 9.

#### **6.**CHECK ECM POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check the voltage between ECM harness connector terminals as follows.

(-	+)	(	Voltage	
Connector	Terminal	Connector Terminal		
F68	62	E60	128	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 9.

# 7.CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM harness connector.

- 2. Disconnect IPDM E/R harness connector E15.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	СМ	IPDM E/R		Continuity
Connector Terminal		Connector	Terminal	Continuity
E68	93	E15	48	Existed
LUU	94		47	LAISIEU

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

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

#### Check the following.

Harness or connectors E7, E121

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

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

# 9. CHECK ECM POWER SUPPLY CIRCUIT-V

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E15.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	СМ	IPDN	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F68	62	E15	51	Existed	

4. Also check harness for short to ground and short to power. <u>Is the inspection result normal?</u>

POWER SUPPLY AND GROUND CIRCUIT		
< COMPONENT DIAGNOSIS >	[M9R]	
YES >> GO TO 11.		
NO >> GO TO 10. 10 detect may experime dart		А
10.DETECT MALFUNCTIONING PART	🔳	
<ul><li>Check the following.</li><li>Harness or connectors E7, E121</li></ul>	F	ECR
<ul> <li>Harness for open or short between ECM and IPDM E/R</li> </ul>		
>> Repair open circuit or short to ground or short to power in harness or connectors.		С
11.CHECK 20A FUSE		
<ol> <li>Disconnect 20A fuse (No. 62) from IPDM E/R.</li> <li>Check 20A fuse.</li> </ol>		D
Is the inspection result normal?		
YES >> GO TO 12.		Ε
NO >> Replace 20A fuse.		
12.CHECK INTERMITTENT INCIDENT		F
Refer to <u>GI-39, "Intermittent Incident"</u> .		
Is the inspection result normal?		
YES >> Replace IPDM E/R. NO >> Repair open circuit or short to power in harness or connectors.		G
		Н
		J
		Κ
		L

0

M

Ν

# U1000 CAN COMM CIRCUIT

# Description

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

# DTC Logic

INFOID:000000001450373

INFOID:000000001450329

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000	CAN communication line	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) for 2 seconds or more.	<ul> <li>Harness or connectors (CAN communication line is open or shorted)</li> </ul>

## DTC CONFIRMATION PROCEDURE

# 1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> ECR-114, "Diagnosis Procedure".

NO >> INSPECTION END

## **Diagnosis** Procedure

Go to LAN-21, "CAN System Specification Chart".

# P0016 CKP - CMP CORRELATION

# **DTC** Logic

# DTC DETECTION LOGIC

#### NOTE:

If DTC P0016 is displayed with DTC P0335 or P0340, first perform the trouble diagnosis for DTC P0335 or P0340. Refer to <u>ECR-167, "DTC Logic"</u> or <u>ECR-169, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0016	Crankshaft position - camshaft position correlation	The correlation between crankshaft position sensor signal and camshaft position sensor signal is out of the normal range.	<ul> <li>Harness or connectors (CKP sensor circuit is open or shorted.) (CMP sensor circuit is open or shorted.)</li> <li>Crankshaft position sensor</li> <li>Camshaft position sensor</li> <li>Timing chain</li> <li>Signal plate</li> </ul>
DTC CO	NFIRMATION PROCED	URE	
1.PREC	ONDITIONING		
If DTC C	onfirmation Procedure has	s been previously conducted, always	turn ignition switch OFF and wait at
least 20 s	seconds before conducting	the next test.	C C
-	>> GO TO 2. ORM DTC CONFIRMATIC		
	engine and let it idle for at engine does not start, kee	ep ignition switch at START position f	or at least 10 seconds.
2. Cheo	ck 1st trip DTC.		
	DTC detected?		
	>> Go to <u>ECR-115, "Diagn</u> >> INSPECTION END	osis Procedure".	
	sis Procedure		INFOID:000000001307442
	K CMP SENSOR		
	ECR-171, "Component Ins	nection"	
	pection result normal?		
	>> GO TO 2.		
~	>> Replace camshaft position	tion sensor.	
2.CHEC	K SPROCKET		
-	check for chipping signal p	ate gear tooth.	
	pection result normal?		
	>> GO TO 3. >> Repair or replace sproc	ket	
•	K CKP SENSOR		
	ECR-168, "Component Ins	nection"	
_	pection result normal?		
	>> GO TO 4.		
	>> Replace crankshaft pos	sition sensor.	
4.CHEC	K TIMING CHAIN		
Refer to	EM-294, "Removal and Ins	tallation".	

Is the inspection result normal?

А

ECR

С

YES >> GO TO 5. NO >> Replace timing chain.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

# P0045 TC BOOST CONTROL SOLENOID VALVE

#### < COMPONENT DIAGNOSIS >

# P0045 TC BOOST CONTROL SOLENOID VALVE

## Description

The turbocharger boost control solenoid valve controls vacuum signal to the turbocharger boost control actuator. By changing the variable nozzle vane opening through the rods, the intake air volume is adjusted. The turbocharger boost control solenoid valve is moved by ON/OFF pulse from the ECM. The longer the ON pulse, the charge air pressure rises.

# DTC Logic

INFOID:000000001307444

INFOID:000000001532240

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0045	Turbocharger boost control solenoid valve circuit	An improper voltage is sent to ECM through turbocharger boost control solenoid valve	<ul> <li>Harness or connectors (The solenoid valve circuit is open or shorted.)</li> <li>Turbocharger boost control solenoid valve</li> </ul>	E

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

>> GO TO 2.

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

	PERFORM DTC CONFIRMATION PROCEDURE	
	<ul><li>Start engine and let it idle for at least 10 seconds.</li><li>Check 1st trip DTC.</li></ul>	
	s 1st trip DTC detected?	
	YES >> Go to <u>ECR-117, "Diagnosis Procedure"</u> . NO >> INSPECTION END	
l	Diagnosis Procedure	INFOID:0
_	.CHECK TURBOCHARGER BOOST CONTROL SOLENOID VALVE POWER SUPPLY CIRC	UIT

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Disconnect turbocharger boost control solenoid valve harness connector.

3. Turn ignition switch ON.

4. Check the voltage between turbocharger boost control solenoid valve harness connector and ground.

Turbocharger boost c	Turbocharger boost control solenoid valve		Voltago
Connector	Terminal	- Ground	Voltage
E55	1	Ground	Battery voltage
Is the inspection result n	ormal?		
YES >> GO TO 3. NO >> GO TO 2.			
2.DETECT MALFUNCT	HONING PART		
Check the following.			
<ul> <li>Harness for open or sh</li> </ul>	nort between IPDM E/	R and turbocharg	er boost control solenoid

• Harness for open or short between ECM and turbocharger boost control solenoid valve

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

 $\mathbf{3}.$  Check turbocharger boost control solenoid valve output signal circuit for open and short

A

ECR

D

F

Н

Κ

L

Μ

OID:0000000001307445

# P0045 TC BOOST CONTROL SOLENOID VALVE

### < COMPONENT DIAGNOSIS >

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between turbocharger boost control solenoid valve harness connector and ECM harness connector.

Turbocharger boost	control solenoid valve	E	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
E55	2	F68	57	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 connector E7, F121

• Harness for open or short between ECM and turbocharger boost control solenoid valve

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

**5.**CHECK TURBOCHARGER BOOST CONTROL SOLENOID VALVE

Refer to ECR-118, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace turbocharger boost control solenoid valve.

**6.**CHECK INTERMITTENT INCIDENT

Refer to GI-39. "Intermittent Incident".

#### >> INSPECTION END

## **Component Inspection**

INFOID:000000001307446

# 1.CHECK TURBOCHARGER BOOST CONTROL SOLENOID VALVE

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

Terminals	Resistance
1 and 2	0.006 - 1 kΩ

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace turbocharger boost control solenoid valve.

# P0089 FUEL PUMP

# **DTC** Logic

А

ECR

F

Н

Κ

L

Μ

INFOID:000000001307451

INFOID:000000001307450

[M9R]

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0089	Fuel pump performance	Fuel pressure is out of the target range	<ul> <li>Harness or connectors (Fuel pump circuit is open or shorted.)</li> <li>Fuel pump</li> <li>Fuel injector</li> <li>Fuel filter</li> <li>Air mixed with fuel</li> <li>Lack of fuel</li> <li>Fuel rail pressure sensor</li> </ul>	(
	FIRMATION PROCEDU	JRE		_

## **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

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

## Is 1st trip DTC detected?

YES >> Go to <u>ECR-119</u>, "Diagnosis Procedure". NO >> INSPECTION END

# Diagnosis Procedure

# **1.**PERFORM FUEL FILTER AIR BLEEDING

#### NOTE:

If the DTC is detected because of air mixed with fuel (i.e.: caused by lack of fuel), it may become normal by performing following procedure.

1. Turn ignition switch ON.

2. Perform Fuel Filter Air Bleeding. Refer to <u>FL-17, "Air Bleeding"</u>.

3. Erase DTC.

4. Perform DTC confirmation procedure again, refer to ECR-119. "DTC Logic".

#### Is 1st trip DTC detected?

Yes >> GO TO 2.	
No >> INSPECTION END	Ν
2. CHECK FUEL RAIL PRESSURE SENSOR	
Refer to ECR-151, "Component Inspection".	
OK or NG	0
OK >> GO TO 3.	
NG >> Replace fuel rail.	D
3. CHECK FUEL INJECTOR	Ρ
Perform ECR-156, "Component Inspection".	
OK or NG	

OK >> GO TO 5.

NG >> GO TO 4.

**4.**REPLACE FUEL INJECTOR

# P0089 FUEL PUMP

#### < COMPONENT DIAGNOSIS >

2. Perform Injector adjustment value registration. Refer to <u>ECR-14, "INJECTOR ADJUSTMENT VALUE</u> <u>REGISTRATION : Special Repair Requirement"</u>.

#### >> INSPECTION END

5. CHECK FUEL PUMP

Perform ECR-120, "Component Inspection".

OK or NG

OK >> GO TO 6.

NG >> Replace Fuel pump.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTION END

Component Inspection

1.CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel pump harness connector.
- 3. Check the resistance between fuel pump terminals as follows.

Terminals	Resistance
1 and 2	2 - 6 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel pump.

# P0090 FUEL PUMP

# < COMPONENT DIAGNOSIS >

# P0090 FUEL PUMP

# DTC Logic

# DTC DETECTION LOGIC

DTC No.	Trouble diagn	iosis name	DTC detecting condition	Possible cause
			ECM detects fuel pump circuit is open.	
P0090	Fuel pump circuit	ECM detects fuel pump circuit is short to ground.	Harness or connectors     (The fuel pump circuit is open or shorted.)	
			ECM detects fuel pump circuit is short to power.	Fuel pump
OTC CONF	FIRMATION P	ROCEDU	RE	
1.PRECON	NDITIONING			
	firmation Proce conds before co			turn ignition switch OFF and wait at
>>	GO TO 2.			
2.PERFOF	RM DTC CONF	IRMATION	PROCEDURE	
	nition switch ON 1st trip DTC.	N and wait a	at least 10 seconds.	
	TC detected?			
	Go to ECR-12		is Procedure".	
	INSPECTION			
Diagnosis	s Procedure			INFOID:000000001307453
1.снеск	FUEL PUMP P	OWER SUI	PPLY CIRCUIT	
			at least 20 seconds.	
	nect fuel pump nition switch ON		nnector.	
			ump harness connector and groun	d.
Fu	el pump			
Connector	Terminal	Ground	Voltage	
F92	1	Ground	Battery voltage	
Is the inspe	ction result nor	mal?		
	GO TO 3.			
-	GO TO 2.		т.	
		DINING PAR		
Check the for Harness c	ollowing. connector E7, F	121		
<ul> <li>Harness feature</li> </ul>	or open or shor	t between I	PDM E/R and fuel pump	
<ul> <li>Harness features</li> </ul>	or open or shor	t between E	ECM and fuel pump	
>>	Repair open ci	rcuit or sho	rt to ground or short to power in ha	rness or connectors.
<b>^</b>	• •		GNAL CIRCUIT FOR OPEN AND S	

- Turn ignition switch OFF and wait at least 20 seconds.
   Disconnect ECM harness connector.
- 3. Check the continuity between fuel pump harness connector and ECM harness connector.

# **ECR-121**

А

ECR

# P0090 FUEL PUMP

## < COMPONENT DIAGNOSIS >

Fuel pump		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F92	2	F68	89	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK FUEL PUMP

Refer to ECR-122, "Component Inspection".

Is the inspection result normal?

Yes >> GO TO 5.

No >> Replace fuel pump.

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTION END

## **Component Inspection**

# 1.CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel pump harness connector.
- 3. Check the resistance between fuel pump terminals as follows.

Terminals	Resistance
1 and 2	1.5 - 1,000 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel pump.

ECR-122

# P0100 MAF SENSOR

## < COMPONENT DIAGNOSIS >

# P0100 MAF SENSOR

## Description

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

Therefore, the electirc 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:000000001307456

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
P0100	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	(Mass air flow sensor circuit is open or shorted.)
	Mass air flow sensor circuit range/performance	An improper voltage from the sensor is sent to ECM during self shut-off.	Mass air flow sensor
DTC CO	NFIRMATION PROCEDU	JRE	
1.PREC	ONDITIONING		
		been previously conducted, always tu	rn ignition switch OFF and wait at
least 20 s	seconds before conducting t	he next test.	
	>> GO TO 2.		
2.PERF	ORM DTC CONFIRMATION	N PROCEDURE-I	
	ignition switch ON and wait	at least 10 seconds.	
	k 1st trip DTC.		
	DTC detected?		
	>> Go to <u>ECR-123, "Diagno</u> >> GO TO 3.	sis Procedure .	
3.PERF	ORM DTC CONFIRMATION	N PROCEDURE-II	
	ignition switch OFF and wa		
	ignition switch ON and wait k 1st trip DTC.	at least 10 seconds.	
	DTC detected?		
YES	>> Go to <u>ECR-123, "Diagno</u>	sis Procedure".	
NO	>> INSPECTION END		
Diagno	sis Procedure		INFOID:00000001307457
<b>1.</b> CHEC	K GROUND CONNECTION	IS	
	ignition switch OFF and wa ck ground connection E17.	it at least 20 seconds. Refer to Ground inspection in <u>GI-41, "C</u>	Circuit Inspection".
Is the ins	pection result normal?		
	>> GO TO 2.		
-	>> Repair or replace ground		
<b>Z</b> .CHEC	K WASS AIR FLOW SENS	OR POWER SUPPLY CIRCUIT	

1. Disconnect mass air flow sensor harness connector.

2. Turn ignition switch ON.

# ECR-123

INFOID:000000001307455

А

# **P0100 MAF SENSOR**

#### < COMPONENT DIAGNOSIS >

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

Mass air f	low sensor	Ground	Voltage
Connector Terminal		Ground	voltage
E3	2	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

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

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

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

1. Turn ignition switch OFF and wait at least 20 seconds.

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

Mass air flow sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
E3	3	F68	87	Existed	

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

**5.**DETECT MALFUNCTIONING PART

Check the following.

Harness connector E6, F123

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

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

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

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

Mass air flow sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
E3	4	F68	80	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 connector E6, F123

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

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

**8.**CHECK MASS AIR FLOW SENSOR

# ECR-124

# **P0100 MAF SENSOR**

< COMPONENT DIAGNOSIS > [M9R]	
Refer to ECR-125, "Component Inspection".	
Is the inspection result normal?	А
YES >> GO TO 9.	
NO >> Replace mass air flow sensor.	
9. CHECK INTERMITTENT INCIDENT	ECR
Refer to GI-39, "Intermittent Incident".	
	С
>> INSPECTION END	
Component Inspection INFOID:000000001462648	D
1. CHECK MASS AIR FLOW SENSOR	
<ol> <li>Turn ignition switch OFF and wait at least 20 seconds.</li> <li>Reconnect all harness connectors disconnected.</li> </ol>	Е

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

4. Check the voltage between ECM harness connector terminals as follows.

	(+)		(-)			-	
Connector	Terminal	Connector	Terminal	Condition	Voltage	G	
				Ignition switch ON (Engine stopped.)	Approx. 0.4V	G	
F68	80 (MAF sensor signal)	F68	87 (Sensor ground)	Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.4V	Н	
	olghaij		ground	Idle to about 4,000 rpm	1.1 - 1.4V to Approx. 4.0V*		

\*: 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 >> Replace mass air flow sensor.

ECR-125

Ν

F

J

Κ

L

Μ

Ο

Ρ

# P0101 MAF SENSOR

# Description

INFOID:000000001548244

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

Therefore, the electirc 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:000000001548245

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0101	Mass air flow sensor circuit range/performance	Improper voltage from the sensor is sent to ECM compared with the driving condition.	<ul> <li>Harness or connectors (Mass air flow sensor circuit is open or shorted.)</li> <li>Mass air flow sensor</li> <li>Intake air leaks</li> <li>Air cleaner</li> <li>Intake air temperature sensor</li> <li>EGR volume control valve</li> <li>Turbocharger boost sensor</li> </ul>

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### CAUTION:

#### Always drive vehicle at a safe speed.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and let it idle for at least 40 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECR-127, "Diagnosis Procedure"</u>. NO >> GO TO 3.

NO >> GO IO 3.

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

1. Drive vehicle under the following conditions.

Engine speed	Approx. 2,800 rpm
Vehicle speed	70 - 100 km/h (43 - 62 MPH)
Shift lever	4th position

2. Release accelerator pedal for at least 10 seconds. Do not depress brake pedal during this procedure.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-127, "Diagnosis Procedure".

NO >> INSPECTION END

# P0101 MAF SENSOR

< COMPONENT DIAGNOSIS > [M9R] Diagnosis Procedure INFOID:00000001548246 1.CHECK INTAKE SYSTEM 1. Check air cleaner for clogging. 2. Check the following for connection and cracks.								
1. CHECK INTAKE SYSTEM         1. Check air cleaner for clogging.								
1. Check air cleaner for clogging.	А							
	1 1							
2 ('heck the following for connection and cracks	ECR							
<ol> <li>Check the following for connection and cracks.</li> <li>Air duct</li> </ol>								
<ul> <li>Vacuum hoses</li> <li>Intake air passage between air duct and intake manifold</li> </ul>								
Is the inspection result normal?	С							
YES >> GO TO 2.								
NO >> Repair or reconnect the parts.	D							
2. CHECK GROUND CONNECTIONS								
<ol> <li>Turn ignition switch OFF and wait at least 20 seconds.</li> <li>Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.</li> </ol>	Ε							
Is the inspection result normal?								
YES >> GO TO 3. NO >> Repair or replace ground connection.	F							
<b>3.</b> CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT								
1. Disconnect mass air flow sensor harness connector.	G							
2. Turn ignition switch ON.								
3. Check the voltage between mass air flow sensor harness connector and ground.	Н							
Mass air flow sensor								
Connector Terminal Ground Voltage								
E3 2 Ground Battery voltage								
<u>Is the inspection result normal?</u> YES >> GO TO 5.								
NO $>>$ GO TO 4.	J							
4. DETECT MALFUNCTIONING PART								
Check the following.	Κ							
<ul> <li>Harness for open or short between IPDM E/R and mass air flow sensor</li> <li>Harness for open or short between ECM and mass air flow sensor</li> </ul>								
	L							
>> Repair open circuit or short to ground or short to power in harness or connectors.								
<b>5.</b> CHECK MASS AIR FLOW SENSOR GROUND CIRCUIT FOR OPEN AND SHORT	M							
<ol> <li>Turn ignition switch OFF and wait at least 20 seconds.</li> <li>Check the continuity between mass air flow sensor harness connector and ECM harness connector.</li> </ol>								
	Ν							
Mass air flow sensor ECM Continuity	$\sim$							
Connector Terminal Connector Terminal Continuity	0							
ConnectorTerminalConnectorTerminalE33F6887Existed								
ConnectorTerminalConnectorTerminalE33F6887Existed3. Also check harness for short to ground and short to power.								
Connector     Terminal     Connector     Terminal       E3     3     F68     87     Existed       3. Also check harness for short to ground and short to power.       Is the inspection result normal?       YES     >> GO TO 7.	Ρ							
Connector     Terminal     Connector     Terminal       E3     3     F68     87     Existed       3. Also check harness for short to ground and short to power.       Is the inspection result normal?       YES     >> GO TO 7.       NO     >> GO TO 6.	Ρ							
Connector     Terminal     Connector     Terminal       E3     3     F68     87     Existed       3. Also check harness for short to ground and short to power.       Is the inspection result normal?       YES     >> GO TO 7.	Ρ							

Harness connector E6, F123Harness for open or short between ECM and mass air flow sensor

# ECR-127

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

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

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

Mass air	flow sensor	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E3	4	F68	80	Existed

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.

NU >> GUTU8. **7** 

8. DETECT MALFUNCTIONING PART

Check the following.

Harness connector E6, F123

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

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

**9.**CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to ECR-131, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace mass air flow sensor.

**10.**CHECK TURBOCHARGER BOOST SENSOR

Refer to ECR-161, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace mass air flow sensor.

**11.**CHECK MASS AIR FLOW SENSOR

Refer to ECR-128, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace mass air flow sensor.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace.

**13.**REPLACE EGR VOLUME CONTROL VALVE

- 1. Replace EGR volume control valve.
- 2. Perform <u>ECR-15. "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING VALUE CLEAR :</u> <u>Special Repair Requirement"</u>.
- 3. Perform <u>ECR-15</u>, "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING : Special Repair <u>Requirement</u>".

>> INSPECTION END

**Component Inspection** 

1.CHECK MASS AIR FLOW SENSOR

# **P0101 MAF SENSOR**

## < COMPONENT DIAGNOSIS >

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 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 as follows.

						EC
(+)		(-)		Condition		
Connector	Terminal	Connector	Terminal	Condition	Voltage	
				Ignition switch ON (Engine stopped.)	Approx. 0.4V	С
F68	80 (MAF sensor signal)	F68	87 (Sensor ground)	Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.4V	
			g	Idle to about 4,000 rpm	1.1 - 1.4V to Approx. 4.0V*	D

\*: 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 >> Replace mass air flow sensor.

Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

# P0110 IAT SENSOR

## < COMPONENT DIAGNOSIS >

# P0110 IAT SENSOR

# Description

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

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

# DTC Logic

INFOID:000000001307464

INFOID:000000001307465

INFOID:000000001307463

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0110	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Intake air temperature sensor circuit is
P0110	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.) <ul> <li>Intake air temperature sensor</li> </ul>

## DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> 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 ECR-130, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

#### Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

# 2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor (with intake air temperature sensor) harness connector.

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

Mass air f	low sensor	Ground	Voltage
Connector	Terminal	Cround	vonage
E3	5	Ground	Approx. 5V

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

# **P0110 IAT SENSOR**

<ul> <li>Harness connector E6, F123</li> <li>Harness for open or short between ECM and mass air flow sensor</li> <li>&gt; Repair open circuit or short to ground or short to power in harness or connectors.</li> <li>4.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT</li> <li>1. Turn ignition switch OFF and wait at least 20 seconds.</li> </ul>			P0110	IAI SENSU	ĸ	
<ul> <li>Harness for open or short between ECM and mass air flow sensor</li> <li>&gt;&gt; Repair open circuit or short to ground or short to power in harness or connectors.</li> <li>4. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT</li> <li>Turn ignition switch OFF and wait at least 20 seconds.</li> <li>Disconnect ECM harness connector.</li> <li>Continuity between mass air flow sensor harness connector and ECM harness connector.</li> <li>Connector Terminal Connector Terminal Continuity</li> <li>Bas air flow sensor ECM harness connector.</li> <li>Connector Terminal Connector Terminal Continuity</li> <li>A Also check harness for short to ground and short to power.</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 6.</li> <li>S. DETECT MALPUNCTIONING PART</li> <li>Check the following.</li> <li>Harness for open circuit or short to ground or short to power in harness or connectors.</li> <li>6. CHECK INTAKE AIR TEMPERATURE SENSOR</li> <li>Refer to ECR-131. "Component Inspection".</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 7.</li> <li>NO &gt;&gt; Replace mass air flow sensor (with intake air temperature sensor).</li> <li>7. CHECK INTERMITTENT INCIDENT</li> <li>Refer to EGR-33. "Intermittent Incident".</li> <li>&gt;&gt; INSPECTION END</li> <li>Component Inspection</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO F.</li> <li>No &gt;&gt; Replace mass air flow sensor harmess connector.</li> <li>Check KINTAKE AIR TEMPERATURE SENSOR</li> <li>I. Turn ignition switch OFF.</li> <li>Disconnect mass air flow sensor harmess connector.</li> <li>Condition Resistance (II)</li> <li>25° (17°F)</li> <li>180 - 220</li> <li>80° (176°F)</li> <li>0.28 - 0.36</li> </ul>	< COMPONENT	DIAGNOSIS >				[M9R]
>> Repair open circuit or short to ground or short to power in harness or connectors.       4.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT       1         1. Turn ignition switch OFF and wait at least 20 seconds.       0       0         2. Disconnect ECM harness connector.       0       0         Mass air flow sensor       ECM       Continuity <u>Connector</u> Terminal       Continuity         E3       6       F68       87       Existed         4. Also check harness for short to ground and short to power.       Is the inspection result normal?       E         YES       >> GO TO 6.       NO       >> GO TO 5.       F         5. DETECT MALFUNCTIONING PART       Check the following.       I       I         - Harness connector E6, F123       -       Harness or connectors.       I         - Harness for open or short between ECM and mass air flow sensor       -       >> Repair open circuit or short to ground or short to power in harness or connectors.       I         - CHECK INTAKE AIR TEMPERATURE SENSOR       I       I       I       I         - Harness connector E6, F123       -       I       I       I         - So OT O7.       NO       >> Repair open circuit or short to ground or short to power in harness or connectors.       I       I       I			FOM	· 4		
4.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT       I         1. Turn ignition switch OFF and wait at least 20 seconds.       Disconnect ECM harness connector.         2. Disconnect ECM harness connector.       Image: Connector and ECM harness connector.         3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.       Image: Connector and ECM harness connector.         Mass air flow sensor       ECM Continuity       Continuity         Connector       Terminal Connector Terminal       Continuity         Connector       Terminal       Connector         Kass air flow sensor       ECM Continuity       Image: Connector and ECM harness connector.         4. Also check harness for short to ground and short to power.       Is the inspection result normal?         YES       > GO TO 5.       F         5.DETECT MALFUNCTIONING PART       Check the following.         Check the following.       Harness for open or short between ECM and mass air flow sensor         >> Repair open circuit or short to ground or short to power in harness or connectors.       6.CHECK INTAKE AIR TEMPERATURE SENSOR         Refer to ECR-131. "Component Inspection".       Is the inspection result normal?         YES       >> GO TO 7.         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDEN	<ul> <li>Harness for op-</li> </ul>	en or short betwe	een ECM and ma	ss air flow sense	or	
4.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT       I         1. Turn ignition switch OFF and wait at least 20 seconds.       Disconnect ECM harness connector.         2. Disconnect ECM harness connector.       Image: Connector and ECM harness connector.         3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.       Image: Connector and ECM harness connector.         Mass air flow sensor       ECM Continuity       Continuity         Connector       Terminal Connector Terminal       Continuity         Connector       Terminal       Connector         Kass air flow sensor       ECM Continuity       Image: Connector and ECM harness connector.         4. Also check harness for short to ground and short to power.       Is the inspection result normal?         YES       > GO TO 5.       F         5.DETECT MALFUNCTIONING PART       Check the following.         Check the following.       Harness for open or short between ECM and mass air flow sensor         >> Repair open circuit or short to ground or short to power in harness or connectors.       6.CHECK INTAKE AIR TEMPERATURE SENSOR         Refer to ECR-131. "Component Inspection".       Is the inspection result normal?         YES       >> GO TO 7.         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDEN	>> Rep	air open circuit o	r short to around a	or short to powe	r in harness or conne	ctors
1.       Turn ignition switch OFF and wait at least 20 seconds.         2.       Disconnect ECM harness connector.         3.       Check the continuity between mass air flow sensor harness connector and ECM harness connector.         Mass air flow sensor       ECM         Connector       Terminal         Connector EG       60 T0 6.         So GO T0 5.       5.         5.       DETECT MALFUNCTIONING PART         Check the following.       -         + Harness for open or short between ECM and mass air flow sensor         >> Repair open circuit or short to ground or short to power in harness or connectors.         6.       CHECK INTAKE AIR TEMPERATURE SENSOR         Refer to ECR-131. "Component Inspection".         Is the inspection result normal?         YES       >> GO T0 7.         NO       >> Replace mass air flow sensor (		•	•	•		
2. Disconnect ECM harness connector.       Continuity between mass air flow sensor harness connector and ECM harness connector.         Mass air flow sensor       ECM         Connector       Terminal         Setter       GO TO 5.         5       DETECT MALFUNCTIONING PART         Check the following.       F68         • Harness connector E6, F123       F123         • Harness connector E0, F123       Terminal         Refer to ECR-131. "Component Inspection".         Is the inspect						
3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.         Mass air flow sensor       ECM         Connector       Terminal         E3       6         F68       87         Existed         4. Also check harness for short to ground and short to power.         Is the inspection result normal?         YES       > GO TO 6.         NO       >> GO TO 5.         5. DETECT MALFUNCTIONING PART         Check the following.         • Harness connector E6, F123         • Harness connector E6, F123         • Harness connector S0 F, F123         • Harness for open or short between ECM and mass air flow sensor         >> Repair open circuit or short to ground or short to power in harness or connectors.         6.CHECK INTAKE AIR TEMPERATURE SENSOR         Refer to ECR-131. "Component Inspection".         Is the inspection result normal?         YES       > GO TO 7.         NO       > Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.	2. Disconnect E	ECM harness cor	nnector.			(
Connector         Terminal         Connector         Terminal         Continuity           E3         6         F68         87         Existed           4. Also check harness for short to ground and short to power.         Is the inspection result normal?         YES         >> GO TO 6.         F68           YES         >> GO TO 5.         F         5.         5.         F         5.           5. DETECT MALFUNCTIONING PART         Check the following.         F         6         F123         G           • Harness connector E6, F123         •         Harness connector S.         6         C.         F         6         C.         F         6         C.         F         G	3. Check the co	ontinuity betweer	n mass air flow se	nsor harness co	onnector and ECM ha	rness connector.
Connector         Terminal         Connector         Terminal         Continuity           E3         6         F68         87         Existed           4. Also check harness for short to ground and short to power.         Is the inspection result normal?         YES         >> GO TO 6.         F68           YES         >> GO TO 5.         F         5.         5.         F         5.           5. DETECT MALFUNCTIONING PART         Check the following.         F         6         F123         G           • Harness connector E6, F123         •         Harness connector S.         6         C.         F         6         C.         F         6         C.         F         G	Mass air fl	ow sensor	FC	ΣM	1	
E3       6       F68       87       Existed         4. Also check harness for short to ground and short to power.       Is the inspection result normal?       It is the inspection result normal?         YES       >> GO TO 6.       NO       >> GO TO 5.       F         5. DETECT MALFUNCTIONING PART       Check the following.       It is the inspection result normal?       It is is the inspection of the tween ECM and mass air flow sensor         >       No       >> Repair open circuit or short to ground or short to power in harness or connectors.       It is the inspection result normal?         YES       >> GO TO 7.       It is the inspection result normal?       It is the inspection result normal?         YES       >> GO TO 7.       It is the inspection result normal?       It is the inspection result normal?         YES       >> GO TO 7.       It is the inspection result normal?       It is the inspection result normal?         YES       >> GO TO 7.       It is prevention result normal?       It is the inspection result normal?         YES       >> GO TO 7.       It is the inspection result normal?       It is is the inspection result normal?         YES       >> GO TO 7.       It is is prevention to short to prevent where the issue of the iss					Continuity	[
4. Also check harness for short to ground and short to power.       Is the inspection result normal?         Is the inspection result normal?       YES >> GO TO 6.         NO >> SG OTO 5.       F         5.DETECT MALFUNCTIONING PART       Check the following.         • Harness connector E6, F123       •         • Harness connector E6, F123       •         • Harness for open or short between ECM and mass air flow sensor       •         >> Repair open circuit or short to ground or short to power in harness or connectors.       •         6.CHECK INTAKE AIR TEMPERATURE SENSOR       I         Refer to ECR-131, "Component Inspection".       Is the inspection result normal?         YES >> GO TO 7.       NO         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDENT       Refer to GI-39. "Intermittent Incident".         >> INSPECTION END       No         Component Inspection       No					Existed	
Is the inspection result normal?       YES       >> GO TO 6.       P         NO       >> GO TO 5.       S.       F         5. DETECT MALFUNCTIONING PART       Check the following.       G         • Harness connector E6, F123       •       Harness connector E6, F123         • Harness for open or short between ECM and mass air flow sensor	_	-		_		
YES       >> GO TO 6.       P         NO       >> GO TO 5.       Source Sour			to ground and on			
5. DETECT MALFUNCTIONING PART         Check the following.         • Harness connector E6, F123         • Harness for open or short between ECM and mass air flow sensor         >>> Repair open circuit or short to ground or short to power in harness or connectors.         6.CHECK INTAKE AIR TEMPERATURE SENSOR         Refer to ECR-131. "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 7.         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.         No         \$Condition         Resistance (Ω)         25°C (77°F)       1.80 - 2.20         80°C (176°F)       0.28 - 0.38	YES >> GO	TO 6.				
Check the following.       G         • Harness connector E6, F123       Harness for open or short between ECM and mass air flow sensor         >> Repair open circuit or short to ground or short to power in harness or connectors.       H         6.CHECK INTAKE AIR TEMPERATURE SENSOR       H         Refer to ECR-131. "Component Inspection".       I         Is the inspection result normal?       YES         YES       >> GO TO 7.         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.         N         ZorC(176°F)       1.80 – 2.20         80°C (176°F)       0.28 – 0.36						
• Harness connector E6, F123 • Harness for open or short between ECM and mass air flow sensor >> Repair open circuit or short to ground or short to power in harness or connectors. 6. CHECK INTAKE AIR TEMPERATURE SENSOR Refer to ECR-131. "Component Inspection". Is the inspection result normal? YES >> GO TO 7. NO >> Replace mass air flow sensor (with intake air temperature sensor). 7. CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK INTAKE AIR TEMPERATURE SENSOR 1. Turn ignition switch OFF. 2. Disconnect mass air flow sensor harness connector. 3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions. No 25°C (77°F) 1.80 - 2.20 80°C (176°F) 0.28 - 0.36	<b>5.</b> DETECT MAL	FUNCTIONING	PART			
<ul> <li>Harness for open or short between ECM and mass air flow sensor</li> <li>&gt;&gt; Repair open circuit or short to ground or short to power in harness or connectors.</li> <li>6.CHECK INTAKE AIR TEMPERATURE SENSOR</li> <li>Refer to ECR-131. "Component Inspection".</li> <li>Is the inspection result normal?</li> <li>YES &gt;&gt; GO TO 7.</li> <li>NO &gt;&gt; Replace mass air flow sensor (with intake air temperature sensor).</li> <li>7.CHECK INTERMITTENT INCIDENT</li> <li>Refer to GI-39. "Intermittent Incident".</li> <li>&gt;&gt; INSPECTION END</li> <li>Component Inspection</li> <li>MFORECONDENSION</li> <li>MFORECONDENSION</li> <li>MFORECONDENSION</li> <li>MFORECONDENSION</li> <li>MFORECONDENSION</li> <li>MFORECONDENSION</li> <li>NO Server (1, 1, 1, 1, 2, 2, 2, 3, 2, 2, 2, 3, 4, 2, 2, 3, 4, 2, 2, 3, 4, 2, 2, 3, 4, 2, 2, 3, 4, 3, 4, 2, 2, 3, 4, 4, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,</li></ul>						(
					~ *	
	<ul> <li>Harness for op-</li> </ul>	en or snort betwe	een ECIM and ma	ss air now sense	JL	
6. CHECK INTAKE AIR TEMPERATURE SENSOR         Refer to ECR-131. "Component Inspection".         Is the inspection result normal?         YES       >> GO TO 7.         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7. CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         1. CHECK INTAKE AIR TEMPERATURE SENSOR         1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.         No         Z5°C (77°F)       1.80 - 2.20         80°C (176°F)       0.28 - 0.36	>> Ren:	air open circuit o	r short to around a	or short to nowe	r in harness or conne	
Refer to ECR-131. "Component Inspection".       I         Is the inspection result normal?       YES >> GO TO 7.         NO >> Replace mass air flow sensor (with intake air temperature sensor).       J         7.CHECK INTERMITTENT INCIDENT       Refer to GI-39. "Intermittent Incident".         Refer to GI-39. "Intermittent Incident".       K         >> INSPECTION END       Import 10000000007007466         1. CHECK INTAKE AIR TEMPERATURE SENSOR       Import 10000000007007466         1. Turn ignition switch OFF.       Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.       N $\frac{Condition}{Resistance (\Omega)}$ $\frac{Resistance (\Omega)}{25°C (176°F)}$ $0.28 - 0.36$	• ·	•	•	•		0.013.
Is the inspection result normal?       YES       >> GO TO 7.       J         YES       >> GO TO 7.       NO       >> Replace mass air flow sensor (with intake air temperature sensor).       J         7.CHECK INTERMITTENT INCIDENT       Refer to GI-39. "Intermittent Incident".       K         >> INSPECTION END       NFOLD-00000000 1307466       K         1.CHECK INTAKE AIR TEMPERATURE SENSOR       M         1. Turn ignition switch OFF.       M         2. Disconnect mass air flow sensor harness connector.       M         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.       N				N		
YES       >> GO TO 7.         NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         1.CHECK INTAKE AIR TEMPERATURE SENSOR         1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.         No         25°C (77°F)         1.80 - 2.20         80°C (176°F)			nspection".			
NO       >> Replace mass air flow sensor (with intake air temperature sensor).         7.CHECK INTERMITTENT INCIDENT         Refer to GI-39, "Intermittent Incident".         >> INSPECTION END         Component Inspection         1.CHECK INTAKE AIR TEMPERATURE SENSOR         1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.         No         25°C (77°F)       1.80 - 2.20         80°C (176°F)       0.28 - 0.36	-					
Refer to GI-39, "Intermittent Incident".       K         >> INSPECTION END       NFOID-000000000000000000000000000000000000			w sensor (with inta	ake air temperat	ure sensor).	,
>> INSPECTION END Component Inspection INFOLX000001307466 1. CHECK INTAKE AIR TEMPERATURE SENSOR 1. Turn ignition switch OFF. 2. Disconnect mass air flow sensor harness connector. 3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.	<b></b>		·		,	
>> INSPECTION END Component Inspection INFOLLOWING COMPONENT INFOLLOWING SUBJECT Service And A Ser	Refer to GI-39 "I	ntermittent Incid	ent"			
Component Inspection       INFOID:00000001307466         1. CHECK INTAKE AIR TEMPERATURE SENSOR       M         1. Turn ignition switch OFF.       Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.       N $\overline{Condition}$ Resistance ( $\Omega$ )       N $25^{\circ}$ C ( $77^{\circ}$ F)       1.80 - 2.20       N $80^{\circ}$ C ( $176^{\circ}$ F)       0.28 - 0.36       N			<u></u> .			
1. CHECK INTAKE AIR TEMPERATURE SENSOR       M         1. Turn ignition switch OFF.       Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.       M $\overline{Condition}$ Resistance ( $\Omega$ ) $25^{\circ}$ C ( $77^{\circ}$ F) $1.80 - 2.20$ $80^{\circ}$ C ( $176^{\circ}$ F) $0.28 - 0.36$	>> INSF	PECTION END				
1. CHECK INTAKE AIR TEMPERATURE SENSOR       M         1. Turn ignition switch OFF.       Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.       M <u>Condition</u> <u>Resistance (Ω)</u> <u>25°C (77°F)         1.80 - 2.20         </u> <u>80°C (176°F)         0.28 - 0.36         </u> M	Component li	nspection				INECID-00000001207466
1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions. $\overline{\text{Condition}}$ Resistance ( $\Omega$ ) $25^{\circ}\text{C}$ ( $77^{\circ}\text{F}$ ) $1.80 - 2.20$ $80^{\circ}\text{C}$ ( $176^{\circ}\text{F}$ ) $0.28 - 0.36$		•				INFOID:00000001307406
1. Turn ignition switch OFF.         2. Disconnect mass air flow sensor harness connector.         3. Check resistance between mass air flow sensor terminals 5 and 6 under the following conditions.         Condition       Resistance (Ω)         25°C (77°F)       1.80 – 2.20         80°C (176°F)       0.28 – 0.36	<b>1.</b> CHECK INTA	KE AIR TEMPEF	RATURE SENSO	R		1
Condition       Resistance ( $\Omega$ )         25°C (77°F)       1.80 – 2.20         80°C (176°F)       0.28 – 0.36	1. Turn ignition	switch OFF.				
Condition         Resistance (Ω)           25°C (77°F)         1.80 – 2.20           80°C (176°F)         0.28 – 0.36						
25°C (77°F)         1.80 – 2.20           80°C (176°F)         0.28 – 0.36	3. Check resist	ance between m	ass air flow sense	or terminals 5 ar	id 6 under the following	ig conditions.
25°C (77°F)         1.80 – 2.20           80°C (176°F)         0.28 – 0.36	Condition	Resista	ance (O)			
80°C (176°F) 0.28 – 0.36						(
	· · ·					
	. ,		0.00			
	NO >> Popl	aco mass air flor	v concor (with int	ako air tomporat	uro concor)	

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

# P0115 ECT SENSOR

# Description

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

# DTC Logic

INFOID:000000001450518

INFOID:000000001307469

INFOID:000000001307467

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0115	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Engine coolant temperature sensor	
P0115	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	<ul><li>circuit is open or shorted.)</li><li>Engine coolant temperature sensor</li></ul>	

## DTC CONFIRMATION PROCEDURE

## **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> 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 ECR-132, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

## **1.**CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

#### Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

## 2.CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

Engine coolant te	mperature sensor	Ground	Voltage	
Connector	Terminal	Ciouna	voltage	
F79	2	Ground	Approx. 5V	

#### Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

# P0115 ECT SENSOR

## < COMPONENT DIAGNOSIS >

2. Disconnect ECM harness connector.

3. Check the continuity between engine coolant temperature sensor harness connector and ECM harness A connector.

Engine coolant temperature sensor ECM Continuity		EC		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F79	1	F85	24	Existed	
Also check harness fo	or short to ground an	d short to power.			
the inspection result nor	rmal?				
YES >> GO TO 4.	in a stand the second standard				
		•	er in narness or	connectors.	
CHECK ENGINE COO		IRE SENSOR			
Refer to <u>ECR-133, "Comp</u>					
<u>s the inspection result no</u> YES >> GO TO 5.					
	ne coolant temperatu	ure sensor.			
CHECK INTERMITTEN					
Refer to GI-39, "Intermitte	nt Incident".				
>> INSPECTION	END				
Component lasses					
	on			IN	IFOID:000000001307470
Component Inspection				15	IFOID:000000001307470
CHECK ENGINE COO	LANT TEMPERATU	IRE SENSOR		IN	IFOID:000000001307470
CHECK ENGINE COO	LANT TEMPERATU FF.		ector	ΙΝ	IFOID:000000001307470
CHECK ENGINE COO	LANT TEMPERATU FF. olant temperature se	ensor harness conn		ΙΛ	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co	LANT TEMPERATU FF. olant temperature se	ensor harness conn		ιΝ	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co	LANT TEMPERATU FF. olant temperature se veen engine coolant	ensor harness conn		ΙΝ	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw	LANT TEMPERATU FF. olant temperature se veen engine coolant	ensor harness conn t temperature senso		<i>I</i> N	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 s the inspection result nor	LANT TEMPERATU FF. olant temperature se veen engine coolant	ensor harness conn t temperature senso Resistance		μ.	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 s the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ		ιΝ 	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se veen engine coolant	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ		ικ. 	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 s the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ		μ.	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ		ικ. 	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ		ικ. 	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ			IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 s the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ		ι. 	IFOID:000000001307470
CHECK ENGINE COO Turn ignition switch O Disconnect engine co Check resistance betw Terminal 1 and 2 s the inspection result nor YES >> INSPECTION	LANT TEMPERATU FF. olant temperature se ween engine coolant control ( mal? END	ensor harness conn t temperature senso Resistance 0.087 - 83 kΩ			IFOID:000000001307470

Ρ

[M9R]

# P0120 TP SENSOR

# Description

Electric throttle control actuator consists of the following two components, throttle control motor with gear which operates throttle valve, throttle position sensor which detects throttle position sensor. Throttle valve is fully opened when regeneration is not performed and engine is running. The valve is closed to perform regeneration and to perform smooth engine stop when the ignition switch is turned OFF. Throttle position sensor detects the opening angle of throttle valve and converts the angle into a voltage signal. Based on the signal, ECM judges whether throttle control actuator operates throttle valve properly or not.

# DTC Logic

INFOID:000000001450519

INFOID:000000001307471

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0120	Throttle position sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Throttle position sensor circuit is open
10120	Throttle position sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	or shorted.) <ul> <li>Throttle position sensor</li> </ul>

## DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> 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 ECR-134, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

INFOID:000000001307473

## **1.**CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2. CHECK THROTTLE POSITION SENSOR 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.

Electric throttle	control actuator	Ground	Voltage	
Connector	Terminal	Ciouna	voltage	
F86	3	Ground	Approx. 5V	

#### Is the inspection result normal?

YES >> GO TO 3.

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

# ECR-134

# P0120 TP SENSOR

### < COMPONENT DIAGNOSIS >

 $\overline{\mathbf{3.}}$  check throttle position sensor ground circuit for open and short

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Continuity				
	Terminal	Connector	Terminal	Connector
Existed	85	F68	1	F86

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

#### Is the inspection result normal?

YES >> GO TO 4.

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

## 4.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle con	trol actuator	EC	M	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F86	6	F68	83	Existed	
Also check harness for	short to ground and	short to power.			
ne inspection result norm	<u>nal?</u>				
S >> GO TO 5.					
	cuit or short to grou	nd or short to powe	er in harness or o	connectors.	
CHECK THROTTLE PO	SITION SENSOR				
er to ECR-135, "Compo	nent Inspection".				
ne inspection result norm	<u>nal?</u>				
S >> GO TO 6.					
O >> Replace electric	c throttle control actu	uator.			
•					
	INCIDENT				

#### >> INSPECTION END

# Component Inspection

# 1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

	ECM		ECM	Condition	Voltage	D
Connector	Terminal	Connector	Terminal	Condition	vollage	P
F68	83	F68	85	For 20 seconds after turning ignition switch OFF	Output voltage fluctuates between 0 V and 5 V	
FUO	(TP sensor)	FUO	(Sensor ground)	More than 20 seconds after turning ignition switch OFF	0.63 - 0.77 V	

А

Е

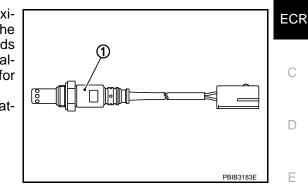
Μ

# P0130 A/F SENSOR 1

# Description

Air fuel ratio (A/F) sensor 1 (1) is installed on the upstream of the oxidation catalyst. A/F sensor 1 measures the oxygen level in the exhaust gas and converts it into a voltage signal. A/F sensor 1 sends the signal to ECM. Based on the signal from A/F sensor 1, ECM calculates the air fuel mixture ratio. ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor 1 to ensure the required operating temperature.



#### INFOID:00000000145052

# F

А

# DTC Logic

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0130	Air fuel ratio (A/F) sensor 1 circuit	The A/F signal computed by ECM from the air fuel ratio sensor 1 signal is out of the specified range.	<ul> <li>Harness or connectors (The air fuel ratio sensor 1 circuit is shorted.)</li> <li>Air fuel ratio sensor 1</li> </ul>
Diagnosi	is Procedure		INFOID:000000001450340
1.снеск		DNS	
2. Check	gnition switch OFF and v k ground connection E17 ection result normal?	vait at least 20 seconds. 7. Refer to Ground inspection in <u>GI-41, "C</u>	Sircuit Inspection".
	> GO TO 2.		
NO >:	> Repair or replace grou	nd connections. SENSOR 1 POWER SUPPLY CIRCUIT	

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

A/F se	ensor 1		
Connector	Terminal	Ground	Voltage
F91	4	Ground	Battery voltage
OK or NG			
	GO TO 4. GO TO 3.		
3.DETECT N		ONING PART	г
Check the foll <ul> <li>Harness cor</li> </ul>	lowing.		
<ul> <li>IPDM E/R c</li> </ul>			

- Harness for open or short between A/F sensor 1 and IPDM E/R
- Harness for open or short between A/F sensor 1 and ECM
  - >> Repair or replace harness or connectors.

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

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

A/F s	A/F sensor 1 ECM		A/F sensor 1 ECM		Continuity
Connector	Terminal	Connector	Connector Terminal		
	1		81		
F91	2	F68	78	Existed	
F91	5	F00	82	Existed	
	6		77		

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

A/F s	ensor 1	ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal	Giodila	Continuity
	1		81		
504	2	FCO	78		
F91	5	F68	82	Ground	Not existed
	6		77	-	

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

# 5. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE A/F SENSOR 1

# Replace A/F sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

# P0131 A/F SENSOR 1

# Description

DTC Logic

Air fuel ratio (A/F) sensor 1 (1) is installed on the upstream of the oxidation catalyst. A/F sensor 1 measures the oxygen level in the exhaust gas and converts it into a voltage signal. A/F sensor 1 sends the signal to ECM. Based on the signal from A/F sensor 1, ECM calculates the air fuel mixture ratio. ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor 1 to ensure the required operating temperature.



#### DTC No. Trouble diagnosis name DTC detecting condition Possible Cause Harness or connectors The A/F signal computed by ECM from the air Air fuel ratio (A/F) sensor 1 (The air fuel ratio sensor 1 circuit is P0131 fuel ratio sensor 1 signal is out of the specified circuit shorted.) range. Air fuel ratio sensor 1

# Diagnosis Procedure

1.CHECK GROUND CONNECTIONS
----------------------------

- Turn ignition switch OFF and wait at least 20 seconds. 1
- Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection". 2.

## Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connections.

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

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

A/F sei	nsor 1	Ground	Voltage
Connector	Terminal	Ground	voltage
F91	4	Ground	Battery voltage
OK or NG			
	O TO 4. O TO 3.		
			_
3. DETECT N	ALFUNCTION	ONING PAR	I
Check the foll		<b>E404</b>	
<ul> <li>Harness cor</li> <li>IPDM E/R cor</li> </ul>			

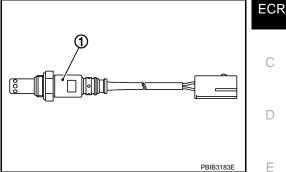
- Harness for open or short between A/F sensor 1 and IPDM E/R
- Harness for open or short between A/F sensor 1 and ECM

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

INFOID:000000001548250

INFOID:000000001548249

INFOID:000000001548248



А

F

Н

Κ

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

A/F s	ensor 1	E	Continuity		
Connector Terminal		Connector	Terminal	Continuity	
	1		81	Existed	
F91	2	FCO	78		
F91	5	F68	82		
	6		77		

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

A/F s	ensor 1	ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
	1	500	81	- Ground	Not existed
F04	2		78		
F91	5	F68	82		
	6		77		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

# 5. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE A/F SENSOR 1

# Replace A/F sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

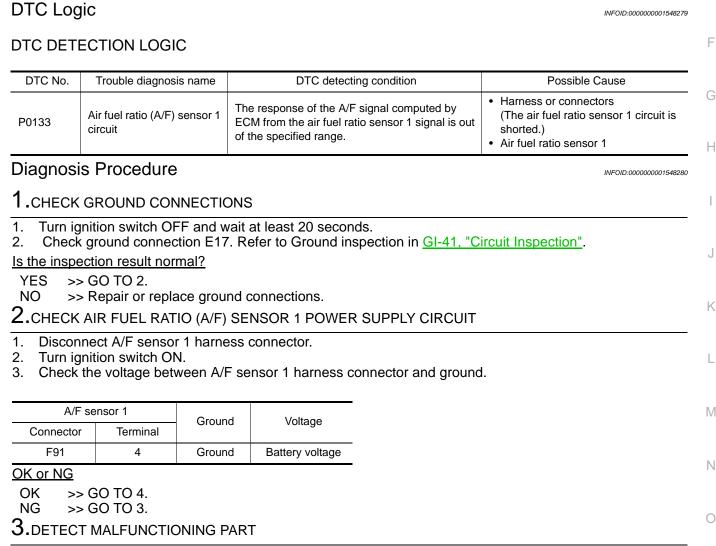
>> INSPECTION END

# P0133 A/F SENSOR 1

# Description

Air fuel ratio (A/F) sensor 1 (1) is installed on the upstream of the oxidation catalyst. A/F sensor 1 measures the oxygen level in the exhaust gas and converts it into a voltage signal. A/F sensor 1 sends the signal to ECM. Based on the signal from A/F sensor 1, ECM calculates the air fuel mixture ratio. ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor 1 to ensure the required operating temperature.



- Harness connectors E7, F121
- IPDM E/R connector E15
- Harness for open or short between A/F sensor 1 and IPDM E/R
- Harness for open or short between A/F sensor 1 and ECM

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

## ECR-141



ECR

D

E

Ρ

PBIB3183F

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

A/F s	ensor 1	E	Continuity		
Connector Terminal		Connector	Terminal	Continuity	
	1		81	Existed	
F91	2	FCO	78		
F91	5	F68	82		
	6		77		

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

A/F sensor 1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal	Giodila	Continuity
	1	500	81	Ground	Not existed
504	2		78		
F91	5	F68	82		
	6		77		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

# 5. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE A/F SENSOR 1

# Replace A/F sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

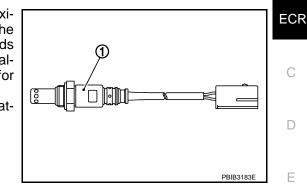
>> INSPECTION END

# P0134 A/F SENSOR 1

# Description

Air fuel ratio (A/F) sensor 1 (1) is installed on the upstream of the oxidation catalyst. A/F sensor 1 measures the oxygen level in the exhaust gas and converts it into a voltage signal. A/F sensor 1 sends the signal to ECM. Based on the signal from A/F sensor 1, ECM calculates the air fuel mixture ratio. ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor 1 to ensure the required operating temperature.



#### INFOID:000000001551261

# F

Ν

Ρ

# DTC Logic

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0134	Air fuel ratio (A/F) sensor 1 circuit	The A/F signal computed by ECM from the air fuel ratio sensor 1 signal is out of the specified range.	<ul> <li>Harness or connectors (The air fuel ratio sensor 1 circuit is shorted.)</li> <li>Air fuel ratio sensor 1</li> </ul>
Diagnosi	is Procedure		INFOID:000000001551262
1.снеск		ONS	
2. Check Is the inspe		vait at least 20 seconds. 7. Refer to Ground inspection in <u>GI-41, "C</u>	Circuit Inspection".
-	Repair or replace grou AIR FUEL RATIO (A/F)	nd connections. SENSOR 1 POWER SUPPLY CIRCUIT	
2. Turn ig	nnect A/F sensor 1 harne gnition switch ON. the voltage between A/	ess connector. F sensor 1 harness connector and groun	d.
A/F	- sensor 1 Grour	ud Voltage	

INFOID:000000001551260

[M9R]

А

Ground Voltage Connector Terminal F91 4 Ground Battery voltage OK or NG OK >> GO TO 4. NG >> GO TO 3. **3.** DETECT MALFUNCTIONING PART Check the following. Harness connectors E7. F121 IPDM E/R connector E15 Harness for open or short between A/F sensor 1 and IPDM E/R • Harness for open or short between A/F sensor 1 and ECM >> Repair or replace harness or connectors. 4.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

A/F s	ensor 1	E	Continuity		
Connector Terminal		Connector	Terminal	Continuity	
	1		81	Existed	
F91	2	FCO	78		
F91	5	F68	82		
	6		77		

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

A/F s	ensor 1	ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
	1	500	81	- Ground	Not existed
F04	2		78		
F91	5	F68	82		
	6		77		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

# 5. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE A/F SENSOR 1

# Replace A/F sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

# P0135 A/F SENSOR 1 HEATER

# Description

## SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator	
Camshaft position sensor Crankshaft position sensor	Engine speed			С
Engine coolant temperature sensor	Engine coolant temperature	Air fuel ratio (A/F) sensor 1 heater control	Air fuel ratio (A/F) sensor 1 heater	
Exhaust gas temperature sensor	Exhaust gas temperature		Tiealei	D
Intake air temperature sensor	Intake air temperature			

Based on intake air temperature, engine coolant temperature and exhaust gas temperature, ECM switches the mode of A/F sensor heater from OFF to ON (or from ON to OFF).

During A/F sensor heater is ON, ECM controls A/F sensor heater with ON/OFF pulse duty signals according to driving conditions.

## OPERATION

Condition	Air fuel ratio (A/F) sensor 1 heater	G
Ignition switch: ON (Engine stopped)	OFF	0
<ul> <li>After the vehicle is driven for 6 minutes under the following conditions.</li> <li>Warm-up condition</li> <li>Vehicle speed: 80km/h (50MPH)</li> <li>Shift lever: Suitable gear position</li> </ul>	ON	Н

# DTC Logic

INFOID:000000001450527

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0135	Air fuel ratio (A/F) sensor 1 heater circuit	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low or high voltage signal is sent to ECM through the A/F sensor 1 heater)	<ul> <li>Harness or connectors (The air fuel ratio sensor 1 heater circuit is open or shorted.)</li> <li>Air fuel ratio sensor 1 heater</li> </ul>	K

## DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up normal operating temperature.
- 2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a 6 minutes in the suitable gear position.
- 3. Release accelerator pedal for at least 3 seconds.
- Do not depress brake pedal during this procedure. 4. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-145, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

А

ECR

E

F

Ν

Ρ

INFOID:000000001451059

# P0135 A/F SENSOR 1 HEATER

#### < COMPONENT DIAGNOSIS >

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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

1. Disconnect A/F sensor 1 harness connector.

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

A/F se	A/F sensor 1		Voltage
Connector	Terminal	Ground	voltage
F91	4	Ground	Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E7, F121
- IPDM E/R connector E15

• Harness for open or short between A/F sensor 1 and IPDM E/R

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

>> Repair or replace harness or connectors.

**4.**CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Disconnect ECM harness connector.

3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

A/F s	A/F sensor 1		ECM	
Connector	Terminal	Connector	Terminal	Continuity
F91	3	F85	12	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK A/F SENSOR 1 HEATER

Refer to ECR-147, "Component Inspection".

Is the inspection result normal?

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

**6.**REPLACE A/F SENSOR 1

#### Replace A/F sensor 1.

#### CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

# P0135 A/F SENSOR 1 HEATER

	PU135 A/F SENSUR 1 HEA	
< COMPONENT DIA	AGNOSIS >	[M9R]
7. CHECK INTERMI	TTENT INCIDENT	A
Perform <u>GI-39, "Inter</u>	mittent Incident".	~
<b>.</b> .		
>> Repair of		EC
Component Insp	ection	INFOID:000000001451064
1.CHECK AIR FUEI	_ RATIO (A/F) SENSOR 1	С
1. Turn ignition swit		
	sensor 1 harness connector. e between A/F sensor 1 terminals as follows.	D
Terminal	Resistance	E
3 and 4	2.4 - 4.0 Ω [at 25°C (77°F)]	
3 and 1, 2	$\infty \Omega$	_
4 and 1, 2	(Continuity should not exist)	F
<u>Is the inspection resu</u> YES >> INSPEC		
NO >> GO TO 2		G
2.REPLACE AIR FL	JEL RATIO (A/F) SENSOR 1	
Replace malfunctioni	ng air fuel ratio (A/F) sensor 1.	Н
• Discard any air fu	uel ratio (A/F) sensor which has been dropp	ed from a height of more than 0.5 m
(19.7 in) onto a ha	rd surface such as a concrete floor; use a ne	w one.
	new air fuel ratio (A/F) sensor, clean exhaust : eaner tool and approved anti-seize lubricant.	system threads using Heated Oxygen
>> INSPEC	TION END	J
		K
		L

M

Ν

0

Ρ

# P0180 FUEL TEMPERATURE SENSOR

# Description

The fuel temperature sensor is used to detect the fuel temperature inside the fuel line in the engine room. 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.

# DTC Logic

INFOID:000000001451240

INFOID:000000001307476

INFOID:000000001451239

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0180	Fuel temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Fuel temperature sensor circuit is
F 0 100	Fuel temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.) <ul> <li>Fuel temperature sensor</li> </ul>

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> 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 ECR-148, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

# **1.**CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

#### Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

# 2. CHECK FUEL TEMPERATURE SENSOR SUPPLY CIRCUIT CIRCUIT

- 1. Disconnect fuel temperature sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between fuel pump temperature sensor connector and ground.

Fuel pump temp	perature sensor	Ground	Voltage
Connector	Terminal	Ciouna	voltage
F100	1	Ground	Approx. 5V

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK FUEL TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

# P0180 FUEL TEMPERATURE SENSOR

#### < COMPONENT DIAGNOSIS >

2. Disconnect ECM harness connector.

3. Check the continuity between fuel pump temperature sensor harness connector and ECM harness con- A nector.

Connector         Terminal         Connector         Terminal         Continuity           F100         2         F85         22         Existed           4. Also check harness for short to ground and short to power.         Existed         Existed           NO         >> Repair open circuit or short to ground or short to power in harness or connectors.         4. CHECK FUEL TEMPERATURE SENSOR           Refer to ECR-149.         "Component Inspection".         St the inspection result normal?           YES         >> GO TO 5.         NO         >> Replace fuel temperature sensor.           D.CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END           Component Inspection	Fuel pump ten	nperature sensor	EC	M	Continuity
A. Also check harness for short to ground and short to power. s the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit or short to ground or short to power in harness or connectors. 4. CHECK FUEL TEMPERATURE SENSOR Refer to ECR-149, "Component Inspection". s the inspection result normal? YES >> GO TO 5. NO >> Replace fuel temperature sensor. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL TEMPERATURE SENSOR 1. Turn ignition switch OFF. 2. Disconnect fuel temperature sensor harness connector. 3. Check resistance between fuel temperature sensor terminal. Terminals Resistance 1 and 2 0.085 - 50 KΩ s the inspection result normal? YES >> INSPECTION END	Connector	Terminal	Connector	Terminal	Continuity
s the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit or short to ground or short to power in harness or connectors. 4. CHECK FUEL TEMPERATURE SENSOR Refer to <u>ECR-149</u> , "Component Inspection". s the inspection result normal? YES >> GO TO 5. NO >> Replace fuel temperature sensor. 5. CHECK INTERMITTENT INCIDENT Refer to <u>GI-39</u> , "Intermittent Incident". >> INSPECTION END Component Inspection . CHECK FUEL TEMPERATURE SENSOR . Turn ignition switch OFF. 2. Disconnect fuel temperature sensor harness connector. 3. Check resistance between fuel temperature sensor terminal. Terminals Resistance 1 and 2 0.085 - 50 kΩ s the inspection result normal? YES >> INSPECTION END	F100	2	F85	22	Existed
YES       >> GO TO 4.         NO       >> Repair open circuit or short to ground or short to power in harness or connectors.         •.CHECK FUEL TEMPERATURE SENSOR         efer to ECR-149, "Component Inspection".         •.the inspection result normal?         YES       >> GO TO 5.         NO       >> Replace fuel temperature sensor.         •.CHECK INTERMITTENT INCIDENT         efer to GI-39, "Intermittent Incident".         >> INSPECTION END         component Inspection         •.CHECK FUEL TEMPERATURE SENSOR         •.Turn ignition switch OFF.         •. Disconnect fuel temperature sensor harness connector.         •. Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         the inspection result normal?         YES       >> INSPECTION END	. Also check harness	for short to ground and	short to power.		
refer to ECR-149. "Component Inspection".         a the inspection result normal?         YES       >> GO TO 5.         NO       >> Replace fuel temperature sensor.         O.CHECK INTERMITTENT INCIDENT         refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         .CHECK FUEL TEMPERATURE SENSOR         .CHECK FUEL TEMPERATURE SENSOR         . Turn ignition switch OFF.         . Disconnect fuel temperature sensor harness connector.         . Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         athe inspection result normal?         YES       > INSPECTION END	YES >> GO TO 4. NO >> Repair ope	n circuit or short to grou	nd or short to powe	er in harness or o	connectors.
s the inspection result normal? YES >> GO TO 5. NO >> Replace fuel temperature sensor. D.CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection I.CHECK FUEL TEMPERATURE SENSOR I. Turn ignition switch OFF. 2. Disconnect fuel temperature sensor harness connector. 3. Check resistance between fuel temperature sensor terminal. Terminals Resistance 1 and 2 0.085 - 50 kΩ s the inspection result normal? YES >> INSPECTION END					
YES       >> GO TO 5.         NO       >> Replace fuel temperature sensor.         D.CHECK INTERMITTENT INCIDENT         Refer to GI-39. "Intermittent Incident".         >> INSPECTION END         Component Inspection         I.CHECK FUEL TEMPERATURE SENSOR         I. Turn ignition switch OFF.         2. Disconnect fuel temperature sensor harness connector.         3. Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES       >> INSPECTION END					
Refer to GI-39, "Intermittent Incident".         >> INSPECTION END         Component Inspection         1.CHECK FUEL TEMPERATURE SENSOR         1. Turn ignition switch OFF.         2. Disconnect fuel temperature sensor harness connector.         3. Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES       >> INSPECTION END	YES >> GO TO 5. NO >> Replace fue	el temperature sensor.			
>> INSPECTION END         Component Inspection         1.CHECK FUEL TEMPERATURE SENSOR         1. Turn ignition switch OFF.         2. Disconnect fuel temperature sensor harness connector.         3. Check resistance between fuel temperature sensor terminal.         Image: Terminals Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES       >> INSPECTION END					
Component Inspection       INFOID:0000000130747         1. CHECK FUEL TEMPERATURE SENSOR       I         1. Turn ignition switch OFF.       I         2. Disconnect fuel temperature sensor harness connector.       I         3. Check resistance between fuel temperature sensor terminal.         Image: Terminals Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES >> INSPECTION END	Refer to <u>GI-39, "Intermit</u>	ttent Incident".			
1. CHECK FUEL TEMPERATURE SENSOR         1. Turn ignition switch OFF.         2. Disconnect fuel temperature sensor harness connector.         3. Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES       >> INSPECTION END	>> INSPECTIO	ON END			
1. Turn ignition switch OFF.         2. Disconnect fuel temperature sensor harness connector.         3. Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES       >> INSPECTION END	Component Inspec	ction			INFOID:0000000013074
1. Turn ignition switch OFF.         2. Disconnect fuel temperature sensor harness connector.         3. Check resistance between fuel temperature sensor terminal.         Terminals       Resistance         1 and 2       0.085 - 50 kΩ         s the inspection result normal?         YES       >> INSPECTION END		PERATURE SENSOR			
<ul> <li>2. Disconnect fuel temperature sensor harness connector.</li> <li>3. Check resistance between fuel temperature sensor terminal.</li> <li>Terminals Resistance         <ol> <li>1 and 2</li> <li>0.085 - 50 kΩ</li> </ol> </li> <li>s the inspection result normal?         YES &gt;&gt; INSPECTION END     </li> </ul>					
1 and 20.085 - 50 kΩs the inspection result normal?YES>> INSPECTION END	<ol> <li>Disconnect fuel terr</li> </ol>	nperature sensor harnes			
s the inspection result normal? YES >> INSPECTION END	Terminals	Resistance			
YES >> INSPECTION END	1 and 2	0.085 - 50 kΩ			
	s the inspection result i	normal?	_		
NO >> Replace lue temperature sensol.					
		er temperature sensor.			

[M9R]

Ρ

# P0190 FRP SENSOR

# Description

The fuel rail pressure (FRP) sensor is placed to the fuel rail. It measures the fuel pressure in the fuel rail. The sensor sends voltage signal to the ECM. As the pressure increases, the voltage rises. The ECM controls the fuel pressure in the fuel rail by operating fuel rail pressure control valve. The ECM uses the signal from fuel rail pressure sensor as a feedback signal.

# DTC Logic

INFOID:000000001451243

INFOID:000000001307480

INFOID:000000001307478

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
	Fuel rail pressure sensor circuit low input	A)	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
P0190	Fuel rail pressure sensor circuit high input	~)	An excessively high voltage from the sensor is sent to ECM.	(Fuel rail pressure sensor circuit is open or shorted.)
	Fuel rail pressure sensor performance	B)	An improper voltage signal from sensor is sent to ECM.	<ul> <li>Fuel rail pressure sensor</li> </ul>

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> GO TO 2.

# **2.** PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

YES >> Go to ECR-150, "Diagnosis Procedure".

NO >> GO TO 3.

# $\mathbf{3}$ . PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

- 1. Start engine and let it idle for at least 5 seconds.
- 2. Check DTC.

#### Is DTC detected?

- YES >> Go to ECR-150, "Diagnosis Procedure".
- NO >> INSPECTION END

## Diagnosis Procedure

- **1.**CHECK GROUND CONNECTIONS
- 1. Turn ignition switch OFF and wait at least 20 seconds.
- Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# **2.**CHECK FUEL RAIL PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect fuel rail pressure sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between fuel rail pressure sensor connector and ground.

# **P0190 FRP SENSOR**

## < COMPONENT DIAGNOSIS >

[M9R]

Fu	el rail pressure senso	r				
Connector		erminal	Ground	Voltag	je	
F102		1	Ground	Approx.	5V	
Is the inspection	result normal?	•	Cround	, approx.		
YES >> GO						
	air open circuit or	r short to ground	d or short to	o power in	harness or co	nnectors.
<b>3.</b> CHECK FUE	L RAIL PRESSUI	RE SENSOR GI	ROUND CI	IRCUIT FO	OR OPEN ANI	D SHORT
. Turn ignitior	switch OFF and	wait at least 20	seconds.			
	ECM harness cor					
<ol> <li>Check the c</li> </ol>	ontinuity betweer	n fuel rail pressu	re sensor i	narness co	onnector and E	ECM harness connector.
Fuel rail pre	essure sensor	F	ECM			
Connector	Terminal	Connector	Term	inal	Continuity	
F102	3	F85	34		Existed	
-	harness for short		-		LAIOLOU	
	result normal?	to ground and S		VCI.		
YES >> GO						
	air open circuit o	r short to ground	d or short to	o power in	harness or co	nnectors.
•	L RAIL PRESSUI	-		-		
						ECM harness connector.
	ontinuity between					
Fuel rail pre	essure sensor	E	CM			
Connector	Terminal	Connector	Term	inal	Continuity	
F102	2	F85	30	)	Existed	
2. Also check	harness for short	to ground and s	hort to pov	ver.		•
	result normal?	0				
YES >> GO						
-	air open circuit or	-	d or short to	o power in	harness or co	nnectors.
CHECK FUE	L RAIL PRESSUI	RE SENSOR				
Refer to ECR-15						
	<u>1, "Component li</u>	nspection".				
the inspection	· · · · · · · · · · · · · · · · · · ·	nspection".				
YES >> GO	result normal? TO 6.					
YES >> GO NO >> Rep	result normal? TO 6. lace fuel rail pres	sure sensor.				
YES >> GO NO >> Rep	result normal? TO 6.	sure sensor.				
YES >> GO NO >> Rep CHECK INTE	result normal? TO 6. lace fuel rail pres	sure sensor. DENT				
YES >> GO NO >> Rep CHECK INTE	result normal? TO 6. lace fuel rail pres RMITTENT INCI	sure sensor. DENT				
YES >> GO NO >> Rep CHECK INTE Refer to <u>GI-39, '</u>	result normal? TO 6. lace fuel rail pres RMITTENT INCI	sure sensor. DENT				
YES >> GO NO >> Rep CHECK INTE Refer to <u>GI-39, '</u> >> INS	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END	sure sensor. DENT				INFOID:00000001307481
YES >> GO NO >> Rep C.CHECK INTE Refer to <u>GI-39, '</u> >> INS Component I	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END nspection	sure sensor. DENT ent".				INFOID:000000001307481
YES >> GO NO >> Rep D.CHECK INTE Refer to <u>GI-39, '</u> >> INS Component I	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END	sure sensor. DENT ent".				INFOID:000000001307481
YES >> GO NO >> Rep 6.CHECK INTE Refer to <u>GI-39, '</u> >> INS Component I 1.CHECK FUE 1. Turn ignitior	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END nspection L RAIL PRESSU	sure sensor. DENT ent". RE SENSOR wait at least 1 r	ninutes.			INFOID:000000001307481
YES >> GO NO >> Rep <b>5.</b> CHECK INTE Refer to <u>GI-39, '</u> >> INS Component I <b>1.</b> CHECK FUE 1. Turn ignitior 2. Reconnect I	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END nspection L RAIL PRESSUI	sure sensor. DENT ent". RE SENSOR wait at least 1 r	ninutes.			INFOID:000000001307481
YES >> GO NO >> Rep <b>5.</b> CHECK INTE Refer to <u>GI-39,</u> >> INS <b>Component</b> <b>1.</b> CHECK FUE 1. Turn ignitior 2. Reconnect 3. Turn ignitior	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END nspection L RAIL PRESSUI	sure sensor. DENT ent". RE SENSOR wait at least 1 r or disconnected.				INFOID:000000001307481
NO >> Rep 6.CHECK INTE Refer to <u>GI-39, '</u> >> INS Component I 1.CHECK FUE 1. Turn ignitior 2. Reconnect I 3. Turn ignitior 4. Select "DAT	result normal? TO 6. lace fuel rail pres RMITTENT INCI Intermittent Incide PECTION END NSPECTION L RAIL PRESSUI Switch OFF and narness connecto Switch ON.	sure sensor. DENT ent". RE SENSOR wait at least 1 r or disconnected. de with CONSU	ILT-III.			INFOID:000000001307481

#### YES >> INSPECTION END.

NO >> Replace fuel rail pressure sensor.

# **P0200 FUEL INJECTOR**

# < COMPONENT DIAGNOSIS >

# P0200 FUEL INJECTOR

# DTC Logic

DTC DETECTION LOGIC

	Trouble diagnosis name	DTC detecting conc	ition	Po	ossible Cause
		An excessively low voltage from sent to ECM.	the injectors is		
P0200	Fuel injector circuit range/ performance	An excessively high voltage from sent to ECM.	n the injectors is	<ul> <li>Harness or (The fuel inj</li> </ul>	connectors ector circuit is shorted.)
		An improper voltage signal is se through fuel injectors.	nt to ECM		
DTC CON	IFIRMATION PROCE	DURE			
<b>1.</b> PRECC	NDITIONING				
		s been previously conducto	ed, always tur	n ignition sw	itch OFF and wait at
east 20 se	conds before conducting	j the next test.			
>:	> GO TO 2.				
2.perfo	RM DTC CONFIRMATIO	ON PROCEDURE			
	ngine and let it idle for a	t least 10 seconds.			
	1st trip DTC.				
	DTC detected?				
	> Go to <u>ECR-153, "Diag</u> et > INSPECTION END	nosis Procedure".			
	is Procedure				
					INFOID:000000001307483
I.CHECK	FUEL INJECTOR POW	ER SUPPLY CIRCUIT FO	R OPEN AND	SHORT	
	nition switch OFF and v				
	nnect ECM harness conr nnect fuel injector harnes				
		uel injector harness connec	tor and ECM	harness coni	nector.
	Fueliniector		ECM		
Cyling	Fuel injector	Terminal Co	ECM	Terminal	Continuity
Cylinc 1		Terminal Co	ECM nnector F85	Terminal 6	- Continuity
-	der Connector		nnector		
1	der Connector F70	1	nnector F85	6	Continuity Existed
1	der Connector F70 F71	1 1	nnector F85 F85	6 7	
1 2 3 4	der Connector F70 F71 F72 F73	1 1 1	nnector F85 F85 F85 F85 F85	6 7 8	
1 2 3 4 5. Also c	der Connector F70 F71 F72 F73	1           1           1           1           1           1	nnector F85 F85 F85 F85 F85	6 7 8	
1 2 3 4 5. Also cl s the inspe YES >:	der Connector F70 F71 F72 F73 heck harness for short to ection result normal? > GO TO 2.	1       1       1       1       2       1       3       9 ground and short to powe	nnector F85 F85 F85 F85	6 7 8 5	Existed
1 2 3 4 5. Also cl Is the inspo YES >: NO >:	der Connector F70 F71 F72 F73 heck harness for short to ection result normal? > GO TO 2. > Repair open circuit or s	1         1         1         1         o ground and short to powe         short to ground or short to p	nnector F85 F85 F85 F85 : : ower in harne	6 7 8 5 ss or connec	Existed
1 2 3 4 5. Also cl Is the inspo YES >: NO >:	der Connector F70 F71 F72 F73 heck harness for short to ection result normal? > GO TO 2. > Repair open circuit or s	1       1       1       1       2       1       3       9 ground and short to powe	nnector F85 F85 F85 F85 : : ower in harne	6 7 8 5 ss or connec	Existed

А

ECR

# **P0200 FUEL INJECTOR**

## < COMPONENT DIAGNOSIS >

Continuity	M	EC	Fuel injector		
Continuity	Terminal	Connector	Terminal	Connector	Cylinder
	2	F85	2	F70	1
Existed	3	F85	2	F71	2
Existed	4	F85	2	F72	3
	1	F85	2	F73	4

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

Is the inspection result normal?

YES >> GO TO 3.

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

 $\mathbf{3}$ . Check fuel injector output signal circuit for short

Check the continuity between fuel injector harness connector and ECM harness connector.

	Fuel injector		Fuel injector ECM			Continuity
Cylinder	Connector	Terminal	Connector	Terminal	Continuity	
				1		
1	F70	2	F85	3		
				4		
				1		
2	F71	2	F85	2		
					4	Not existed
				1	NOT EXISTED	
3	F72	2	F85	2		
				3		
				2		
4	F73	2	F85	3		
				4		

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

# P0201, P0202, P0203, P0204 FUEL INJECTOR

## < COMPONENT DIAGNOSIS >

# P0201, P0202, P0203, P0204 FUEL INJECTOR

# Description

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the fuel injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the fuel injector into the cylinder. 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.

# DTC Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0201	NO. 1 cylinder fuel injector circuit	An improper voltage signal is sent to ECM through No. 1 cylinder fuel injector	
P0202	NO. 2 cylinder fuel injector circuit	An improper voltage signal is sent to ECM through No. 2 cylinder fuel injector	Harness or connectors     (The fuel integration growth is open or shorted.)
P0203	NO. 3 cylinder fuel injector circuit	An improper voltage signal is sent to ECM through No. 3 cylinder fuel injector	<ul><li>(The fuel injector circuit is open or shorted.)</li><li>Fuel injector</li></ul>
P0204	NO. 4 cylinder fuel injector circuit	An improper voltage signal is sent to ECM through No. 4 cylinder fuel injector	
DTC CC	NFIRMATION PROCEDU	JRE	
1.PREC	ONDITIONING		
	confirmation Procedure has l seconds before conducting t		s turn ignition switch OFF and wait at
•	>> GO TO 2. ORM DTC CONFIRMATION	I PROCEDURE	
2. Cheo	engine and let it idle for at leck 1st trip DTC.	east 10 seconds.	
	>> Go to <u>ECR-155, "Diagno</u> >> INSPECTION END	<u>sis Procedure"</u> .	
Diagno	sis Procedure		INFOID:000000001307486
<b>1.</b> CHEC	K FUEL INJECTOR POWE	R SUPPLY CIRCUIT FOR OPEN	
<ol> <li>Disc</li> <li>Disc</li> </ol>	ignition switch OFF and wai onnect ECM harness connec onnect fuel injector harness	ctor.	

4. Check the continuity between fuel injector harness connector and ECM harness connector.

	Continuity	CM	EC		Fuel injector	
	Continuity	Terminal	Connector	Terminal	Connector	Cylinder
P		6	F85	1	F70	1
	Existed	7	F85	1	F71	2
	Existed	8	F85	1	F72	3
		5	F85	1	F73	4

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit in harness or connectors.

А

ECR

С

D

#### INFOID:000000001532244

# 2. CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN

Check the continuity between fuel injector harness connector and ECM harness connector.

Continuity	CM	EC	Fuel injector		
Continuity	Terminal	Connector	Terminal	Connector	Cylinder
	2	F85	2	F70	1
Existed	3	F85	2	F71	2
Existed	4	F85	2	F72	3
	1	F85	2	F73	4

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit in harness or connectors.

 $\mathbf{3}.$  CHECK FUEL INJECTOR CONTROL CIRCUIT FOR SHORT

Check the continuity between fuel injector harness connector and ECM harness connector.

Fuel injector			EC	Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F70	1	- F85 -	2	
I	170	2	105	6	
2	F71	1	F85	3	
2		2	105	7	Not existed
3	F72	1	- F85 -	4	NOT EXISTED
5		2	105	8	
4	F73	1	F85	1	
4	175	2	105	5	

## Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short circuit in harness or connectors.

# **4.**CHECK FUEL INJECTOR

Refer to ECR-156, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel injector.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTION END

# **Component Inspection**

# **1.**CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector.

3. Check resistance between fuel injector terminals as follows.

Terminals	Resistance
1 and 2	178.2 - 181.8Ω

	FUZUI, FUZUZ, FUZU3, FUZU4 FUEL INJECTOR		
< CON	IPONENT DIAGNOSIS >	[M9R]	
Is the i	Is the inspection result normal?		
YES	>> INSPECTION END		А
NO	>> Replace malfunctioning fuel injector.		
			ECR
			С
			D
			E

0

Ν

F

G

Н

J

Κ

L

Μ

Р

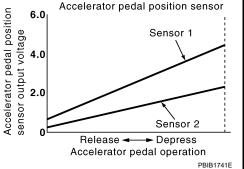
# P0225 APP SENSOR

# Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensors detect the accelerator pedal position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.

#### INFOID:000000001307490

INFOID:000000001451447



# DTC Logic

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
P0225	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the sensor is sent to ECM.	(Accelerator pedal position sensor circuit is open or shorted.)
	Accelerator pedal position sensor 1, 2 signal correlation	The correlation between APP sensor 1 signal and APP sensor 2 signal is out of the normal range.	Accelerator pedal position sensor (APP sensor 1 and 2)

## DTC CONFIRMATION PROCEDURE

# **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

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

YES >> Go to ECR-158, "Diagnosis Procedure".

NO >> GO TO 3.

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

1. Depress accelerator pedal slowly spending 5 seconds, and then release it slowly spending 5 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-158, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

# **1.**CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF and wait at least 20 seconds.

Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

Is the inspection result normal?

INFOID:000000001307492

# ECR-158

# P0225 APP SENSOR

		P0225	5 APP SE	ENSO	R	
< COMPONEN	T DIAGNOSIS :	>				[M9R]
YES >> GO NO >> Rep	TO 2. pair or replace gr	ound connectior	٦.			А
2.CHECK ACC	ELERATOR PE	DAL POSITION	SENSOR F	OWER	SUPPLY CIRCUIT	-
<ol> <li>Disconnect</li> <li>Turn ignition</li> </ol>	accelerator peda	al position sense	or harness c	onnecto		ECR
	g	p				
Accele	rator pedal position s	sensor	Ground	Vo	Itage	С
Connecto	r	Terminal	Ground	VO		
E110		4 5	Ground	Appr	ox. 5V	D
3.CHECK ACC 1. Turn ignition 2. Disconnect	TO 3. pair open circuit o ELERATOR PE n switch OFF and ECM harness co	DAL POSITION d wait at least 20 onnector.	SENSOR ( ) seconds.	GROUN		PEN AND SHORT F octor and ECM harness G
		1				
Connector	lal position sensor Terminal	Connector	ECM	Terminal Continuity		Н
Connector	1	Connector	120			
E110	2	E60	12		Existed	1
Is the inspection YES >> GO NO >> Rep 4.CHECK ACC	TO 4. pair open circuit d ELERATOR PEI	or short to groun	d or short to SENSOR IN	o power NPUT S		J DR OPEN AND SHORT Cotor and ECM harness
connector.						1
Accelerator ped	lal position sensor		ECM		Continuity	L
Connector	Terminal	Connector	Term	inal	Continuity	ъ. л.
E110	3	– E60	120		Existed	М
5.CHECK ACC Refer to ECR-10 Is the inspection YES >> GO NO >> Rep	TO 5. TO 5. pair open circuit of ELERATOR PE 0, "Component or result normal?	or short to groun DAL POSITION Inspection". pedal position s	id or short to SENSOR		r in harness or conr	N nectors. P

Refer to GI-39, "Intermittent Incident".

# P0225 APP SENSOR

## < COMPONENT DIAGNOSIS >

#### >> INSPECTION END

# Component Inspection

# **1.**CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

3. Turn ignition switch ON.

4. Check the voltage between ECM harness connector terminals as follows.

	ECM	E	CM	Con	dition	Voltage
Connector	Terminal	Connector	Terminal	Con		voltage
	126		127		Fully released	0.6 - 4.6 V
E60	(APP sensor 1)	E60	(Sensor ground)	Accelerator pedal	Fully depressed	Less than 5 V
EOU	119	EOU	120	Accelerator pedar	Fully released	More than 0.3 V
	(APP sensor 2)		(Sensor ground)		Fully depressed	Less than 2.5 V

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly.

# **P0235 TC BOOST SENSOR**

#### < COMPONENT DIAGNOSIS >

# P0235 TC BOOST SENSOR

# Description

The turbocharger boost sensor detects pressure in the exit side of the charge air cooler. The sensor output voltage to the ECM increases as pressure increases.

# DTC Logic

INFOID:000000001451448

INFOID:000000001307494

# DTC DETECTION LOGIC

narger boost sensor circuit ut	An excessively low voltage from the sensor is sent to ECM.	
		<ul> <li>Harness or connectors</li> </ul>
harger boost sensor circuit ut	An excessively high voltage from the sensor is sent to ECM.	(Turbocharger boost sensor circuit is open or shorted.)
narger boost sensor circuit erformance	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from barometric pressure sensor (built-into ECM)	<ul> <li>Turbocharger boost sensor</li> <li>Barometric pressure sensor (built- into EC)</li> </ul>
	RE	
, ,	arger boost sensor circuit erformance	ut     sent to ECM.       arger boost sensor circuit erformance     Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from barometric pressure sensor (built-into ECM)       MATION PROCEDURE

>> GO TO 2.	
2. PERFORM DTC CONFIRMATION PROCEDURE	I
<ol> <li>Turn ignition switch ON and wait at least 10 seconds.</li> <li>Check 1st trip DTC.</li> </ol>	J
Is 1st trip DTC detected?	
YES >> Go to <u>ECR-161, "Diagnosis Procedure"</u> . NO >> INSPECTION END	K
Diagnosis Procedure	496
1. CHECK GROUND CONNECTIONS	L
<ol> <li>Turn ignition switch OFF and wait at least 20 seconds.</li> <li>Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.</li> </ol>	M
<u>Is the inspection result normal?</u> YES >> GO TO 2.	
NO >> Repair or replace ground connection.	Ν
2. CHECK TUBOCHARGER BOOST SENSOR POWER SUPPLY CIRCUIT	
<ol> <li>Disconnect turbocharger boost sensor harness connector.</li> <li>Turn ignition switch ON.</li> </ol>	0
3. Check the voltage between turbocharger boost sensor harness connector and ground.	
Turbocharger boost sensor	Р

Turbocharger	Ground	Voltage	
Connector	Terminal	Ciouna	voltage
F84	3	Ground	Approx. 5V

#### Is the inspection result normal?

YES >> GO TO 3.

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

[M9R]

С

# ${f 3.}$ check tubocharger boost sensor ground circuit for open and short

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Check the continuity between turbocharger boost sensor harness connector and ECM harness connector.

Turbocharger boost sensor		E	CM	Continuity
Connector	Terminal	Connector Terminal		Continuity
F84	2	F85	17	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

4. CHECK TUBOCHARGER BOOST SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between turbocharger boost sensor harness connector and ECM harness connector.

Turbocharge	Turbocharger boost sensor ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity
F84	1	F85	18	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

 ${f 5.}$ CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

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

**6.**REPLACE TUBOCHARGER BOOST SENSOR

Replace turbocharger boost sensor.

#### >> GO TO 7.

7. PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-161, "DTC Logic".

Is 1st trip DTC P0235 displayed again?

YES >> GO TO 8.

# NO >> INSPECTION END

**8.**REPLACE ECM

1. Replace ECM.

 Go to <u>ECR-12</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

# P0263, P0266, P0269, P0272 FUEL INJECTOR

## < COMPONENT DIAGNOSIS >

# P0263, P0266, P0269, P0272 FUEL INJECTOR

# Description

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the needle valve back and amount of fuel to flow through the fuel injector into the cylinder. 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.

# DTC Logic

INFOID:000000001375014

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0263	NO. 1 cylinder fuel injector performance	The zero fuel calibration value for fuel injector 1 is out of the specified range.		
P0266	NO. 2 cylinder fuel injector performance	The zero fuel calibration value for fuel injector 2 is out of the specified range.	• Fuel injector	
P0269	NO. 3 cylinder fuel injector performance	The zero fuel calibration value for fuel injector 3 is out of the specified range.	Fuel injector	
P0272	NO. 4 cylinder fuel injector performance	The zero fuel calibration value for fuel injector 4 is out of the specified range.		
	FIRMATION PROCEDURE			
1.PRECC	ONDITIONING			
	nfirmation Procedure has been p econds before conducting the next	reviously conducted, always turn test.	ignition switch OFF and wait at	
•	> GO TO 2. PRM DTC CONFIRMATION PROC			
	gnition switch ON and wait at leas t 1st trip DTC.	t 10 seconds.		
	DTC detected?			
	> Go to <u>ECR-163, "Diagnosis Pro</u> > INSPECTION END	cedure".		
Diagnos	is Procedure		INFOID:00000001375015	
<b>1.</b> PERFC	ORM INJECTOR ADJUSTAMENT	VALUE REGSITRATION		
	gnition switch OFF and wait at lea	st 20 seconds.		
3. Perfor	gnition switch ON. m injector adjustment value regis STMENT VALUE REGISTRATION	tration for malfunctioning cylinder.	Refer to <u>ECR-14, "INJECTOR</u>	
>	> GO TO 2.			
2.снеск	( DTC			
	TC CONFIRMATION PROCEDUR	RE again.		
	<u>CR-163, "DTC Logic"</u> .			
	played again?	eter		
	> Replace malfunctioning fuel inje			

NO >> INSPECTION END

## [M9R]

#### А

ECR

С

D

# P0297 SERVICE REGENERATION

# Description

Service regeneration is performed with CONSULT-III to reduce particulate matter in DPF. For details, refer to <u>ECR-16</u>, <u>"SERVICE REGENERATION : Description"</u>.

# DTC Logic

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0297	Vehicle overspeed condition	ECM received vehicle speed signal [more than 5km/h (3 MPH)] during service regeneration.	Vehicle was driven at a speed of 5km/h (3 MPH) or more during service regeneration.

# **Diagnosis Procedure**

INFOID:000000001527780

# **1.**PERFORM SERVICE REGENERATION

Refer to ECR-17, "SERVICE REGENERATION : Special Repair Requirement".

>> GO TO 2.

2.ERASE DTC

#### With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.
- 3. Touch "ERASE".

#### With GST

- 1. Turn ignition switch ON.
- 2. Select Service \$04 with GST.

#### Is DTC erased?

YES >> INSPECTION END

NO >> GO TO 3.

 ${\it 3.}$  CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

INFOID:000000001527778

# P0300, P0301, P0302, P0303, P0304 MISFIRE

## < COMPONENT DIAGNOSIS >

# P0300, P0301, P0302, P0303, P0304 MISFIRE

# **DTC** Logic

INFOID:000000001348510

[M9R]

## DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position sensor signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function	
Crankshaft position sensor	Engine speed	On board diagnosis of misfire	

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0300	Multiple cylinder misfire detected	Multiple cylinder misfire.		
P0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	Poor compression	
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	Incorrect fuel injector connection     Fuel injector	
P0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	Lack of fuel	F
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.		

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

# PERFORM DTC CONFIRMATION PROCEDURE Start engine and warm it up to normal operating temperature. Turn ignition switch OFF and wait at least 20 seconds. Restart engine and let it idle for about 30 seconds. Check 1st trip DTC. Is 1st trip DTC detected?

# YES >> Go to <u>ECR-165</u>, "Diagnosis Procedure".

NO >> INSPECTION END

## Diagnosis Procedure

# **1.**CHECK FOR LEAK

1.	Start engine.	M
2.	Visually check the following for fuel leak.	
-	Fuel line from fuel pump to fuel rail	
-	Fuel rail	Ν
	Fuel line from fuel rail to fuel injector.	
3.	Check PCV hose connection.	
<u>ls ir</u>	ntake air leak detected?	0
YE	ES >> Discover air leak location and repair.	0
N		
2.	CHECK FUEL INJECTOR-I	Ρ
Ref	er to ECR-156. "Component Inspection".	

Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 4. **3.**CHECK FUEL INJECTOR-II ECR

Н

Κ

L

#### (P) With CONSULT-III

1. Remove two fuel injectors.

NOTE:

One is from malfunctioning cylinder and the other is from any cylinder other than the malfunctioning cylinder.

- 2. Swap the two fuel injectors to the other cylinder.
- 3. Reconnect ECM harness connector and fuel injector harness connectors.
- 4. Turn ignition switch ON.
- 5. Perform Injector Adjustment Value Registration. Refer to <u>ECR-14, "INJECTOR ADJUSTMENT VALUE</u> <u>REGISTRATION : Special Repair Requirement"</u>.
- 6. Select "SELF DIAG RESULTS" mode with CONSULT-III.
- 7. Touch "ERASE".
- 8. Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-165, "DTC Logic".
- 9. Is DTC displayed for the other cylinder?

#### With GST

1. Remove two fuel injectors.

#### NOTE:

One is from malfunctioning cylinder and the other is from any cylinder other than the malfunctioning cylinder.

- 2. Swap the two fuel injectors to the other cylinder.
- 3. Reconnect ECM harness connector and fuel injector harness connector.
- 4. Turn ignition switch ON.
- 5. Perform Injector Adjustment Value Registration. Refer to <u>ECR-14, "INJECTOR ADJUSTMENT VALUE</u> <u>REGISTRATION : Special Repair Requirement"</u>.
- 6. Select Service \$04 with GST.
- 7. Perform DTC CONFIRMATION PROCEDURE again. Refer to <u>ECR-165, "DTC Logic"</u>.

Is DTC displayed for the other cylinder?

YES >> GO TO 4.

NO >> GO TO 5.

**4.**REPLACE FUEL INJECOR

- 1. Replace fuel injector of malfunctioning cylinder.
- Perform Injector Adjustment Value Registration. Refer to <u>ECR-14, "INJECTOR ADJUSTMENT VALUE</u> <u>REGISTRATION : Special Repair Requirement"</u>.
- 3. Perform Injector ZFC reset. Refer to ECR-14, "ZFC VALUE RESET : Special Repair Requirement".

>> INSPECTION END

#### **5.**CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-260, "Inspection".

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

**6.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

# P0335 CKP SENSOR

## < COMPONENT DIAGNOSIS >

# P0335 CKP SENSOR

# Description

The crankshaft position (CKP) sensor is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate.

The ECM receives the voltage signal and detects the function of the engine revolution.

# **DTC** Logic

INFOID:000000001307498

INFOID:000000001532246

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis r	name	DTC detecti	ng condition	Possible cause
P0335	Crankshaft position se circuit			ensor signal is not en engine is running.	Harness or connectors     (The sensor circuit is open or shorted.)
F 0555	Crankshaft position so circuit range/performation		•	ensor signal is not in ien engine is running.	<ul><li>Crankshaft position sensor</li><li>Signal plate</li></ul>
DTC CON	FIRMATION PR	OCEDURE			
1.PRECO	ONDITIONING				
				conducted, alway	s turn ignition switch OFF and wait at
ieast 20 Se	econds before cond	aucting the r	iext test.		
>	> GO TO 2.				
2.PERFC	RM DTC CONFIR	MATION PF	ROCEDURE		
	engine and let it idle				
	ne could not start, 1st trip DTC.	keep ignitio	n switch at S	FART position for	5 seconds.
	DTC detected?				
YES >	> Go to <u>ECR-167,</u>		Procedure".		
NO >	> INSPECTION EN	ND			
Diagnos	is Procedure				INFOID:000000001307499
<b>1.</b> CHECK	GROUND CONN	ECTIONS			
	gnition switch OFF				
	0		er to Ground i	nspection in <u>GI-4</u>	1, "Circuit Inspection".
•	<u>ection result norma</u> > GO TO 2.	<u>al (</u>			
-	> Repair or replace	e ground coi	nnection.		
<b>2.</b> снеси	CKP SENSOR G	ROUND CIF	RCUIT FOR C	OPEN AND SHOP	RT
1. Disco	nnect crankshaft po			less connector.	
	anaat ECNI harnaa	s connector.			
2. Disco	nnect ECM harnes	ween CKP s	ensor harnes	s connector and	ECM harness connector
2. Disco		ween CKP s	ensor harnes	s connector and	ECM harness connector.
2. Disco 3. Checł		ween CKP s			ECM harness connector.
2. Disco 3. Checł	KP sensor			S connector and	ECM harness connector.

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

#### Is the inspection result normal?

YES >> GO TO 3.

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

 $\mathbf{3}.$  CHECK CKP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

А

# P0335 CKP SENSOR

## < COMPONENT DIAGNOSIS >

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

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F83	1	F68	49	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK CKP SENSOR

Refer to ECR-168, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace crankshaft position sensor.

5. CHECK GEAR TOOTH

Visually check for chipping flywheel or signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace flywheel or signal plate.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTION END

# **Component Inspection**

1.CHECK CKP SENSOR

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

Terminals	Resistance
1 and 2	0.6 - 1.0 kΩ

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace CKP sensor.

# P0340 CMP SENSOR

## < COMPONENT DIAGNOSIS >

# P0340 CMP SENSOR

# Description

The camshaft position (CMP) sensor senses the retraction with camshaft (left side) to identify a particular cylinder. The camshaft position (CMP) sensor senses the piston position.

When the crankshaft position (CKP) sensor system becomes inoperative, the camshaft position (CMP) sensor 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 cause the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

# DTC Logic

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sensor circuit	Camshaft position sensor signal is not detected by ECM when engine is running.	Harness or connectors     (The sensor circuit is open or shorted.)
F0340	Camshaft position sensor circuit range/performance	nge/performance normal pattern when engine is running. • Signal plate	
ртс со	NFIRMATION PROCE	DURE	
1.PREC	ONDITIONING		
		as been previously conducted, always t	urn ignition switch OFF and wait at
least 20 s	seconds before conductir	ng the next test.	
	>> GO TO 2.		
2 DEDE	ORM DTC CONFIRMAT		
		ION PROCEDURE	
1. Start	engine and let it idle for		
1. Start 2. Chec	engine and let it idle for k 1st trip DTC.		
1. Start 2. Cheo <u>Is 1st trip</u>	engine and let it idle for k 1st trip DTC. DTC detected?	at least 10 seconds.	
1. Start 2. Chec <u>Is 1st trip</u> YES	engine and let it idle for k 1st trip DTC.	at least 10 seconds.	
1. Start 2. Cheo <u>Is 1st trip</u> YES NO	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u>	at least 10 seconds.	INFOID:00000001307502
1. Start 2. Chec <u>Is 1st trip</u> YES NO <b>Diagno</b>	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u> >> INSPECTION END	at least 10 seconds. gnosis Procedure".	INFOID:000000001307502
1. Start 2. Chec Is 1st trip YES NO Diagno <b>1.</b> CHEC 1. Turn	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u> >> INSPECTION END sis Procedure K GROUND CONNECT ignition switch OFF and	at least 10 seconds. gnosis Procedure". IONS wait at least 20 seconds.	
1. Start 2. Chec Is 1st trip YES NO Diagno <b>1.</b> CHEC 1. Turn 2. Che	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diag</u> >> INSPECTION END sis Procedure K GROUND CONNECT ignition switch OFF and ck ground connection E1	at least 10 seconds. gnosis Procedure". IONS	
1. Start 2. Chec Is 1st trip YES NO Diagno 1.CHEC 1. Turn 2. Che Is the ins	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u> >> INSPECTION END sis Procedure K GROUND CONNECT ignition switch OFF and	at least 10 seconds. gnosis Procedure". IONS wait at least 20 seconds.	
1. Start 2. Chec Is 1st trip YES NO Diagno 1.CHEC 1. Turn 2. Che Is the ins YES	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u> >> INSPECTION END sis Procedure K GROUND CONNECT ignition switch OFF and ck ground connection E1 pection result normal?	at least 10 seconds. gnosis Procedure". IONS wait at least 20 seconds. 7. Refer to Ground inspection in <u>GI-41.</u>	
1. Start 2. Chec Is 1st trip YES NO Diagno 1.CHEC 1. Turn 2. Che Is the ins YES NO	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u> >> INSPECTION END sis Procedure K GROUND CONNECT ignition switch OFF and ck ground connection E1 <u>pection result normal?</u> >> GO TO 2.	at least 10 seconds. gnosis Procedure". IONS wait at least 20 seconds. 7. Refer to Ground inspection in <u>GI-41, "</u> und connection.	
1. Start 2. Chec Is 1st trip YES NO Diagno 1.CHEC 1. Turn 2. Che Is the ins YES NO 2.CHEC 1. Disco	engine and let it idle for k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-169, "Diac</u> >> INSPECTION END sis Procedure K GROUND CONNECT ignition switch OFF and ck ground connection E1 <u>pection result normal?</u> >> GO TO 2. >> Repair or replace gro K CMP SENSOR POWE	at least 10 seconds. gnosis Procedure". IONS wait at least 20 seconds. 7. Refer to Ground inspection in <u>GI-41, "</u> und connection.	

CMP	sensor	Ground	Voltage
Connector	Terminal	Oround	vollage
F82	3	Ground	Battery voltage

Is the inspection result normal?

INFOID:000000001532247

INFOID:000000001452050

А

С

D

Е

# NO >> GO TO 3.

# **3.** DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connector E7, F121
- Harness for open or short between ECM and CMP sensor
- Harness for open or short between IPDM E/R and CMP sensor

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

# **4.**CHECK CMP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CMP sensor harness connector and ECM harness connector.

CMP	CMP sensor		CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F82	1	F85	46	Existed

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

Is the inspection result normal?

```
YES >> GO TO 5.
```

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

 ${f 5.}$ CHECK CMP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

CMP	sensor	E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F82	2	F85	48	Existed

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

Is the inspection result normal?

YES >> GO TO 6.

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

**6.**CHECK CMP SENSOR

Refer to ECR-171, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace camshaft position sensor.

7.CHECK SPROCKET

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace sprocket.

8. CHECK TIMING CHAIN

Refer to EM-293, "Exploded View".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace timing chain.

**9.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

	FU34	U CIVIF JENJUK	
< COMPONENT D	DIAGNOSIS >	[N	19R]
>> INSPE	CTION END		
Component Ins	spection	INF0ID:0000000	A 001307503
1.CHECK CAMSH	HAFT POSITION SENSOR		ECR
1. Turn ignition s			
	mshaft position sensor harne stance between camshaft po	ess connector. Sition sensor terminals as follows.	С
Terminals	Resistance		
2 and 3	7.2 - 13.4 kΩ		D
1 and 2	More than 100 k $\Omega$		
1 and 3	More than 100 k $\Omega$		
Is the inspection re	sult normal?		E
YES >> INSPE	CTION END		
NO >> Replac	ce camshaft position sensor.		F
			1

G

Н

J

Κ

L

Μ

Ν

0

Ρ

# P0380 GLOW CONTROL SYSTEM

# DTC Logic

INFOID:000000001307504

[M9R]

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0380	Glow control unit circuit	An improper voltage signal is sent to ECM from glow control unit	<ul> <li>Harness or connectors (Glow plug control circuit is open or shorted.) (Glow control unit input signal circuit is open or shorted.)</li> <li>Glow plug</li> <li>Glow control unit</li> </ul>

#### DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Check the "ENG COOLAN TEMP" indication. If indication is below 50 °C (122 °F), go to the next step. If indication is above 50 °C (122 °F), cool down engine and then go to the next step.
- 3. Wait at least 10 seconds.
- 4. Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-172, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

INFOID:000000001307505

# 1. CHECK GLOW CONTROL UNIT POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect glow control unit harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between glow control unit harness connector and ground.

Glow co	ntrol unit	Ground	Voltage
Connector	Terminal	Ciouna	voltage
F94	4	Ground	Battery voltage

#### Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

## 2. DETECT MALFUNCTIONING PART

#### Check the following.

• 60A fusible link (letter N)

• Harness for open and short between glow control unit and battery

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

# ECR-172

# P0380 GLOW CONTROL SYSTEM

#### < COMPONENT DIAGNOSIS >

 $\mathbf{3}$ .check glow control unit ground circuit for open and short

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between glow control unit harness connector and ECM harness connector.

Glow control unit		E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F94	5	F85	9	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

#### ${f 4.}$ CHECK GLOW CONTROL UNIT INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between glow control unit harness connector and ECM harness connector.

Glow co	ontrol unit	E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F94	3	F68	53	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

 ${f 5.}$ CHECK GLOW PLUG CONTROL CIRCUIT FOR OPEN AND SHORT

1. Disconnect glow plug harness connector.

2. Check the continuity between glow control unit harness connector and glow plug harness connector.

Continuity	plug	Glow		Glow control unit	
Continuity	Terminal	Connector	Terminal	Connector	Cylinder
	1	F95	2		1
Existed	1	F96	7	F94	2
Existed	1	F97	1	F94	3
	1	F98	6		4

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

#### Is the inspection result normal?

YES >> GO TO 6.

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

**6.**CHECK GLOW PLUG

Refer to ECR-174, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning glow plug.

**/**.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace glow control unit.

NO >> Repair or replace.

[M9R]

А

ECR

D

Е

F

Н

Μ

Ν

Ρ

# **P0380 GLOW CONTROL SYSTEM**

# < COMPONENT DIAGNOSIS >

# **Component Inspection**

INFOID:000000001349038

# 1.CHECK GLOW PLUG

- 1. Turn ignition switch OFF.
- Disconnect glow plug harness connector.
   Check resistance between glow plug terminals as follows.

Terminal	Resistance
1 and engine ground	0.1 - 1.0 Ω [at 20°C (68°F)]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning glow plug.

# P0409 EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

## < COMPONENT DIAGNOSIS >

# P0409 EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

# Description

INFOID:000000001532248

[M9R]

ECR

D

Е

А

The EGR volume control valve consists of valve, actuator and position sensor, etc. The valve is installed in EGR passage, and operated by the actuator according to the output signal or the ECM. The actuator used DC motor and it opens or closes the valve to change the EGR flow rate.

The EGR volume control valve control position sensor consists of a permanent magnet and Hall IC. It senses the valve shaft movement and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the valve from this signals, and controls the DC motor to make the valve opening angle in response to driving conditions.

# DTC Logic

INFOID:000000001452056

# DTC DETECTION LOGIC

DTC No.	Trouble diagnos	is name	DTC det	ecting condition		F	Possible cause	
<b>D0400</b>	EGR volume control v position sensor circuit		An excessively sensor is sent t	low voltage from o ECM.	the		e control valve control positic	'n
P0409	EGR volume control v position sensor circuit		An excessively sensor is sent t	high voltage from o ECM.	the		is open or shorted.) control valve control positio	n
DTC CO	NFIRMATION PF	ROCEDUR	E					
1.PREC	ONDITIONING							
				conducted, al	ways	turn ignition	switch OFF and wait	at
least 20 s	seconds before cor	iducting the	next test.					
:	>> GO TO 2.							
2.PERF	ORM DTC CONFI	RMATION F	ROCEDURE					
	ignition switch ON	and wait at	least 10 seco	nds.				
	k 1st trip DTC.							
-	DTC detected? >> Go to ECR-175	"Diagnosis	Procedure"					
	>> INSPECTION E		<u>s r roccuure .</u> .					
Diagno	sis Procedure						INFOID:00000000130	7510
<b>1.</b> CHEC		NECTIONS						
	ignition switch OFI					10: VI		
	k ground connection pection result norm		er to Ground i	nspection in C	<u>51-41,</u>		<u>ection"</u> .	
	>> GO TO 2.							
NO	>> Repair or replace	-						
<b>2.</b> CHEC	K EGR VOLUME (	CONTROL	VALVE CONT	ROL POSITIO	N SE	NSOR POW	ER SUPPLY CIRCUIT	-
2. Turn	onnect EGR volum							
3. Cheo groui		ween EGR	volume contro	oi vaive contro	ol pos	sition sensor	harness connector a	nd
EG	R volume control valve	e control position	on sensor	Crowned		Voltogo	-	
	Connector	Te	rminal	Ground		Voltage		

Connector	Terminal		
F99	4	Ground	Approx. 5V

Is the inspection result normal?

# ECR-175

# P0409 EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

< COMPONENT DIAGNOSIS >

[M9R]

INFOID:000000001559390

YES >> GO TO 3.

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

 $\mathbf{3}$ .check egr volume control value control position sensor ground circuit for open and short

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Disconnect ECM harness connector.

3. Check the continuity between EGR volume control valve control position sensor harness connector and ECM harness connector.

EGR volume control valve control position sensor		E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F99	2	F85	36	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR INPUT CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EGR volume control valve control position sensor harness connector and ECM harness connector.

EGR volume control valve control position sensor		E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F99	6	F85	32	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

**5.**CHECK EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

Refer to ECR-176, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

**6.**REPLACE EGR VOLUME CONTROL VALVE

1. Replace EGR volume control valve.

- Perform <u>ECR-15</u>, "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING VALUE CLEAR : <u>Special Repair Requirement</u>".
- 3. Perform <u>ECR-15</u>, "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING : Special Repair <u>Requirement</u>".

#### >> INSPECTIO END

**1**.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTIO END

Component Inspection

**1.**CHECK EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

1. Turn ignition switch OFF.

# ECR-176

# **P0409 EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR** [M9R]

#### < COMPONENT DIAGNOSIS >

- 2. Disconnect EGR volume control valve harness connector.
- 3. Check the resistance between EGR volume control valve terminals as follows.

Terminals	Resistance
2 and 4	1 - 15 kΩ
2 and 6	1 10 122

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EGR volume control valve. ECR

С

D

Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

# P0470 EXHAUST GAS PRESSURE SENSOR

#### < COMPONENT DIAGNOSIS >

# P0470 EXHAUST GAS PRESSURE SENSOR

# Description

Exhaust gas pressure sensor is conected turbocharger with exhasut pressure tube. Exhaust gas pressure sensor measures the exhaust gas pressure and convers the pressure into a voltage signal. ECM receives the signal and control turbocharger boost pressure.

# DTC Logic

INFOID:000000001452141

INFOID:000000001350914

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	Exhaust gas pressure sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
Exhaust gas pressure sensor circuit high input		An excessively high voltage from the sensor is sent to ECM.	<ul><li>(Exhaust gas pressure sensor circuit is open or shorted.)</li><li>Exhaust gas pressure sensor</li></ul>
-	Exhaust gas pressure sensor circuit range/performance	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from barometric pressure sensor (built-into ECM)	<ul> <li>Barometric pressure sensor (built-into EC)</li> <li>Exhaust manifold and exhaust pipe</li> </ul>

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE-I

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

2. Check 1st trip DTC.

# Is 1st trip DTC detected?

YES >> Go to ECR-178, "Diagnosis Procedure".

NO >> GO TO 3.

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

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

#### Is 1st trip DTC detected?

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

## Diagnosis Procedure

- **1.**CHECK GROUND CONNECTIONS
- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".
- Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.CHECK EXHAUST GAS PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect exhaust gas pressure sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between exhaust gas pressure sensor harness connector and ground.

# ECR-178

# P0470 EXHAUST GAS PRESSURE SENSOR

## < COMPONENT DIAGNOSIS >

[M9R]

Exbau	st gas pressure sen	sor					
Connector		erminal	Ground	ound Voltage			
F81		1	Ground	Appr	ox. 5V		
the inspection	result normal?	•	Croana	, appr			
CHECK EXHA	air open circuit o AUST GAS PRE switch OFF and	r short to ground SSURE SENSOF wait at least 20 s exhaust gas pre	R GROUN		UIT FOR OPE		ec-
tor.						_	
Exhaust gas pi	essure sensor	E	СМ		Continuity		
Connector	Terminal	Connector	Term	inal	,	_	
F81	3	F85 to ground and sh	16		Existed	_	
	TO 4. air open circuit o	r short to ground		•		onnectors. OPEN AND SHORT	
tor. Exhaust gas pi	essure sensor	E	СМ		Continuity	-	
Connector	Terminal	Connector	Term	inal	Continuity	_	
F81	2	F85	20	)	Existed		
s the inspection YES >> GO T NO >> Repa	result normal? FO 5. air open circuit o AUST MANIFOL	to ground and sh r short to ground D AND EXHAUS	or short to	o power		onnectors.	
s the inspection YES >> GO T	result normal? FO 6.	exhaust pipe for a naust manifold or			ks.		
CHECK INTE	RMITTENT INC	DENT		· ·			
Refer to <u>GI-39, "I</u>		ent".					_
		pressure senso	r.				

Ρ

# P0487 EGR VOLUME CONTROL VALVE

#### < COMPONENT DIAGNOSIS >

# P0487 EGR VOLUME CONTROL VALVE

# Description

The EGR volume control valve consists of valve, actuator and position sensor, etc. The valve is installed in EGR passage, and operated by the actuator according to the output signal of the ECM. The actuator used DC motor and it opens or closes the valve to change the EGR flow rate.

The EGR volume control valve control position sensor consists of a permanent magnet and Hall IC. It senses the valve shaft movement and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the valve from this signals, and controls the DC motor to make the valve opening angle in response to driving conditions,

## DTC Logic

INFOID:000000001307511

# DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0487 EGR volume control valve circui		ECM detects EGR volume control valve circuit is open.	
	ECM detects EGR volume control valve circuit is short to ground.	Harness or connectors     (The EGR volume control valve control	
	ECM detects EGR volume control valve circuit is short to power.	<ul><li>motor circuit is open or shorted.)</li><li>EGR volume control valve</li></ul>	
		ECM detects EGR volume control valve circuits are short to each other.	

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

## >> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> Go to ECR-180, "Diagnosis Procedure".
- NO >> GO TO 3.

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

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Turn ignition switch ON and wait at least 10 seconds.
- 3. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> Go to ECR-180, "Diagnosis Procedure".
- NO >> INSPECTION END

## Diagnosis Procedure

# **1.**CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

#### Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

# ECR-180

INFOID:000000001307512

# P0487 EGR VOLUME CONTROL VALVE

< COMPONENT DIAGNOSIS >

[M9R]

	T DIAGNOSIS >				[mort]	
2.CHECK EGF	R VOLUME CONT	ROL VALVE DC	MOTOR CIRCU	IT		А
	EGR volume con		s connector.			
	ECM harness continuity bet		g terminals.			
	-		-			ECR
	e control valve	EC		Continuity		
Connector	Terminal	Connector	Terminal			С
	1	-	95	Existed		
F99		F68	96 95	Not existed		D
	5	-	95	Existed		
4. Also check	harness for short	to ground and sh		Existed		Е
Is the inspection						
YES >> GO						
· ·	•	-	or short to powe	r in harness or con	nectors.	F
	R VOLUME CONT					
	81, "Component l	nspection".				G
Is the inspection YES >> GO						
NO >> GO						ш
4.REPLACE E	GR VOLUME CO	NTROL VALVE				Η
	e EGR volume co					
	CR-15, "EGR VOL Dair Requirement"		VALVE CLOSE	D POSITION LEAF	<u>RNING VALUE CLEAR :</u>	
			VALVE CLOSE	D POSITION LEA	RNING : Special Repair	
<u>Requiremer</u>	<u>nt"</u> .					J
~~ <b>INS</b>						
_	ERMITTENT INCI	DENT				К
	"Intermittent Incid					TX.
		<u>onc</u> .				
>> INS	PECTION END					L
Component	Inspection				INFOID:000000001307513	
	R VOLUME CONT					Μ
		ROL VALVE COI				
	n switch OFF. EGR volume con	trol valve harness	s connector.			Ν
	stance between E	GR volume contro	ol valve terminal	s as follows.		
<u> </u>						0
Terminals	Resistance					0
1 and 5	$1 - 400 \Omega$					
Is the inspection YES >> INS						Ρ
	place EGR volume	e control valve.				

## P0488 EGR SYSTEM

## DTC Logic

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0488	EGR volume control valve function	<ul> <li>ECM detects EGR volume control valve is stuck closed.</li> <li>ECM detects EGR volume control valve is stuck open.</li> <li>EGR volume control valve closed position learning is not completed successfully.</li> </ul>	<ul> <li>Harness or connectors (The EGR volume control valve circuit is open or shorted.)</li> <li>EGR volume control valve</li> <li>EGR volume control valve installation</li> <li>EGR passage clogged</li> </ul>

#### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to normal operating temperature.
- 2. Let engine idle for at least 10 seconds.
- 3. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-182, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

## 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

**2.**CHECK EGR VOLUME CONTROL VALVE INSTALLATION

Check that EGR volume control valve is installed properly.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Install EGR volume control valve properly.

 ${f 3.}$  check egr volume control valve control motor circuit

1. Check harness continuity between the following terminals.

EGR volume control valve		ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
	99 2 6 F68	F68		95	Existed
F99			96	Not existed	
1 33			95	Not existed	
		96	Existed		

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

INFOID:000000001307514

INFOID:000000001307515

# P0488 EGR SYSTEM

< COMPONENT DIAGNOSIS > [M9R]
Is the inspection result normal?
YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.
<b>4.</b> CHECK EGR VOLUME CONTROL VALVE VISUALLY
<ol> <li>Remove the EGR volume control valve</li> <li>Check if foreign matter is caught between the EGR volume control valve and the housing.</li> </ol>
Is the inspection result normal?
YES >> GO TO 5. NO >> Remove the foreign matter and clean the EGR volume control valve.
5. CHECK EGR PASSAGE
Check the following for clogging and cracks.
• EGR tube
• EGR hose
• EGR cooler
Is the inspection result normal?
YES >> GO TO 6. NO >> Repair or replace EGR passage.
<b>Ö</b> .CHECK EGR VOLUME CONTROL VALVE
Refer to ECR-181, "Component Inspection".
Is the inspection result normal?
YES >> GO TO 7.
NO >> GO TO 8.
CHECK EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR
Refer to ECR-176, "Component Inspection".
Is the inspection result normal?
YES >> GO TO 9.
NO >> GO TO 8.
8.REPLACE EGR VOLUME CONTROL VALVE
1. Replace the EGR volume control valve.
2. Perform ECR-15, "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING VALUE CLEAR :
Special Repair Requirement".
3. Perform <u>ECR-15</u> , "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING : Special Repair <u>Requirement"</u> .
<u>rrequirement</u> .
9. CHECK INTERMITTENT INCIDENT
Refer to GI-39, "Intermittent Incident".
>> INSPECTIO END

## P0500 VSS

### Description

The vehicle speed signal is sent to the combination meter from the "ABS actuator and electric unit (control unit)" by CAN communication line. The combination meter then sends a signal to the ECM by CAN communication line.

# DTC Logic

INFOID:000000001307518

INFOID:000000001307519

INFOID:000000001307517

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	Vehicle speed signal	Vehicle speed signal is more than the specified range	<ul> <li>Harness or connectors (The CAN communication line is open or shorted)</li> <li>Harness or connectors (The vehicle speed signal circuit is open or shorted)</li> <li>Wheel sensor</li> <li>Combination meter</li> <li>ABS actuator and electric unit (control unit)</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

## **2.**PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 1 minutes.

## 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-184, "Diagnosis Procedure".

NO >> INSPECTION END

#### Diagnosis Procedure

**1.**CHECK CAN COMMUNICATION LINE

Refer to LAN-25, "CAN Communication Signal Chart".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace

**2.**CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to <u>BRC-104, "CONSULT-III Function (ABS)"</u> (without ESP) or <u>BRC-17, "CONSULT-III Function (ABS)"</u> (with ESP).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

**3.**CHECK COMBINATION METER

Refer to <u>MWI-24, "CONSULT-III Function (METER/M&A)"</u>.

#### >> INSPECTION END

## P0530 REFRIGERANT PRESSURE SENSOR

#### < COMPONENT DIAGNOSIS >

## P0530 REFRIGERANT PRESSURE SENSOR

#### Description

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

## **DTC** Logic

INFOID:000000001450353

INFOID:000000001450352

#### DTC DETECTION LOGIC

	Trouble diagnosis name	DTC detectin	g condition	Possible cause
P0530	Refrigerant pressure sensor circuit low input	An excessively low sensor is sent to EC	•	Harness or connectors     (Refrigerant pressure sensor circuit is
F0330	Refrigerant pressure sensor circuit high input	An excessively high sensor is sent to EC	-	open or shorted.) <ul> <li>Refrigerant pressure sensor</li> </ul>
DTC CO	NFIRMATION PROCEDURE			
1.PREC	ONDITIONING			
			icted, always t	urn ignition switch OFF and wait at
least 20 S	econds before conducting the r	lext lest.		
;	>> GO TO 2.			
2.PERF	ORM DTC CONFIRMATION P	ROCEDURE		
	ignition switch ON and wait at I			
	k 1st trip DTC.			
•	DTC detected?			
YES > NO >	> Go to <u>ECR-185, "Diagnosis</u> >> INSPECTION END	Procedure".		
-				
Diagnos	sis Procedure			INFOID:000000001450354
1.CHEC	K GROUND CONNECTIONS			
	ignition switch OFF and wait at		_	_
	ck ground connection E17. Refe	er to Ground inspec	ction in <u>GI-41, '</u>	Circuit Inspection".
	pection result normal?			
	> GO TO 2. > Repair or replace ground co	nnection.		
~	K REFRIGERANT PRESSURE		R SUPPLY CIR	CUIT
	nnect refrigerant pressure sen			
2. Turn	ignition switch ON.			
3. Chec	k the voltage between refrigera	int pressure sensor	connector and	l ground.
				_
	Refrigerant pressure sensor	Ground	Voltage	
	onnector Terminal			_
Co	E49 3	Ground	Approx. 5V	

**3.**DETECT MALFUNCTIONING PART

Check the following.

Harness connector E6, F123

[M9R]

А

ECR

## P0530 REFRIGERANT PRESSURE SENSOR

#### < COMPONENT DIAGNOSIS >

• Harness for open or short between ECM and refrigerant pressure sensor

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

**4.**CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Disconnect ECM harness connector.

Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E49	1	F85	35	Existed

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

**5.**DETECT MALFUNCTIONING PART

Check the following.

• Harness connector E6, F123

• Harness for open or short between ECM and refrigerant pressure sensor

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

**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		E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E49	2	F85	31	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 connector E6, F123

• Harness for open or short between ECM and refrigerant pressure sensor

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

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace refrigerant pressure sensor.
- NO >> Repair or replace.

## P0544 EGT SENSOR 1

## Description

The exhaust gas temperature sensor 1 is used to detect the exhaust gas temperature before turbocharger. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the exhaust gas 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.

## DTC Logic

DTC DETECTION LOGIC

INFOID:000000001505655

#### INFOID:000000001350979

ECR

С

D

А

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0544	Exhaust gas temperature sensor 1 circuit low input	ure sensor 1 An excessively low voltage from the sensor is sent to ECM. • Harness or connectors (Exhaust gas temperature s	
1 0344	Exhaust gas temperature sensor 1 circuit high input	An excessively high voltage from the sensor is sent to ECM.	circuit is open or shorted.) <ul> <li>Exhaust gas temperature sensor 1</li> </ul>
DTC COI	NFIRMATION PROCEDURE		
1.PREC	ONDITIONING		
			rn ignition switch OFF and wait a
least 20 s	econds before conducting the n	ext test.	
-	>> GO TO 2. DRM DTC CONFIRMATION PR		
	ignition switch ON and wait at le k 1st trip DTC.	ast 10 seconds.	
	DTC detected?		
		<u>Procedure"</u> .	
<b>-</b>	>> GO TO 3.		
<b>3.</b> PERFC	ORM DTC CONFIRMATION PR	OCEDURE-II	
		the following conditions for at least	st 10 seconds.
	position: 3rd position le speed: Accelerates from 55ki	m/h (34 MPH) to 70 km/h (43 MPł	+)
	k 1st trip DTC.		,
-	DTC detected?		
	So to <u>ECR-187, "Diagnosis F</u> INSPECTION END	<u>Procedure"</u> .	
Diagnos	sis Procedure		INFOID:00000000135097
<b>1.</b> CHEC	K GROUND CONNECTIONS		
1. Turn i	ignition switch OFF and wait at I	east 20 seconds.	
	-	r to Ground inspection in <u>GI-41, "(</u>	Circuit Inspection".
-	pection result normal?		
	> GO TO 2. > Repair or replace ground con	nection	
		JRE SENSOR 1 POWER SUPPL	
	nnect exhaust gas temperature	Sensor i namess connector.	
2. Turn i	ignition switch ON.		

## ECR-187

## P0544 EGT SENSOR 1

#### < COMPONENT DIAGNOSIS >

[M9R]

Exhaust gas tem	Exhaust gas temperature sensor 1		
Connector	Terminal	Ground	Voltage
F101	1	Ground	Approx. 5V

Is the inspection result normal?

YES >> GO TO 3.

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

 $\mathbf{3}$ . CHECK EXHAUST GAS TEMPERATURE SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check the continuity between exhaust gas temperature sensor 1 harness connector and ECM harness connector.

Exhaust gas temperature sensor 1		E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F101	2	F85	10	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

- YES >> Replace exhaust gas temperature sensor 1.
- NO >> Repair or replace.

## **P0560 BATTERY VOLTAGE**

#### < COMPONENT DIAGNOSIS >

# P0560 BATTERY VOLTAGE

# DTC Logic

А

ECR

INFOID:000000001505734

[M9R]

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
		An excessively low voltage from the battery is sent to ECM.	Harness or connectors     (ECM power supply circuit is open or shorted.)
P0560	Battery voltage	An excessively high voltage from the battery is sent to ECM.	<ul><li>Battery</li><li>Battery terminal</li></ul>
		An improper voltage is sent to ECM through battery	Alternator     IPDM E/R
DTC CON	IFIRMATION PROCED	DURE	
1.PRECC	NDITIONING		
			ways turn ignition switch OFF and wait at
least 20 Se	conds before conducting	j the next test.	
>:	> GO TO 2.		
2.PERFO	RM DTC CONFIRMATIC	ON PROCEDURE	
	nition switch ON and wa	it at least 30 seconds.	
	1st trip DTC. <u>DTC detected?</u>		
YES >:	> Go to <u>ECR-189, "Diag</u> r	nosis Procedure".	
	> INSPECTION END		
Diagnos	is Procedure		INFOID:000000001307524
1.снеск	BATTERY VOLTAGE		
	nition switch ON. battery voltage.		
Vol	tage: Above 11V		
Is the insp	ection result normal?		
	> GO TO 2.		
~	> Recharge the battery. CBATTERY TERMINALS		
	nition switch OFF and w		
	battery terminals conditi		
	ection result normal?		
	> GO TO 3. > Repair the battery term	inals	
-	BATTERY AND ALTER		
		ry and type of alternator are insta	illed.
Refer to, P	G-136, "Battery" and CH		
	ection result normal?		
-	> GO TO 4. > Replace with a proper (	one.	
4			

Check the voltage between ECM harness connector and ground.

## **P0560 BATTERY VOLTAGE**

#### < COMPONENT DIAGNOSIS >

EC	CM	Ground	Voltage	
Connector	Connector Terminal		vollage	
F68	62	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 7.

5. CHECK ECM POWER SUPPLY CIRCUIT-II

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E15.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	ECM		IPDM E/R	
Connector	Terminal	Connector	Terminal	Continuity
E68	93	E15	48	Existed
LUU	94	LIJ	47	LAISted

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

Is the inspection result normal?

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

**6.**DETECT MALFUNCTIONING PART

Check the following.

Harness or connectors E7, E121

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

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

## 7.CHECK ECM POWER SUPPLY CIRCUIT-III

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E15.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	ECM		IPDM E/R		
Connector Terminal		Connector	Terminal	Continuity	
F68	62	E15	51	Existed	

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

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8.

**8.**DETECT MALFUNCTIONING PART

Check the following.

Harness or connectors E7, E121

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

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

## 9.CHECK 20A FUSE

1. Disconnect 20A fuse (No. 62) from IPDM E/R.

2. Check 20A fuse.

Is the inspection result normal?

		P0	560 BATT	ERY VOLTAGE		
< COMPON	ENT DIAGNO	OSIS >			[M9R]	
	GO TO 10. Replace 20A f	use.				А
10.CHECH		ONNECTION				
Check grour	d connection	E9. Refer to (	Ground Inspec	ction in <u>GI-41, "Circuit Inspection"</u> .		ECR
	tion result nor	mal?				LOIN
	GO TO 11. Repair or repla	ace ground co	onnection.			0
		-		ND SHORT		С
1. Check the	ne continuity b	etween ECM	harness conr	nector and ground.		
		1		_		D
Connector	CM Terminal	Ground	Continuity			
	123			-		E
E60	124	Ground	Existed			
E00	125	Giouna	Existed			F
	128			-		
	eck harness fo tion result nor	•	/er.			G
YES >>	GO TO 12.					
				ness or connectors.		Н
			IT			
	<u>39, "Intermitter</u> tion result nor					I
YES >>	Replace IPDM	IE/R.				
NO >>	Repair or repla	ace.				J
						К
						IX
						L
						Μ
						Ν

0

Ρ

## P0564 ASCD STEERING SWITCH

#### Description

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

## DTC Logic

INFOID:000000001505753

INFOID:000000001307528

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
		An excessively high voltage signal from the ASCD steering switch is sent to ECM.	
P0564	ASCD steering switch circuit	ECM detects that input signal from the ASCD steering switch is out of the specified range.	<ul> <li>Harness or connectors (The switch circuit is open or shorted.)</li> <li>ASCD steering switch</li> </ul>
		ECM detects that the ASCD steering switch is stuck ON.	5.

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-192, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

INFOID:000000001307530

## **1.**CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

#### 2. CHECK ASCD STEERING SWITCH CIRCUIT

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as follows.

## **P0564 ASCD STEERING SWITCH**

#### < COMPONENT DIAGNOSIS >

[M9R]

	(+)		(-)		Condition	Voltage	_
Connector	Terminal	Connector	Terminal		Condition	voltage	_
				MAIN swite	ch: Pressed	Approx. 0V	E
	110 (ASCD steering		111	CANSEL s	witch: Pressed	Approx. 1V	
E60		E60	(ASCD steerin		ST switch: Pressed	Approx. 2V	_
	switch signal)		switch ground	) RESUME/	ACCELERATE switch: Pressed	Approx. 3V	_
				All ASCD s	steering switches: Released	Approx. 4V	_
s the inspect	ion result norm	al?					_
	GO TO 8.						
_	GO TO 3.						
CHECK A	SCD STEERIN	G SWITCH	GROUND CIF	CUIT FOR	OPEN AND SHORT		
	tion switch OFF						
	ect combination ect ECM harnes						
				(spiral cable	) and ECM harness connec	ctor.	
	-						
Combination	n switch (spiral cab	le)	ECM		Continuity		
Connector	Termina	l Cor	nnector	Terminal	Continuity		
_	15		E60	111	Existed		
. Also che	ck harness for s	short to arou	nd and short t	o power.			
	ion result norm	•					
•	GO TO 5.						
	GO TO 4.						
1.DETECT I							
Horpood oo							_
	nnectors M77,	E105					_
Combinatio		E105 cable)	M and combir	ation switch			_
Combinatio	nnectors M77, n switch (spiral	E105 cable)	M and combir	nation switch	1		_
Combinatio Harness for	nnectors M77, n switch (spiral r open or short	E105 cable) between EC			r in harness or connectors.		_
Combinatio Harness for >> F	nnectors M77, n switch (spiral r open or short Repair open ciro	E105 cable) between EC cuit or short t	o ground or s	hort to powe			_
Combinatio Harness for >> F D.CHECK A	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN	E105 cable) between EC cuit or short t G SWITCH	o ground or s	hort to powe	r in harness or connectors. FOR OPEN AND SHORT		_
Combinatio Harness for >> F O.CHECK A	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN	E105 cable) between EC cuit or short t G SWITCH	o ground or s	hort to powe	r in harness or connectors.		_
Combinatio Harness for >> F O.CHECK A . Check th	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s	hort to powe	er in harness or connectors. FOR OPEN AND SHORT e) and ECM harness connec		-
Combinatio Harness for >> F D.CHECK A . Check th	nnectors M77, n switch (spiral r open or short Repair open ciro SCD STEERIN e continuity bet	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s INPUT SIGNA nation switch	hort to powe	r in harness or connectors. FOR OPEN AND SHORT		-
Combinatio Harness for >> F O.CHECK A . Check th Combination	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s INPUT SIGNA nation switch ECM	hort to powe L CIRCUIT (spiral cable	er in harness or connectors. FOR OPEN AND SHORT e) and ECM harness connec		-
Combinatio Harness for >> F D.CHECK A . Check th Combination Connector	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab Termina 14	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		
Combinatio Harness for >> F D.CHECK A . Check th Combination Connector — 2. Also che	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab Termina 14 ck harness for s	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		_
Combinatio Harness for >> F D.CHECK A . Check th Combination Connector — 2. Also che s the inspect	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab Termina 14 ck harness for s	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		
Combinatio Harness for >> F D.CHECK A . Check th Combination Connector 	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab Termina 14 ck harness for s ion result norm GO TO 7.	E105 cable) between EC cuit or short t G SWITCH tween combi	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		
Combinatio Harness for >> F D.CHECK A . Check th Combination Connector . Also cher s the inspect YES >> C NO >> C	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab termina 14 ck harness for s cion result norm GO TO 7. GO TO 6.	E105 cable) between EC cuit or short t G SWITCH I tween combi	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		
Combinatio Harness for >> F D.CHECK A I. Check th Combination Connector 	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab termina 14 ck harness for s cion result norm GO TO 7. GO TO 6. MALFUNCTION	E105 cable) between EC cuit or short t G SWITCH tween combi le) I Cor short to grou al?	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		_
Combinatio Harness for S CHECK A COMBINATION CONNECTOR CONNECTOR STATE SALE CONDETTECT I Harness co	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab c harness for s ion result norm GO TO 7. GO TO 6. MALFUNCTION nnectors M77,	E105 cable) between EC cuit or short t G SWITCH I tween combi le) I Cor short to grou al?	o ground or s INPUT SIGNA nation switch ECM nector E60	hort to powe L CIRCUIT (spiral cable Terminal 110	er in harness or connectors. FOR OPEN AND SHORT and ECM harness connectors.		-
Combinatio Harness for >> F D.CHECK A Combination Connector 2. Also cher s the inspect YES >> C NO >> C DETECT I Harness co Combinatio	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab ck harness for s cion result norm GO TO 7. GO TO 7. GO TO 6. MALFUNCTION nnectors M77, n switch (spiral	E105 cable) between EC cuit or short t G SWITCH I tween combi le) I Cor short to grou al? NING PART E105 cable)	o ground or s INPUT SIGNA nation switch ECM nector E60 nd and short t	hort to powe L CIRCUIT (spiral cable Terminal 110 o power.	er in harness or connectors. FOR OPEN AND SHORT a) and ECM harness connectors Continuity Existed		
Combinatio Harness for >> F D.CHECK A Combination Connector 2. Also cher s the inspect YES >> C NO >> C DETECT I Harness co Combinatio	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab c harness for s ion result norm GO TO 7. GO TO 6. MALFUNCTION nnectors M77,	E105 cable) between EC cuit or short t G SWITCH I tween combi le) I Cor short to grou al? NING PART E105 cable)	o ground or s INPUT SIGNA nation switch ECM nector E60 nd and short t	hort to powe L CIRCUIT (spiral cable Terminal 110 o power.	er in harness or connectors. FOR OPEN AND SHORT a) and ECM harness connectors Continuity Existed		
Combinatio Harness for >> F D.CHECK A . Check th Combination Connector . Also cher s the inspect YES >> C NO >> C D.DETECT I Harness co Combinatio Harness for	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab c harness for s cion result norm GO TO 7. GO TO 7. GO TO 6. MALFUNCTION nnectors M77, n switch (spiral r open or short	E105 cable) between EC cuit or short t G SWITCH I tween combi le) I Cor short to grou al? NING PART E105 cable) between EC	o ground or s INPUT SIGNA nation switch ECM nector E60 nd and short t M and combir	hort to powe L CIRCUIT (spiral cable Terminal 110 o power.	er in harness or connectors. FOR OPEN AND SHORT a) and ECM harness connectors Continuity Existed	ctor.	_
Combinatio Harness for >> F D.CHECK A . Check th Combinatio Connector . Also che s the inspect YES >> C NO >> C D.DETECT I Harness co Combinatio Harness for >> F	nnectors M77, n switch (spiral r open or short Repair open circ SCD STEERIN e continuity bet n switch (spiral cab c harness for s cion result norm GO TO 7. GO TO 7. GO TO 6. MALFUNCTION nnectors M77, n switch (spiral r open or short	E105 cable) between EC cuit or short t G SWITCH tween combined in Cor con short to grou al? NING PART E105 cable) between EC cuit or short t	o ground or s INPUT SIGNA nation switch ECM nector E60 nd and short t M and combir	hort to powe L CIRCUIT (spiral cable Terminal 110 o power.	er in harness or connectors. FOR OPEN AND SHORT a) and ECM harness connectors Continuity Existed	ctor.	_

Refer to ECR-194, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ASCD steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTION END

## **Component Inspection**

1.CHECK ASCD STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector M352.

2. Check the continuity between combination switch harness connector terminals under following conditions.

(	Combination meter	Condition	Resistance
Connector Terminals		Condition	Resistance
	14 and 15 (Combination switch)	MAIN switch: Pressed	Approx. 0 Ω
		CANCEL switch: Pressed	Approx. 250 $\Omega$
M352		SET/COAST switch: Pressed	Approx. 660 $\Omega$
	(,	RESUME/ACCELERATE switch: Pressed	Approx. 1,480 Ω
		All ASCD steering switches: Released	Approx. 4,000 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch

INFOID:000000001307531

## P0571 BPP SWITCH

### Description

Brake switch signal is applied to the ECM through the brake pedal position when the brake pedal is depressed. Stop lamp switch signal is also sent to ECM through CAN communication line from BCM. These signals are used mainly to decrease the engine speed when the vehicle is driving.

## DTC Logic

INFOID:000000001307525

INFOID:000000001532251

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0571	Brake pedal position switch/stop lamp switch inconsistency	Brake pedal position switch does not operate properly	<ul> <li>Harness or connectors (Brake pedal position switch circuit is open or shorted) (The CAN communication line is open or shorted)</li> <li>Brake pedal position switch</li> <li>BCM</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

## 2. PERFORM DTC CONFIRMATION PROCEDURE

_	
1.	Start engine and let it idle for at least 30 seconds.

- 2. Apply service brake for at least 30 seconds.
- 3. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-195, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

#### 1.CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

## Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

## **2.**CHECK BRAKE PEDAL POSITION SWITCH CIRCUIT

1. Turn ignition switch ON.

Check the voltage between ECM harness connector and ground.

	ECM	Ground		Condition	Voltage
Connector	Terminal	Ground		Condition	voltage
E60	116	Ground	Brake pedal	Fully released	Battery voltage
E00	(Brake pedal position switch)	Ground	Diake pedai	Slightly depressed	0V

#### Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

A

D

Н

Κ

L

Μ

Ν

INFOID:000000001307526

## P0571 BPP SWITCH

#### < COMPONENT DIAGNOSIS >

[M9R]

# **3.**CHECK BRAKE PEDAL POSITION SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect brake pedal position switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between brake pedal position switch harness connector and ground.

	Brake pedal p	osition switch	Ground	Voltage	
-	Connector Terminal		Cround	vonage	
	E112	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 connector E105, M77

• 10A fuse (No. 1)

Harness for open or short between fuse and brake pedal position switch

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

## 5. Check brake pedal position switch input signal circuit for open and short

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between brake pedal position switch harness connector and ECM harness connector.

Brake pedal position switch		E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E112	2	E60	116	Existed

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

Is the inspection result normal?

YES >> GO TO 6.

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

**6.**CHECK BRAKE PEDAL POSITION SWITCH

Refer to ECR-197, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace brake pedal position switch.

7. СНЕСК ВСМ

Refer to BCS-29, "BCM : CONSULT-III Function (BCM - BCM)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace

8.CHECK CAN COMMUNICATION LINE

Refer to LAN-25, "CAN Communication Signal Chart".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace

**9.**CHECK INTERMITTENT INCIDENT

## P0571 BPP SWITCH

[M9R]

Ρ

#### < COMPONENT DIAGNOSIS >

Refer to GI-39, "Intermittent Incident". А >> INSPECTION END Component Inspection INFOID:000000001307527 ECR 1.CHECK BRAEK PEDAL POSITION SWITCH-I 1. Turn ignition switch OFF. Disconnect brake pedal position switch harness connector. 2. 3. Check the continuity between brake pedal position switch terminals under the following conditions. D Terminals Condition Continuity Fully released Existed 1 and 2 Brake pedal Е Slightly depressed Not existed Is the inspection result normal? YES >> INSPECTION END F NO >> GO TO 2. 2. CHECK BRAKE PEDAL POSITION SWITCH-II Adjust brake pedal position switch installation. Refer to <u>BR-8</u>, "Inspection and Adjustment" (LHD models) 1. or <u>BR-58</u>, "Inspection and Adjustment" (RHD models). 2. Check the continuity between brake pedal position switch terminals under the following conditions. Н Terminals Condition Continuity Fully released Existed 1 and 2 Brake pedal Slightly depressed Not existed Is the inspection result normal? YES >> INSPECTION END NO >> Replace brake pedal position switch. Κ L Μ Ν

## P0575 ASCD STEERING SWITCH

### Description

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

## DTC Logic

INFOID:000000001505756

INFOID:000000001348512

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0575	ASCD steering switch circuit	ECM detects that input signal from the ASCD steering switch is out of the specified range.	<ul> <li>Harness or connectors (ASCD steering switch circuit is open or shorted.)</li> <li>ASCD steering switch</li> </ul>

#### DTC CONFIRMATION PROCEDURE

## **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> 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 ECR-198, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

## 2. CHECK ASCD STEERING SWITCH CIRCUIT

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

	(+)	(–)		Condition	Voltage
Connector	Terminal	Connector	Terminal	Condition	voltage
				MAIN switch: Pressed	Approx. 0V
	110		111	CANSEL switch: Pressed	Approx. 1V
E60	(ASCD steering	E60	(ASCD steering	SET/COAST switch: Pressed	Approx. 2V
	switch signal)		switch ground)	RESUME/ACCELERATE switch: Pressed	Approx. 3V
				All ASCD steering switches: Released	Approx. 4V

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

#### VITCH

## ECR-198

INFOID:000000001348514

## **P0575 ASCD STEERING SWITCH**

< COMPONENT DIAGNOSIS >

[M9R]

< COMPONEN	I DIAGNOSIS >				
3.CHECK ASC	D STEERING SV	VITCH GROUND	CIRCUIT FOR	OPEN AND SHORT	
<ol> <li>Turn ignition</li> <li>Disconnect</li> </ol>	n switch OFF and combination swite	wait at least 20 s ch harness conne	econds.		A
	ECM harness cor continuity betweer		itch (spiral cable	) and ECM harness conr	ector.
Combination sw	vitch (spiral cable)	EC	CM		C
Connector	Terminal	Connector	Terminal	- Continuity	С
_	15	E60	111	Existed	
	harness for short	to ground and sh	ort to power.		D
Is the inspection YES >> GO NO >> GO	TO 5.				E
4.DETECT MA	LFUNCTIONING	PART			
	ectors M77, E105				F
	witch (spiral cable oen or short betwe		mbination switch		
· · · · · · · · · · · · · · · ·					G
>> Rep	air open circuit o	short to ground	or short to powe	r in harness or connector	
5.CHECK ASC	D STEERING SV	VITCH INPUT SIG	GNAL CIRCUIT	FOR OPEN AND SHOR	Г
1. Check the c	continuity betweer	n combination swi	itch (spiral cable	) and ECM harness conr	hector.
Combination sw	vitch (spiral cable)	EC	CM	Continuity	I
Connector	Terminal	Connector	Terminal	· · · · · · · · · · · · · · · · · · ·	
_	14	E60	110	Existed	
2. Also check Is the inspection	harness for short	to ground and sh	ort to power.		J
YES >> GO	TO 7.				
NO >> GO					K
<b>O.</b> DETECT MA	LFUNCTIONING	PART			
	ectors M77, E105 witch (spiral cable				L
	pen or short betwe		mbination switch		
					M
	-	-	or short to powe	r in harness or connector	
I.CHECK ASC	D STEERING SV	VITCH			
-	<u>99, "Component li</u>	nspection".			N
Is the inspection					
YES >> GO NO >> Rep	lo 8. blace ASCD steeri	ina switch.			0
· ·	ERMITTENT INCI	•			
	Intermittent Incide				P
	PECTION END				
Component					
					INFOID:000000001348515
I.CHECK ASC	D STEERING SV	VIICH			

1. Disconnect combination switch (spiral cable) harness connector M352.

## ECR-199

## **P0575 ASCD STEERING SWITCH**

#### < COMPONENT DIAGNOSIS >

2. Check the continuity between combination switch harness connector terminals under following conditions.

(	Combination meter	Condition	Resistance	
Connector	Terminals	Condition		
	2 14 and 15 (Combination switch)	MAIN switch: Pressed	Approx. 0 Ω	
		CANCEL switch: Pressed	Approx. 250 $\Omega$	
M352		SET/COAST switch: Pressed	Approx. 660 $\Omega$	
		RESUME/ACCELERATE switch: Pressed	Approx. 1,480 Ω	
		All ASCD steering switches: Released	Approx. 4,000 Ω	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch

# P0606 ECM

## Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

# DTC Logic

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0606	Engine control module	ECM calculation function is malfunctioning.	• ECM
DTC CON	FIRMATION PROCED	URE	
1.PRECO	NDITIONING		
	firmation Procedure has conds before conducting	been previously conducted, always tur the next test.	rn ignition switch OFF and wait at
>>	GO TO 2.		
2.PERFOR	RM DTC CONFIRMATIO	N PROCEDURE FOR MALFUNCTION	
	nition switch ON. 1st trip DTC.		
	<u>TC detected?</u>		
YES >>	• Go to <u>ECR-201, "Diagn</u> • INSPECTION END	osis Procedure".	
Diagnosi	s Procedure		INFOID:000000001505785
1.INSPEC	TION START		
With CO			
	nition switch ON. "SELE-DIAG RESULTS"	mode with CONSULT-III.	
3. Touch '	'ERASE".		
	m DTC CONFIRMATION CR-201, "DTC Logic".	I PROCEDURE.	
Gee <u>L</u>			
	nition switch ON.		
	Service \$04 with GST. m DTC CONFIRMATION	I PROCEDURE.	
See <u>EC</u>	CR-201, "DTC Logic".		
	ip DTC P0606 displayed	again?	
	GO TO 2. INSPECTION END		
2.REPLAC			

INFOID:000000001307532



С

D

Ε

А

MBIB1517E

INFOID:000000001505777

## P0606 ECM

#### < COMPONENT DIAGNOSIS >

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

# P060B ECM

## Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

# DTC Logic

## DTC DETECTION LOGIC

DTC No.         Trouble diagnosis name         DTC detecting condition         Possible cause           P060B         Engine control module         ECM calculation function is malfunctioning.         • ECM	
P060B Engine control module ECM calculation function is malfunctioning. • ECM	
DTC CONFIRMATION PROCEDURE	
1.PRECONDITIONING	
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and least 20 seconds before conducting the next test.	d wait at
>> GO TO 2.	
2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION	
<ol> <li>Turn ignition switch ON.</li> <li>Check 1st trip DTC.</li> </ol>	
Is 1st trip DTC detected?	
YES >> Go to <u>ECR-203, "Diagnosis Procedure"</u> . NO >> INSPECTION END	
Diagnosis Procedure	00000001518868
1.INSPECTION START	
<ul> <li>With CONSULT-III</li> <li>Turn ignition switch ON.</li> <li>Select "SELF-DIAG RESULTS" mode with CONSULT-III.</li> </ul>	
<ol> <li>Touch "ERASE".</li> <li>Perform DTC CONFIRMATION PROCEDURE.</li> <li>See FOR 202 "DTC Logic"</li> </ol>	
See <u>ECR-203, "DTC Logic"</u> . (a) With GST	
Turn ignition switch ON.	
<ol> <li>Select Service \$04 with GST.</li> <li>Perform DTC CONFIRMATION PROCEDURE. See ECR-203, "DTC Logic".</li> </ol>	
Is the 1st trip DTC P060B displayed again?	
YES >> GO TO 2. NO >> INSPECTION END	
2.REPLACE ECM	

INFOID:000000001518866

А

ECR



E

F

MBIB1517E

INFOID:000000001518867

## P060B ECM

#### < COMPONENT DIAGNOSIS >

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

## **P0611 INJECTOR ADJUSTMENT VALUE**

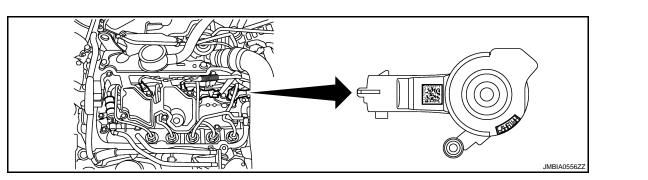
#### < COMPONENT DIAGNOSIS >

# P0611 INJECTOR ADJUSTMENT VALUE

#### Description

Injector adjustment value indicates manufacturing tolerance and the value is printed on the top of fuel injector. The injector adjustment value which is correctly stored in ECM is needed for precise fuel injection control. A performance of emission control and a driveability may effect when there is a mismatch between the following two values.

- The injector adjustment value stored in ECM
- The injector adjustment value of the fuel injector which is installed on the vehicle



Example: Injector adjustment value = 68HBLWH

## DTC Logic

## DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0611	Injector adjustment value data error	ECM detects at least one abnormal value of injector adjustment value.	<ul> <li>CONSULT-III communication status (The status of CONSULT-III communication becomes improper during Injector Adjustment Value Registration.)</li> <li>ECM</li> </ul>
	Injector adjustment value data uninput	At least one injector adjustment value is not stored in ECM.	<ul> <li>Injector adjustment value         <ul> <li>(Injector adjustment value has not been written onto ECM memory yet, or the value has been initialized.)</li> </ul> </li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

Μ If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

#### 2. PERFORM DTC CONFIRMATION PROCEDURE

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

Check 1st trip DTC. 2.

#### Is 1st trip DTC detected?

YES >> Go to ECR-205, "Diagnosis Procedure". >> INSPECTION END NO

## **Diagnosis Procedure**

#### 1.perform injector adjustment value registration

Perform Injector Adjustment Value Registration. Refer to ECR-14, "INJECTOR ADJUSTMENT VALUE REG-ISTRATION : Special Repair Requirement".

#### INFOID:000000001374942

INFOID:000000001375027

[M9R]

ECR

А

С

## **ECR-205**

Ν

INFOID:000000001374945



Н

>> INSPECTION END

# P062B ECM

## Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

# DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P062B	Engine control module	ECM calculation function is malfunctioning.	• ECM
DTC CONI	FIRMATION PROCED	URE	
1.PRECO	NDITIONING		
	firmation Procedure has conds before conducting	been previously conducted, always tur the next test.	rn ignition switch OFF and wait at
>>	GO TO 2.		
2.PERFOF	RM DTC CONFIRMATIO	N PROCEDURE FOR MALFUNCTION	
	nition switch ON.		
	1st trip DTC. TC detected?		
	Go to ECR-207, "Diagn	osis Procedure".	
	INSPECTION END		
Diagnosi	s Procedure		INFOID:000000001569667
<b>1.</b> INSPEC	TION START		
With CO	NSULT-III		
	nition switch ON. "SELE-DIAG RESULTS"	mode with CONSULT-III.	
3. Touch "	'ERASE".		
	m DTC CONFIRMATION CR-207, "DTC Logic".	PROCEDURE.	
@With GS			
1. Turn igi	nition switch ON.		
	Service \$04 with GST. m DTC CONFIRMATION	PROCEDURE.	
	CR-207, "DTC Logic".		
	ip DTC P0606 displayed	again?	
	GO TO 2. INSPECTION END		
2.REPLAC	CE ECM		

INFOID:000000001367495

# ECR C C D MBIB1517E

INFOID:000000001569665

А

F

## P062B ECM

#### < COMPONENT DIAGNOSIS >

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

# P062F ECM

### Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

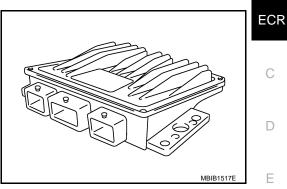
## DTC Logic

#### DTC DETECTION LOGIC

DIODEN			
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P062F	ECM	ECM EEPROM system is malfunctioning.	• ECM
DTC CON	FIRMATION PROCEDUR	RE	
1.PRECO	NDITIONING		
If DTC Cor	nfirmation Procedure has be	een previously conducted, always turr	ignition switch OFF and wait at
least 20 se	conds before conducting the	e next test.	-
	• GO TO 2.		
~	RM DTC CONFIRMATION I	PROCEDURE-I	
	nition switch ON and wait a		
2. Check	1st trip DTC.		
	<u>TC detected?</u>		
	<ul> <li>Go to <u>ECR-209, "Diagnosi</u></li> <li>GO TO 3.</li> </ul>	<u>s Procedure</u> .	
3.PERFO	RM DTC CONFIRMATION I	PROCEDURE-II	
	nition switch OFF and wait		
	nition switch ON and wait a 1st trip DTC.	t least 10 seconds.	
	TC detected?		
	Go to ECR-209, "Diagnosi	<u>s Procedure"</u> .	
-			
Diagnosi	s Procedure		INFOID:000000001569668
1.INSPEC	TION START		
With CO			
	nition switch ON. "SELF-DIAG RESULTS" mo	de with CONSULT-III.	
3. Touch	"ERASE".		
	m DTC CONFIRMATION P CR-209, "DTC Logic".	ROCEDURE.	
With GS	т		
	nition switch ON. Service \$04 with GST.		

INFOID:000000001367498

INFOID:000000001367499



F

А

3. Perform DTC CONFIRMATION PROCEDURE. See <u>ECR-209</u>, "DTC Logic".

Is the 1st trip DTC P0606 displayed again?

YES >> GO TO 2. NO >> INSPECTION END

2.REPLACE ECM

- 1. Replace ECM.
- 2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

## **P0641 SENSOR POWER SUPPLY**

DTC detecting condition

#### < COMPONENT DIAGNOSIS >

DTC DETECTION LOGIC

# P0641 SENSOR POWER SUPPLY

Trouble diagnosis name

# DTC Logic

DTC No.

А

ECR

С

D

Ε

F

Н

J

Κ

L

Μ

Ν

Ο

Ρ

INFOID:000000001348516

[M9R]

	0		0	
	Sensor power supply circuit low	DW Source for sensor is excessively (The APP sensor 1 power supply of (Turbocharger boost sensor circuit)	(The APP sensor 1 power supply circuit is shorted. (Turbocharger boost sensor circuit is shorted.)	
P0641	Sensor power supply circuit high		ects a voltage of power or sensor is excessively	<ul> <li>(Exhaust gas pressure sensor circuit is shorted.)</li> <li>Accelerator pedal position sensor (APP sensor 1)</li> <li>Turbocharger boost sensor</li> <li>Exhaust gas pressure sensor</li> </ul>
DTC CON	<b>IFIRMATION PROCE</b>	DURE		
1.PRECC	NDITIONING			
				d, always turn ignition switch OFF and wait a
least 20 se	econds before conductin	ig the ne	kt test.	
>	> GO TO 2.			
-	RM DTC CONFIRMATI	ON PRO	CEDURE	
	engine and let it idle for a			
	1st trip DTC.			
<u>Is 1st trip [</u>	DTC detected?			
	> Go to <u>ECR-211, "Diag</u> > INSPECTION END	nosis Pro	ocedure".	
-	is Procedure			
				INFOID:0000000013485
1.CHECK	GROUND CONNECTI	ON		
	gnition switch OFF and			
	ection result normal?	. Refer to	o Ground Inspection	in GI-41, "Circuit Inspection".
	> GO TO 2.			
-	> Repair or replace groups	und conne	ection.	
2.CHECK	ACCELERATOR PED	AL POSIT	TION SENSOR 1 PC	WER SUPPLY CIRCUIT
1. Discor	nnect accelerator pedal	position (	APP) sensor harnes	s connector.
	gnition switch ON.			
3. Check	the voltage between Al	PP senso	namess connector	and ground.
	APP sensor			
Connect		Ground	Voltage	
E110	4 0	Ground	Approx. 5V	
Is the insp	ection result normal?			
YES >	> GO TO 4.			
NO >	> GO TO 3.			

**3.**CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

#### **ECR-211**

Possible cause

## P0641 SENSOR POWER SUPPLY

#### < COMPONENT DIAGNOSIS >

[M9R]

EC	CM	Sensor		
Connector	Terminal	Name	Connector	Terminal
E60	122	Accelerator pedal position sensor	E110	4
F85	25	Exhaust gas pressure sensor	F81	1
1 85	21	Turbocharger boost sensor	F84	3

Is the inspection result normal?

YES >> GO TO 5.

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

**4.**CHECK APP SENSOR

Refer to ECR-160, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace APP sensor.

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

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

**6.**REPLACE TUBOCHARGER BOOST SENSOR

Replace turbocharger boost sensor.

>> GO TO 7.

**7.**PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-211. "DTC Logic".

Is 1st trip DTC P0641 displayed again?

YES >> GO TO 8.

NO >> INSPECTION END

8.REPLACE EXHAUST GAS PRESSURE SENSOR

Replace exhaust gas pressure sensor.

>> GO TO 9.

**9.**PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-211, "DTC Logic".

Is 1st trip DTC P0641 displayed again?

YES >> GO TO 10.

NO >> INSPECTION END

**10.**REPLACE ECM

1. Replace ECM.

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

#### P0651 SENSOR POWER SUPPLY

#### < COMPONENT DIAGNOSIS >

# P0651 SENSOR POWER SUPPLY

## DTC Logic

А

INFOID:000000001351304

INFOID:000000001351305

Ο

Ρ

[M9R]

## ECR

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	Sensor power supply circuit low	ECM detects a voltage of power source for sensor is excessively low.	Harness or connectors     (The APP sensor 2 power supply circuit is shorted.)     Differential exhaust pressure appear circuit is
P0651	Sensor power supply circuit high	ECM detects a voltage of power source for sensor is excessively high.	<ul> <li>(Differential exhaust pressure sensor circuit is shorted.)</li> <li>(EGR volume control valve control position sensor circuit is shorted.)</li> <li>(Throttle position sensor circuit is shorted.)</li> <li>(Refrigerant pressure sensor circuit is shorted.)</li> <li>Accelerator pedal position sensor (APP sensor 2)</li> <li>Exhaust differential pressure sensor</li> <li>EGR volume control valve control position sensor</li> <li>Throttle position sensor</li> <li>Refrigerant pressure sensor</li> <li>Refrigerant pressure sensor</li> </ul>
	NFIRMATION PROCE	DURE	
	onfirmation Procedure h seconds before conductin		always turn ignition switch OFF and wait at
~	>> GO TO 2. ORM DTC CONFIRMAT		
1. Start	engine and let it idle for k 1st trip DTC.		
YES	DTC detected? >> Go to <u>ECR-213, "Diad</u> >> INSPECTION END	<u>gnosis Procedure"</u> .	
Diagna	oio Drocoduro		

## Diagnosis Procedure

1.CHECK GROUND CONNECTION	
<ol> <li>Turn ignition switch OFF and wait at least 20 seconds.</li> <li>Check ground connection E17. Refer to Ground Inspection in <u>GI-41. "Circuit Inspection"</u>.</li> </ol>	M
Is the inspection result normal?	
YES >> GO TO 2.	
NO >> Repair or replace ground connection.	Ν
2. CHECK ACCELERATOR PEDAL POSITION SENSOR 2 POWER SUPPLY CIRCUIT	

1. Disconnect accelerator pedal position (APP) sensor harness connector.

2. Turn ignition switch ON.

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

APP sensor		Ground	Voltage	
Connector	Terminal	Giouna	voltage	
E110	5	Ground	Approx. 5V	

Is the inspection result normal?

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

NO >> GO TO 3.

## ECR-213

# **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
E60	118	APP sensor	E110	5
F68	75	Throttle position sensor	F86	3
	37	Exhaust differential pressure sensor	F88	3
F85	33	EGR volume control valve (EGR volume control valve control position sensor)	F99	4
	41	Refrigerant pressure sensor	F49	3

#### Is the inspection result normal?

YES >> GO TO 5.

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

#### **4.**CHECK COMPONENTS

Check the following.

- Throttle position sensor (Refer to <u>ECR-134, "Diagnosis Procedure"</u>.)
- EGR volume control valve (EGR volume control valve control position sensor) (Refer to <u>ECR-175, "Diagno-sis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

**5.**CHECK APP SENSOR

Refer to ECR-160, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace APP sensor.

**6.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.

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

7.REPLACE DIFFERENTIAL EXHAUST PRESSURE SENSOR

Replace differential exhaust pressure sensor.

#### >> GO TO 8.

**8.**PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-213. "DTC Logic".

Is 1st trip DTC P0651 displayed again?

YES >> GO TO 9.

NO >> INSPECTION END

**9.**REPLACE REFRIGERANT PRESSURE SENSOR

Replace refrigerant pressure sensor.

>> GO TO 10.

**10.** PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-213, "DTC Logic".

## ECR-214

P0651 SENSOR POWER SUPPLY			
< COMPONENT DIAGNOSIS > [M9R]			
Is 1st trip DTC P0651 displayed again?			
YES >> GO TO 11.	А		
NO >> INSPECTION END			
11.replace ecm	ECR		
1. Replace ECM.			
<ol> <li>Go to <u>ECR-12</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Require- ment".</li> </ol>			
	С		
>> INSPECTION END			
	D		
	D		
	Е		
	_		
	F		

G

Н

J

Κ

L

Μ

Ν

0

Ρ

## P0670 GLOW CONTROL SYSTEM

## DTC Logic

[M9R]

INFOID:000000001507063

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0670	Glow control unit circuit	ECM detects short circuit in output signal circuit. ECM detects open circuit in output signal circuit.	<ul> <li>Harness or connectors (Glow control unit circuit is open or shorted.)</li> <li>Glow control unit</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to ECR-216, "Diagnosis Procedure".

NO >> GO TO 3.

#### **3.**PERFORM DTC CONFIRMATION PROCEDURE

#### With CONSULT-III

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- Check the "ENG COOLAN TEMP" indication. If indication is below 50 °C (122 °F), go to the next step. If indication is above 50 °C (122 °F), cool down engine and then go to the next step.
- 3. Wait at least 10 seconds.
- 4. Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

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

#### Diagnosis Procedure

#### INFOID:000000001351342

# 1.CHECK GLOW CONTROL UNIT POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect glow control unit harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between glow control unit harness connector and ground.

Glow control unit		Ground	Voltage
Connector	Terminal	Giouna	vonage
F94	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

## ECR-216

# **P0670 GLOW CONTROL SYSTEM**

[M9R]

2.DETECT MAL	FUNCTIONING	PART				Δ
Check the followin • 60A fusible link • Harness for ope	(letter N)	woon alow contro	l unit and batton	,		A
	en and short bet		of unit and battery			ECR
>> Repa	ir open circuit o	r short to ground	or short to power	in harness or con	nectors.	
3.CHECK GLOV	V CONTROL UN	NIT GROUND CI	RCUIT FOR OPE	N AND SHORT		С
		wait at least 20 s	seconds.			
	CM harness countinuity betweer		t harness conner	ctor and ECM harn	ess connector	D
		i gioti control din				
Glow con	ntrol unit	EC	СМ	Continuity		_
Connector	Terminal	Connector	Terminal	Continuity		Е
F94	5	F85	9	Existed		
		to ground and sh	ort to power.			F
<u>Is the inspection r</u> YES >> GO T						
	-	r short to ground	or short to power	in harness or con	nectors.	G
· ·	•	0	•	OR OPEN AND SH		0
				ctor and ECM harn		
	,	5				Н
Glow con	ntrol unit	EC	СМ	Continuity		
Connector	Terminal	Connector	Terminal			
F94	8	F68	63	Existed		
		to ground and sh	ort to power.			.1
<u>Is the inspection r</u> YES >> GO T						0
		r short to ground	or short to power	in harness or con	nectors.	
5. CHECK INTER	RMITTENT INCI	DENT				Κ
Refer to GI-39, "In	ntermittent Incid	ent".				
Is the inspection r	result normal?					L
	ace glow control	unit.				
	ir or replace.					М
Component Ir	ispection				INFOID:000000001571444	IVI
1.CHECK GLOV	V PLUG					
1. Turn ignition	switch OFF.					Ν
2. Disconnect g	low plug harnes					
3. Check resista	ance between gi	ow plug terminals	s as follows.			0
Terminal		Resistance				
1 and engine gr	ound 0.1	I - 1.0 Ω [at 20°C (68	°F)]			Ρ
Is the inspection r						٢
YES >> INSP	ECTION END					
NO >> Repla	ace malfunctioni	na alow plua				

NO >> Replace malfunctioning glow plug.

# P0685 ECM RELAY

### < COMPONENT DIAGNOSIS >

# P0685 ECM RELAY

### DTC Logic

INFOID:000000001507069

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0685	ECM relay circuit low input	An excessively low voltage from the relay is sent to ECM.	Harness or connectors     (ECM relay circuit is open or shorted.)
1 0000	ECM relay circuit high input	An excessively high voltage from the relay is sent to ECM.	ECM relay (IPDM E/R)

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> 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 ECR-218, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000001307540

# 1.CHECK ECM POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check the voltage between ECM harness connector and ground.

EC	CM	Ground	Voltage
Connector	Terminal	Cround	voltage
F68	62	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 4.

# 2. CHECK ECM POWER SUPPLY CIRCUIT-II

- 1. Disconnect ECM harness connector.
- 2. Disconnect IPDM E/R harness connector E15.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	СМ	IPDN	II E/R	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F68	93	E15	48	Existed
100	94	LIJ	47	LAISteu

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

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 3.

# P0685 ECM RELAY

001/001		2010	P0685 E(		[MOD]
_	ENT DIAGNO				[M9R]
<b>5.</b> DETECT	MALFUNCTIO	ONING PART			
Check the fol		7 2101			
	connectors E r open or sho		CM and IPDM	E/R	
					E
, >> F	Repair open c	ircuit or short	to ground or s	short to power in harness or connectors.	
<b>1.</b> CHECK E	CM POWER	SUPPLY CIR	CUIT-III		
		ess connecto			
		harness conr		ector and IPDM E/R harness connector.	
. Check in				lector and IPDM E/K harness connector.	
E	СМ	IPD	M E/R		
Connector	Terminal	Connector	Terminal	Continuity	
F68	62	E15	51	Existed	
. Also che	ck harness fo	or short to arou	und and short	to power.	
	tion result nor	•		•	
	GO TO 5				
-	• •	ircuit or short	to ground or s	short power in harness or connectors.	
CHECK 2	0A FUSE				
		(No. 62) from	IPDM E/R.		
. Check 20					
	<u>tion result nor</u> 30 TO 6.	<u>rmal?</u>			
	Replace 20A f	fuse.			
•					
Check aroun	d connection	F17 Refer to	Ground Inspe	ection in <u>GI-41, "Circuit Inspection"</u> .	
	tion result nor		• · • • · · • · · • • • •	<u> </u>	
YES >> C	GO TO 7.				
		ace ground co			
CHECK E	CM GROUNI	D CIRCUIT FO	OR OPEN AN	D SHORT	
. Check th	e continuity b	etween ECM	harness conn	ector and ground.	
	СМ	Ground	Continuity		
Connector	Terminal			-	
	123	_			
E60	124	Ground	Existed		
	125	_			
	128	<u> </u>			
		or short to pow	ver.		
-	<u>tion result nor</u> 30 TO 8.	mai?			
		ircuit or short	power in harn	ess or connectors.	
			•	-	
	9, "Intermitter				
	tion result nor				

Is the inspection result normal?

YES >> Replace IPDM E/R. NO >> Repair or replace.

### P0697 SENSOR POWER SUPPLY

### < COMPONENT DIAGNOSIS >

# P0697 SENSOR POWER SUPPLY

# DTC Logic

INFOID:000000001307535

INFOID:000000001307536

[M9R]

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0697	Sensor power supply circuit low	ECM detects a voltage of power source for sensor is excessively low.	<ul> <li>Harness or connectors</li> <li>(Fuel rail pressure sensor circuit is shorted.)</li> </ul>
F 0097	Sensor power supply circuit high	ECM detects a voltage of power source for sensor is excessively high.	Fuel rail pressure sensor

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> 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 ECR-220, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

# 1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground Inspection in GI-41, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

### 2.CHECK FUEL RAIL PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect fuel rail pressure sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between fuel rail pressure sensor harness connector and ground.

Fuel rail pre	ssure sensor	Ground	Voltage
Connector	Terminal	Cround	voltage
F102	1	Ground	Approx. 5V

### Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

# **3.**CHECK FUEL RAIL PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF and wait at least 20 seconds.

- 2. Disconnect ECM harness connectors.
- 3. Check harness for short to power and short to ground between fuel rail pressure sensor harness connector tor and ECM harness connector.

### ECR-220

# **P0697 SENSOR POWER SUPPLY**

### < COMPONENT DIAGNOSIS >

[M9R]

EC	M	Se	nsor		A
Connector	Terminal	Name	Connector	Terminal	
F85	29	Fuel rail pressure sensor	F102	1	ECR
s the inspection		mal?			
	O TO 4. epair short to	ground or short to power	in harness or	connectors	0
		ESSURE SENSOR			С
		onent Inspection".			
s the inspection					D
YES >> GO	O TO 5.				
NO >> Re D.CHECK INT		ail pressure sensor.			E
Refer to <u>GI-39</u>	<u>, intermitten</u>	<u>it incluent"</u> .			F
>> IN	SPECTION	END			
					G
					Н
					I
					J
					К
					Γ\
					L
					M
					Ν
					$\sim$
					0
					Р

Ρ

## P1201, P1202, P1203, P1204 FUEL INJECTOR

< COMPONENT DIAGNOSIS >

# P1201, P1202, P1203, P1204 FUEL INJECTOR

### Description

INFOID:000000001532253

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 needle valve back and allows fuel to flow through the fuel injector into the cylinder. 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.

### DTC Logic

INFOID:000000001375017

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1201	Fuel injector No. 1 performance	Fuel injector No. 1 does not operate properly.	Harness or connectors
P1202	Fuel injector No. 2 performance	Fuel injector No. 2 does not operate properly.	
P1203	Fuel injector No. 3 performance	Fuel injector No. 3 does not operate properly.	shorted.) <ul> <li>Fuel injector</li> </ul>
P1204	Fuel injector No. 4 performance	Fuel injector No. 4 does not operate properly.	

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 1 minutes.

# 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-222, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000001375018

### **1.**CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.

3. Disconnect fuel injector harness connector.

4. Check the continuity between fuel injector harness connector and ECM harness connector.

	Fuel injector		E	CM	Continuity
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F70	1	F85	6	
2	F71	1	F85	7	Existed
3	F72	1	F85	8	Existed
4	F73	1	F85	5	1

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

Is the inspection result normal?

YES >> GO TO 2.

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

2.CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

# ECR-222

# P1201, P1202, P1203, P1204 FUEL INJECTOR

### < COMPONENT DIAGNOSIS >

[M9R]

А

Ν

Ο

Ρ

 1. Check the continuity between fuel injector harness connector and ECM harness connector.

 Fuel injector
 ECM

 Cylinder
 Connector
 Terminal

 Connector
 Terminal
 Connector

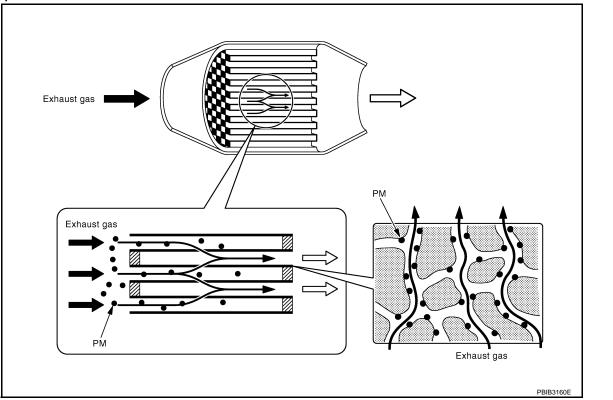
	Connector	Terminal	Connector	Terminal	
1	F70	2	F85	2	
2	F71	2	F85	3	-
3	F72	2	F85	4	- Existed
4	F73	2	F85	1	-
2. Also check ha	arness for short to g	round and short to	power.		
Is the inspection r					
YES >> GO T			ant ta maximu in ha		4
<b>^</b>	ir open circuit or sh	ort to ground or sn	ort to power in na	arness or connec	tors.
3.CHECK FUEL					
	3. "Component Insp	<u>ection"</u> .			
Is the inspection r YES >> GO T					
	ace fuel injector.				
· '	RMITTENT INCIDE	ЛТ			
	ntermittent Incident				
>> INSP	ECTION END				
Component In	spection				INF01D:000000001559840
e en pener en en e	iop o o ii o ii				
1.CHECK FUEL	INJECTOR				
<b>1.</b> CHECK FUEL	switch OFF.				
<b>1.</b> CHECK FUEL 1. Turn ignition s 2. Disconnect fu	switch OFF. Jel injector harness				
<b>1.</b> CHECK FUEL 1. Turn ignition s 2. Disconnect fu	switch OFF.		s follows.		
<b>1.</b> CHECK FUEL 1. Turn ignition s 2. Disconnect fu	switch OFF. Jel injector harness		s follows.		
<b>1.</b> CHECK FUEL 1. Turn ignition s 2. Disconnect fu 3. Check resista	switch OFF. uel injector harness ance between fuel ir	njector terminals as	s follows.		
<b>1.</b> CHECK FUEL 1. Turn ignition s 2. Disconnect fu 3. Check resista Terminals	switch OFF. uel injector harness ance between fuel ir Resistance 178.2 - 181.80	njector terminals as	s follows.		
1.CHECK FUEL 1. Turn ignition s 2. Disconnect fu 3. Check resista Terminals 1 and 2 Is the inspection r YES >> INSP	switch OFF. uel injector harness ance between fuel ir Resistance 178.2 - 181.80 result normal? ECTION END	njector terminals as	s follows.		
1.CHECK FUEL 1. Turn ignition s 2. Disconnect fu 3. Check resista Terminals 1 and 2 Is the inspection r YES >> INSP	switch OFF. uel injector harness ance between fuel in Resistance 178.2 - 181.80 result normal?	njector terminals as	s follows.		

# **P1435 DPF REGENERATION**

### < COMPONENT DIAGNOSIS >

# P1435 DPF REGENERATION

Description



DPF (Diesel Particulate Filter) is placed after oxidation catalyst and traps PM (Particulate Matter) in exhaust gas. DPF is formed in a honeycomb form made of ceramic. This structure facilitates to trap particulate matter. When the amount of particulate matter in the DPF reaches the specified level, the particulate matter needs to be reduced through burning to maintain the DPF function. This reducing of particulate matter is called Regeneration and should be performed periodically. DPF can be effective for a long time through the cycle of trapping particulate matter and regeneration.

### DTC Logic

INFOID:000000001528586

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1435	Diesel particulate filter (DPF) regeneration performance	DPF regeneration failed many times.	DPF

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-225, "Diagnosis Procedure".

# **P1435 DPF REGENERATION**

< COMPONENT DIAGNOSIS >		[M9R]	
NO >> INSPECTION END			
Diagnosis Procedure		/ INFOID:000000001528587	Δ.
1.CHECK DPF		E	
Refer to ECR-232, "Component Inspectio	<u>n"</u> .		Gr
OK or NG			
OK >> INSPECTION END NG >> GO TO 2.		C	С
2.REPLACE DPF			
<ol> <li>Replace DPF.</li> <li>Perform "DPF Data Clear". Refer to E</li> </ol>	CR-17, "DPF DATA CLEAF		D
>> INSPECTION END		E	E
Component Inspection		INFOID:00000001528588	
1.CHECK DPF-I		F	F
Check DPF for damage.			_
Is the inspection result normal?			G
YES >> GO TO 2. NO >> GO TO 3.			
2.CHECK DPF-II		F	Н
	efer to ECR-17 "SERVIC	CE REGENERATION : Special Repair	
Requirement".			1
<ol> <li>Start engine and warm it up to norma</li> <li>Connect CONSULT-III and select "D/</li> </ol>			
4. Select "DIFF EXH PRES" and check		owing conditions.	
			J
Condition	DIFF EXH PRES [mbar]		
<ul> <li>ENGINE SPEED.: 2000 tr/min</li> <li>EXH GAS TEMP2: 150 - 200°C (302 - 392°F)</li> <li>EXH GAS TEMP3: 150 - 200°C (302 - 392°F)</li> </ul>	Less than 3.0	ł	K
Is the inspection result normal?			
YES >> INSPECTION END		L	_
NO >> GO TO 3.			
<b>3.</b> REPLACE DPF		N	VI
<ol> <li>Replace DPF.</li> <li>Perform "DPF Data Clear". Refer to E</li> </ol>	CR-17, "DPF DATA CLEAF		
>> INSPECTION END		1	Ν
		C	С

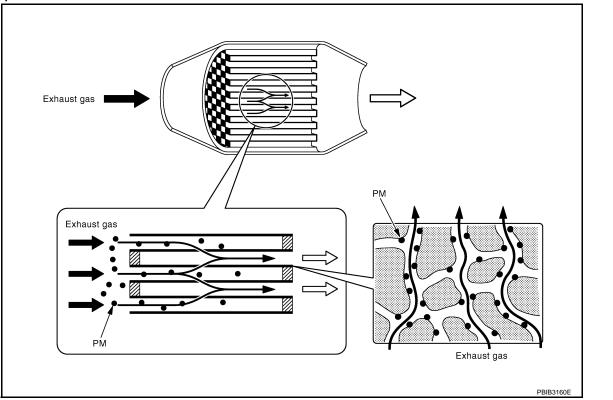
Ρ

# **P1436 DPF REGENERATION**

### < COMPONENT DIAGNOSIS >

# P1436 DPF REGENERATION

Description



DPF (Diesel Particulate Filter) is placed after oxidation catalyst and traps PM (Particulate Matter) in exhaust gas. DPF is formed in a honeycomb form made of ceramic. This structure facilitates to trap particulate matter. When the amount of particulate matter in the DPF reaches the specified level, the particulate matter needs to be reduced through burning to maintain the DPF function. This reducing of particulate matter is called Regeneration and should be performed periodically. DPF can be effective for a long time through the cycle of trapping particulate matter and regeneration.

### DTC Logic

INFOID:000000001528603

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1436	Diesel particulate filter (DPF) regeneration performance	DPF regeneration is not completed successfully.	DPF

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-227, "Diagnosis Procedure".

# **P1436 DPF REGENERATION**

< COMPONENT DIAGNOSIS >		[M9R]
NO >> INSPECTION END		
Diagnosis Procedure		A INFOID:000000001528604
1.CHECK DPF		EC
Refer to ECR-232, "Component Inspectio	<u>n"</u> .	
OK or NG		
OK >> INSPECTION END		С
NG >> GO TO 2.		
2.REPLACE DPF		D
<ol> <li>Replace DPF.</li> <li>Perform "DPF Data Clear". Refer to E</li> </ol>	CR-17, "DPF DATA CLEAR	
>> INSPECTION END		E
Component Inspection		INFOID:000000001559345
<b>1.</b> CHECK DPF-I		F
Check DPF for damage.		
Is the inspection result normal?		G
YES >> GO TO 2. NO >> GO TO 3.		
2.CHECK DPF-II		Н
<ol> <li>Perform "Service Regeneration". R <u>Requirement</u>".</li> </ol>	elei lo <u>egr-17, servic</u>	E REGENERATION : Special Repair
2. Start engine and warm it up to norma		1
<ol> <li>Connect CONSULT-III and select "D/ 4. Select "DIFF EXH PRES" and check</li> </ol>		owing conditions.
		J
Condition	DIFF EXH PRES [mbar]	
ENGINE SPEED ·: 2000 tr/min		К
<ul> <li>EXH GAS TEMP2: 150 - 200°C (302 - 392°F)</li> <li>EXH GAS TEMP3: 150 - 200°C (302 - 392°F)</li> </ul>	Less than 3.0	
Is the inspection result normal?		
YES >> INSPECTION END		L
NO >> GO TO 3.		
<b>3.</b> REPLACE DPF		M
1. Replace DPF.		- Cresial Densir Deguirement
2. Perform "DPF Data Clear". Refer to E	CR-17, DPF DATA CLEAR	N
>> INSPECTION END		N
-		
		0

# P1607 ECM

# Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

# DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1607	Engine control module	ECM function is malfunctioning.	• ECM

# **Diagnosis Procedure**

# **1.**INSPECTION START

### With CONSULT-III

- Turn ignition switch ON.
- 2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.
- 3. Touch "ERASE".
- 4. Perform DTC CONFIRMATION PROCEDURE. See <u>ECR-228, "DTC Logic"</u>.

### With GST

- 1. Turn ignition switch ON.
- 2. Select Service \$04 with GST.
- Perform DTC CONFIRMATION PROCEDURE. See <u>ECR-228</u>, "DTC Logic".

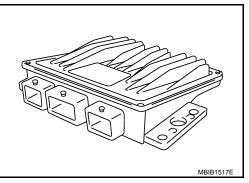
Is the 1st trip DTC P0606 displayed again?

- YES >> GO TO 2.
- NO >> INSPECTION END

# 2.REPLACE ECM

- 1. Replace ECM.
- 2. Go to ECR-12. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END



INFOID:000000001551263

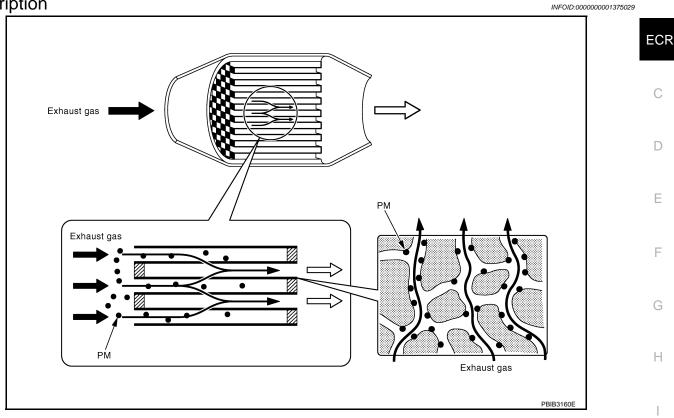
INFOID:000000001551265

### P2002 DPF

# < COMPONENT DIAGNOSIS >

# P2002 DPF

Description



DPF (Diesel Particulate Filter) is placed after oxidation catalyst and traps PM (Particulate Matter) in exhaust gas. DPF is formed in a honeycomb form made of ceramic. This structure facilitates to trap particulate matter. When the amount of particulate matter in the DPF reaches the specified level, the particulate matter needs to be reduced through burning to maintain the DPF function. This reducing of particulate matter is called Regeneration and should be performed periodically. DPF can be effective for a long time through the cycle of trapping particulate matter and regeneration.

# DTC Logic

INFOID:000000001375028

J

Κ

L

Ρ

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	M
P2002	Diesel particulate filter (DPF) efficiency below threshold	<ul> <li>Differential exhaust pressure exceeds a standard level for more than 10 seconds.</li> <li>Exhaust gas temperature does not raise during DPF regeneration.</li> </ul>	<ul> <li>DPF</li> <li>Exhaust gas temperature sensor 2</li> <li>Exhaust gas temperature sensor 3</li> </ul>	Ν

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 minutes.

2. Drive vehicle under the following conditions for at least 2 minutes.

- Gear position: 3rd position

# ECR-229

А

- Engine speed: About 3,000 rpm

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECR-187, "Diagnosis Procedure"</u>. NO >> INSPECTION END

### Diagnosis Procedure

### **1.**CHECK EXHAUST GAS TEMPERATURE SENSOR 2

Refer to ECR-232, "Component Inspection".

### <u>OK or NG</u>

OK >> GO TO 2.

NG >> Replace exhaust gas temperature sensor 2.

**2.**CHECK EXHAUST GAS TEMPERATURE SENSOR 3

Refer to ECR-266, "Component Inspection".

### <u>OK or NG</u>

OK >> GO TO 3.

NG >> Replace exhaust gas temperature sensor 3.

3.CHECK DPF

Refer to ECR-230, "Component Inspection".

### <u>OK or NG</u>

### OK >> INSPECTION END

NG >> Replace DPF.

### Component Inspection

1.CHECK DPF-I

Check DPF for damage.

Is the inspection result normal?

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

### 2.CHECK DPF-II

- 1. Perform "Service Regeneration". Refer to <u>ECR-17, "SERVICE REGENERATION : Special Repair</u> <u>Requirement</u>".
- 2. Start engine and warm it up to normal operating temperature.
- 3. Connect CONSULT-III and select "DATA MONITOR" mode.
- 4. Select "DIFF EXH PRES" and check the indication under the following conditions.

Condition	DIFF EXH PRES [mbar]
<ul> <li>ENGINE SPEED ·: 2000 tr/min</li> <li>EXH GAS TEMP2: 150 - 200°C (302 - 392°F)</li> <li>EXH GAS TEMP3: 150 - 200°C (302 - 392°F)</li> </ul>	Less than 3.0

### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

### **3.**REPLACE DPF

1. Replace DPF.

2. Perform "DPF Data Clear". Refer to ECR-17, "DPF DATA CLEAR : Special Repair Requirement".

>> INSPECTION END

INFOID:000000001374949

# P2031 EGT SENSOR 2

# Description

Exhaust gas temperature sensor 2 is installed before DPF and senses exhaust gas temperature. Exhaust gas temperature sensor 2 uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

### <Reference data>

Exhaust gas temperature °C (°F)	Resistance $k\Omega$
50 (122)	106.18
100 (212)	33.56
350 (662)	1.587 - 1.848
500 (932)	0.640 - 0.709
700 (1292)	0.277 - 0.297
900 (1652)	0.155

# DTC Logic

### DTC DETECTION LOGIC If DTC P2031 is displayed with DTC P0115, first perform the trouble diagnosis for DTC P0115. Refer to <u>ECR-132, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause		
P2031	Exhaust gas temperature sensor 2 circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul> <li>Harness or connectors (Exhaust gas temperature sensor 2 circuit is open or shorted.)</li> <li>Exhaust gas temperature sensor 2</li> </ul>		
P2031	Exhaust gas temperature sensor 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 turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> GO <sup>-</sup>	TO 2.
--------------------	-------

0

2.PERFORM DTC CONFIRMATION PROCEDURE-I	M
<ol> <li>Turn ignition switch ON and wait at least 10 seconds.</li> <li>Check 1st trip DTC.</li> </ol>	
Is 1st trip DTC detected?	Ν
YES >> Go to <u>ECR-232, "Diagnosis Procedure"</u> . NO >> GO TO 3.	
3. PERFORM DTC CONFIRMATION PROCEDURE-II	0
<ol> <li>Start engine and drive vehicle under the following conditions for at least 10 seconds.</li> <li>Gear position: 3rd position</li> </ol>	
<ul> <li>Vehicle speed: Accelerates from 55km/h (34 MPH) to 70 km/h (43 MPH)</li> <li>Check 1st trip DTC.</li> </ul>	Ρ

### Is 1st trip DTC detected?

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

А

ECR

С

D

Е

F

Н

Κ

L

INFOID:000000001374952

# P2031 EGT SENSOR 2

### < COMPONENT DIAGNOSIS >

### Diagnosis Procedure

### **1.**CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Check ground connection E17. Refer to Ground inspection in GI-41. "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2. CHECK EXHAUST GAS TEMPERATURE SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect exhaust gas temperature sensor 2 harness connector.

2. Turn ignition switch ON.

3. Check the voltage between exhaust gas temperature sensor 2 harness connector and ground.

Exhaust gas temp	perature sensor 2	Ground Voltage		
Connector	Terminal	Giouna	Voltage	
F89	1	Ground	Approx. 5V	

Is the inspection result normal?

YES >> GO TO 3.

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

### ${ m 3.}$ CHECK EXHAUST GAS TEMPERATURE SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Check the continuity between exhaust gas temperature sensor 2 harness connector and ECM harness connector.

Exhaust gas temperature sensor 2		ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F89	2	F85	39	Existed	

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK EXHAUST GAS TEMPERATURE SENSOR 2

Refer to ECR-232, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace exhaust gas temperature sensor 2.

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

### >> INSPECTION END

Component Inspection

INFOID:000000001374957

### **1.**CHECK EXHAUST GAS TEMPERATURE SENSOR 2

### (B) With CONSULT-III

- 1. Turn ignition switch ON and select "EXH GAS TEMP2" in "DATA MONITOR" mode with CONSULT-III..
- 2. Start engine and keep engine speed at 3,000 rpm for at least 1 minute.
- 3. Check "EXH GAS TEMP2" indication.

# P2031 EGT SENSOR 2

### < COMPONENT DIAGNOSIS >

Monitor item	Indication
EXH GAS TEMP2	60 - 950 °C (°F)
With GST Follow the procedure " Is the inspection result	With CONSULT-III" above.
YES >> INSPECTI	

0

[M9R]

F

G

Н

J

Κ

L

Μ

Ν

Ρ

# P2080 EGT SENSOR 1

### Description

The exhaust gas temperature sensor 1 is used to detect the exhaust gas temperature before turbocharger. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the exhaust gas 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.

# DTC Logic

INFOID:000000001375031

INFOID:000000001375021

INFOID:000000001375020

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2080	Exhaust gas temperature sensor 1 performance	Exhaust gas temperature detected by exhaust gas temperature sensor 1 is too much higher than the threshold.	Exhaust gas temperature sensor 1

### DTC CONFIRMATION PROCEDURE

# **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> GO TO 2.

### 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and drive vehicle under the following conditions for at least 10 seconds.
- Gear position: 3rd position
- Vehicle speed: Accelerates from 55km/h (34 MPH) to 70 km/h (43 MPH)
- 2. Check 1st trip DTC.

### Is 1st trip DTC detected?

- YES >> Go to ECR-234, "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis** Procedure

### 1.CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

### 2.CHECK EXHAUST GAS TEMPERATURE SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect exhaust gas temperature sensor 1 harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between exhaust gas temperature sensor 1 harness connector and ground.

Exhaust gas tem	Ground	Voltage	
Connector	Terminal	Giouna	voltage
F101	1	Ground	Approx. 5V

### Is the inspection result normal?

YES >> GO TO 3.

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

 ${f 3.}$  CHECK EXHAUST GAS TEMPERATURE SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

# ECR-234

# P2080 EGT SENSOR 1

### < COMPONENT DIAGNOSIS >

1.

Turn ignition switch OFF and wait at least 20 seconds. Check the continuity between exhaust gas temperature sensor 1 harness connector and ECM harness 2. А connector.

Exhaust gas tem	perature sensor 1	EC	CM			ECR
Connector	Terminal	Connector	Terminal	Continuity		
F101	2	F85	10	Existed		
3. Also check h	narness for short t result normal?	to ground and sh	ort to power.			С
			or short to powe	r in harness or cor	nnectors.	D
£	Intermittent Incide					E
Is the inspection						
	lace exhaust gas air or replace.	temperature sen	sor 1.			F
						G
						Н
						I
						J
						K
						L

Μ

Ν

Ο

Ρ

[M9R]

# P2100 ELECTRIC THROTTLE CONTROL FUNCTION

### < COMPONENT DIAGNOSIS >

# P2100 ELECTRIC THROTTLE CONTROL FUNCTION

### Description

Throttle control motor is operated by ECM and it opens throttle valve. Throttle valve is fully opened when regeneration is not performed and engine is running. Based on the signal from throttle position sensor, ECM judges whether throttle control actuator operates throttle valve properly or not.

# DTC Logic

INFOID:000000001367502

INFOID:000000001367501

[M9R]

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100	Electric throttle control function	Electric throttle control function does not operate properly.	<ul> <li>Harness or connectors (Throttle control motor circuit is open or shorted)</li> <li>Electric throttle control actuator</li> </ul>

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

### Is 1st trip DTC detected?

YES >> Go to ECR-236, "Diagnosis Procedure".

NO >> GO TO 3.

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

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Turn ignition switch ON and wait at least 10 seconds.
- 3. Check 1st trip DTC.

### Is 1st trip DTC detected?

- YES >> Go to ECR-236, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

### 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR CIRCUIT

- 1. Disconnect electric throttle control actuator harness connector.
- 2. Disconnect ECM harness connectors.
- 3. Check the continuity between the following terminals.

# P2100 ELECTRIC THROTTLE CONTROL FUNCTION

### < COMPONENT DIAGNOSIS >

А ECM Electric throttle control actuator Continuity Connector Terminal Connector Terminal 91 Existed ECR 4 92 Not existed F86 F68 91 Not existed 5 92 Existed Also check harness for short to ground and short to power. 4. Is the inspection result normal? D YES >> GO TO 3. NO >> Repair open circuit or short to ground or short to power in harness or connectors.

**3.**CHECK THROTRTLE CONTROL MOTOR

Perform ECR-237, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace electric throttle control actuator.

**4.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

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

# **Component Inspection**

# 1. CHECK ELECTRIC THROTTLE CONTROL MOTOR

1. Reconnect all harness connectors disconnected.

2. Check the voltage between ECM harness connectors terminals under the following conditions.

	(+)		(-)	Condition	Voltage	
Connector	Terminal	Connector	Terminal	Condition	volage	k
				[Engine is running] • Warm-up condition • Idle speed	0 - 2 V★ 500µSec/div 	L
F68	91 (Throttle control motor)	E60	128 (ECM ground)	<ul> <li>[Ignition switch: OFF]</li> <li>For 20 seconds after turning ignition switch OFF</li> </ul>	0 - 2 V★ 500µSec/div ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ 10V/div JMBIA0548GB	N C
				[Ignition switch: OFF] • More than 20 seconds after turning ignition switch OFF	0.1 V	F
	92 (Throttle control motor)	*		[Engine is running] • Warm-up condition • Idle speed	0 V	

Ε

F

Н

# **P2100 ELECTRIC THROTTLE CONTROL FUNCTION**

< COMPONENT DIAGNOSIS >

<u>Is the inspection result normal?</u> YES >> INSPECTION END

NO >> GO TO 2.

**2.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Perform ECR-238, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001367505

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR

Refer to ECR-16, "THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR : Special Repair Requirement"

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECR-16, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> END

# P2101 ELECTRIC THROTTLE CONTROL FUNCTION

### < COMPONENT DIAGNOSIS >

# P2101 ELECTRIC THROTTLE CONTROL FUNCTION

### Description

Electric throttle control actuator consists of the following two components, throttle control motor with gear which operates throttle valve, throttle position sensor which detects throttle position sensor. Throttle valve is fully opened when regereration is not performed and engine is running. The valve is closed to perform regeneration and to perform smooth engine stop when the ignition switch is turned OFF. Throttle position sensor detects the opening angle of throttle valve and converts the angle into a voltage signal. Based on the signal, ECM judges whether throttle control actuator operates throttle valve properly or not.

### DTC Logic

# INFOID:000000001348522

### DTC DETECTION LOGIC NOTE: If DTC P2101 is displayed with DTC P0606, first perform the trouble diagnosis for DTC P0606. Refer to ECR-201, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101	Electric throttle control actuator performance	Electric throttle control actuator does not functions properly.	<ul> <li>Harness or connectors (Electric throttle control actuator circuit is open or shorted.)</li> <li>Electric throttle control actuator</li> </ul>
DTC CON	<b>VFIRMATION PROCEDUF</b>	RE	
1.PRECO	ONDITIONING		
least 20 se	econds before conducting the		turn ignition switch OFF and wait at
•	> GO TO 2. DRM DTC CONFIRMATION I		
	gnition switch ON and wait a		
	s 1st trip DTC.		
<u>Is 1st trip</u>	DTC detected?		
	> Go to <u>ECR-239, "Diagnosi</u> > INSPECTION END	<u>s Procedure"</u> .	
	is Procedure		INFOID:00000001348523
1.снеси	GROUND CONNECTIONS		
	gnition switch OFF and wait a k ground connection E17. Re	at least 20 seconds. efer to Ground inspection in <u>GI-41.</u>	"Circuit Inspection".
•	ection result normal?		
-	> GO TO 2. > Repair or replace ground c	connection	
-		ONTROL ACTUATOR CIRCUIT-I	
-	nnect electric throttle control		
2. Disco	nnect ECM harness connectors the continuity between electors	ors.	ss connector and ECM harness con-

INFOID:000000001348521

А

ECR

С

D

Ε

### ECR-239

# P2101 ELECTRIC THROTTLE CONTROL FUNCTION

### < COMPONENT DIAGNOSIS >

Electric throttle	Electric throttle control actuator		ECM	
Connector	Terminal	Connector	Terminal	Continuity
	1		85	
F86	3	F68	75	Existed
	6		83	

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

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR CIRCUIT-II

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F86	4	F68	91	Existed
FOU	5	FUO	92	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK THROTRTLE CONTROL MOTOR

Perform ECR-240, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace electric throttle control actuator.

**5.**CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

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

### **Component Inspection**

INFOID:000000001569782

1. CHECK ELECTRIC THROTTLE CONTROL MOTOR

1. Reconnect all harness connectors disconnected.

2. Check the voltage between ECM harness connectors terminals under the following conditions.

# P2101 ELECTRIC THROTTLE CONTROL FUNCTION

### < COMPONENT DIAGNOSIS >

[M9R]

	(+)		(-)	Constitute	\/ak===	А
Connector	Terminal	Connector	Terminal	- Condition	Voltage	
				[Engine is running] • Warm-up condition • Idle speed	0 - 2 V★ 500µSec/div 	ECR C
F68	91 (Throttle control motor)	E60	128 (ECM ground)	<ul> <li>[Ignition switch: OFF]</li> <li>For 20 seconds after turning ignition switch OFF</li> </ul>	0 - 2 V★ 500µSec/div	E
				[Ignition switch: OFF] • More than 20 seconds after turning ignition switch OFF	0.1 V	G
	92 (Throttle control motor)			[Engine is running] • Warm-up condition • Idle speed	0 V	Η
-	ection result nor					I
NO >:	> INSPECTION > GO TO 2. CE ELECTRIC <sup>-</sup>			CTUATOR		J
1. Replac	ce electric thrott	le control a	ctuator.			
	m <u>ECR-241, "S</u> > INSPECTION	-	ir Requirement	<u>"</u>		K
	Repair Requ				INEO/D-00000001650793	
			0050 000:		INFOID:000000001569783	L
<b>1.</b> PERFORM THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR Refer to <u>ECR-16, "THROTTLE VALVE CLOSED POSITION LEARNING VALUE CLEAR : Special Repair</u> M <u>Requirement"</u>						Μ
>> GO TO 2. 2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING						Ν
Refer to ECR-16. "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"						0
						0
>:	>> END					

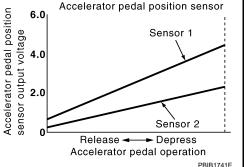
# P2120 APP SENSOR

# Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensors detect the accelerator pedal position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.

### INFOID:000000001307553

INFOID:000000001307554



DTC Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2120	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the sensor is sent to ECM.	circuit is open or shorted.)
	Accelerator pedal position sensor 1, 2 signal correlation	The correlation between APP sensor 1 signal and APP sensor 2 signal is out of the normal range.	Accelerator pedal position sensor (APP sensor 1 and 2)

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

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

YES >> Go to ECR-242, "Diagnosis Procedure".

NO >> GO TO 3.

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

1. Depress accelerator pedal slowly spending 5 seconds, and then release it slowly spending 5 seconds.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECR-242, "Diagnosis Procedure"</u>. NO >> INSPECTION END

### Diagnosis Procedure

### 1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

# ECR-242

# P2120 APP SENSOR

110       5       Ground       Approx. 5V         pection result normal?       >> GO TO 3.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         connect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness rector.         lerator pedal position sensor       ECM         check harness for short to ground and short to power.         pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         cK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connectors.         ck the continuity between accelerator pedal position sensor harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness rector.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness rector.	COMPONENT	DIAGNOSIS >		APP SENSOR		[M9R]
EX ACCELERATOR PEDAL POSITION SENSOR 2 POWER SUPPLY CIRCUIT         onnect accelerator pedal position sensor harness connector.         ignition switch ON.         ck the voltage between accelerator pedal position sensor connector and ground.         lerator pedal position sensor         rector       Terminal         0       5         ground       Approx. 5V         pection result normal?         >> GO TO 3.         >> Repair open circuit or short to ground or short to power in harness or connectors.         X ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         onnect ECM harness connectors.         xk the continuity between accelerator pedal position sensor harness connector and ECM harness tector.         lerator pedal position sensor       ECM         continuity       Continuity         tector       Terminal       Connector         tector       Terminal       Connector         pection result normal?       >       SO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.       X         xk ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         so TO 4.       >>       Repair open circuit or short to ground or short to power in harness or connecto						
connect accelerator pedal position sensor harness connector.         ignition switch ON.         isk the voltage between accelerator pedal position sensor connector and ground.         lerator pedal position sensor         rector       Terminal         Ground       Voltage         110       5       Ground         Approx. 5V         pection result normal?         >> Repair open circuit or short to ground or short to power in harness or connectors.         SK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         onnect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness lector.         lerator pedal position sensor       ECM         continuity       Continuity         letator pedal position sensor to ground and short to power.         pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         cK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         check harness for short to ground and short to power in harness or connectors.         cK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness co	•					
ignition switch ON.         ck the voltage between accelerator pedal position sensor connector and ground.         lerator pedal position sensor       Ground       Voltage         into       5       Ground       Approx. 5V         pection result normal?       >> GO TO 3.         >> Repair open circuit or short to ground or short to power in harness or connectors.       CK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.       onnect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness tector.         lerator pedal position sensor       ECM         continuity       Continuity         ector       Terminal         10       1       E60         check harness for short to ground and short to power.         pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         cK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness or connectors.         ck ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connector and ECM harness tector.	CHECK ACC	ELERATOR PEDAL	POSITION S	SENSOR 2 POWER	R SUPPLY CIRCUIT	
Image: Sk the voltage between accelerator pedal position sensor connector and ground.         Image: Image			osition sensor	harness connector		
Approx         Ground         Voltage           110         5         Ground         Approx. 5V           pection result normal?         >> GO TO 3.           >> Repair open circuit or short to ground or short to power in harness or connectors.         Connect ECM PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT           ignition switch OFF and wait at least 20 seconds.         Onnect ECM harness connectors.           check harness connectors.         Continuity between accelerator pedal position sensor harness connector and ECM harness tector.           lerator pedal position sensor         ECM         Continuity           tector         Terminal         Connector         Terminal           10         1         E60         120         Existed           check harness for short to ground and short to power in harness or connectors.         Continuity           >> GO TO 4.         >         >         Sensor 2 INPUT SIGNAL CIRCUIT FOR OPEN AND           >> K ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         Continuity         Continuity           ck the continuity between accelerator pedal position sensor harness connector and ECM harness tector.         Continuity         Continuity			elerator peda	l position sensor co	nnector and ground.	
Approx         Ground         Voltage           110         5         Ground         Approx. 5V           pection result normal?         >> GO TO 3.           >> Repair open circuit or short to ground or short to power in harness or connectors.         Connector           CELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.           Input terminal         Connect ECM harness connectors.         Continuity between accelerator pedal position sensor harness connector and ECM harness nector.           Iterator pedal position sensor         ECM         Continuity           Income terminal         Connector         Terminal           10         1         E60         120         Existed           Income terminal?         SO TO 4.         So TO 4.         So TO 4.         So TO 4.           >> Repair open circuit or short to ground or short to power in harness connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND           Ck the continuity between accelerator pedal position sensor harness connector and ECM harness tector.         Continuity		-	-	·	-	
Terminal       Approx. 5V         pection result normal?       >> GO TO 3.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         connect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness lector.         terator pedal position sensor       ECM         check harness for short to ground and short to power.         pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness lector.         lease result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         ck the continuity between accelerator pedal position sensor harness or connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness lector.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness lector.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness lector.         continuity	Accelerator pe	dal position sensor	Ground	Voltage		
pection result normal?         >> GO TO 3.         >> Repair open circuit or short to ground or short to power in harness or connectors.         XK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         onnect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness ector.         lerator pedal position sensor       ECM         check harness for short to ground and short to power.         pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         better to result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connector and ECM harness tector.         lerator pedal position sensor       ECM         Continuity       Continuity	Connector	Terminal				
>> GO TO 3.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         onnect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness ector.         lerator pedal position sensor       ECM         continuity         lector       Terminal         10       1       E60         10       1       E60         check harness for short to ground and short to power.         pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND ck the continuity between accelerator pedal position sensor harness connector and ECM harness ector.	E110	5	Ground	Approx. 5V		
>> Repair open circuit or short to ground or short to power in harness or connectors.          CK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT         ignition switch OFF and wait at least 20 seconds.         onnect ECM harness connectors.         ck the continuity between accelerator pedal position sensor harness connector and ECM harness         ierator pedal position sensor         Errator pedal position sensor	the inspection	result normal?				
ck the continuity between accelerator pedal position sensor harness connector and ECM harness rector.         lerator pedal position sensor       ECM         rector       Terminal       Continuity         10       1       E60       120       Existed         check harness for short to ground and short to power.       pection result normal?       Existed       Existed         >> Repair open circuit or short to ground or short to power in harness or connectors.       EX ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connector and ECM harness rector.       EcM       Continuity	CHECK ACC	ELERATOR PEDAL switch OFF and wa	POSITION S	SENSOR 2 GROUN		AND SHORT
Terminal       Connector       Terminal         10       1       E60       120       Existed         10       1       E60       120       Existed         check harness for short to ground and short to power.       pection result normal?       >>         >> GO TO 4.       >>       Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connector and ECM harness inector.         lerator pedal position sensor       ECM         Continuity				edal position sense	or harness connector and	I ECM harness
Terminal       Connector       Terminal         10       1       E60       120       Existed         check harness for short to ground and short to power.       pection result normal?         >> GO TO 4.       >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connector and ECM harness inector.         lerator pedal position sensor       ECM         Continuity	Accelerator pe	dal position sensor		ECM	Continuity	
check harness for short to ground and short to power. pection result normal? >> GO TO 4. >> Repair open circuit or short to ground or short to power in harness or connectors. CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND ck the continuity between accelerator pedal position sensor harness connector and ECM harness heretor. lerator pedal position sensor <u>ECM</u> Continuity			<b>•</b> •		Continuity	
pection result normal?         >> GO TO 4.         >> Repair open circuit or short to ground or short to power in harness or connectors.         CK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND         ck the continuity between accelerator pedal position sensor harness connector and ECM harness hector.         lerator pedal position sensor         ECM         Continuity	Connector	Terminal	Connector	Terminal	-	
lerator pedal position sensor ECM Continuity	E110 . Also check h	1 arness for short to	E60	120	-	
Continuity	E110 Also check h s the inspection YES >> GO NO >> Repared CHECK ACC	1 arness for short to result normal? TO 4. air open circuit or sl	E60 ground and s nort to ground	120 hort to power. d or short to power i	Existed	R OPEN AND
nector Terminal Connector Terminal	E110 Also check h the inspection YES >> GO NO >> Rep CHECK ACC HORT	1 arness for short to result normal? TO 4. air open circuit or sl ELERATOR PEDA	E60 ground and s nort to ground L POSITION	120 hort to power. d or short to power i I SENSOR 2 INPL	Existed n harness or connectors. IT SIGNAL CIRCUIT FC	
	E110 Also check h the inspection YES >> GO NO >> Repa CHECK ACC HORT Check the connector.	1 arness for short to <u>result normal?</u> TO 4. air open circuit or sl ELERATOR PEDA ontinuity between	E60 ground and s nort to ground L POSITION	120 hort to power. d or short to power i I SENSOR 2 INPL edal position sense	Existed n harness or connectors. JT SIGNAL CIRCUIT FC or harness connector and	
10 6 E60 119 Existed	E110 Also check h the inspection YES >> GO NO >> Repa CHECK ACC HORT Check the connector. Accelerator pe Connector	1 arness for short to <u>result normal?</u> TO 4. air open circuit or sl ELERATOR PEDA ontinuity between dal position sensor	E60 ground and s nort to ground L POSITION accelerator p	120       hort to power.       d or short to power i       I SENSOR 2 INPL       edal position sense       ECM       Terminal	Existed n harness or connectors. JT SIGNAL CIRCUIT FC or harness connector and	
10 6 F60 119 Existed	0					
check harness for short to ground and short to power.	E110 Also check h the inspection (ES >> GO NO >> Repa CHECK ACC HORT Check the c connector. Accelerator pe Connector E110	1         arness for short to         result normal?         TO 4.         air open circuit or sl         ELERATOR PEDA         ontinuity between         dal position sensor         Terminal         6	E60 ground and s nort to ground L POSITION accelerator p Connector E60	120       hort to power.       d or short to power i       I SENSOR 2 INPL       edal position sense       ECM       Terminal       119	Existed n harness or connectors. JT SIGNAL CIRCUIT FC or harness connector and Continuity	

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

# P2120 APP SENSOR

# < COMPONENT DIAGNOSIS >

# Component Inspection

# $1. {\sf CHECK} \ {\sf ACCELERATOR} \ {\sf PEDAL} \ {\sf POSITION} \ {\sf SENSOR}$

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

	ECM ECM		Condition		Voltage	
Connector	Terminal	Connector	Terminal	Condition		voltage
	126		127		Fully released	0.6 - 4.6 V
(APP sensor 1)	E60	(Sensor ground)	Accelerator pedal	Fully depressed	Less than 5 V	
EOU	E60 E	E00	120	Accelerator pedar	Fully released	More than 0.3 V
	(APP sensor 2)		(Sensor ground)		Fully depressed	Less than 2.5 V

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly.

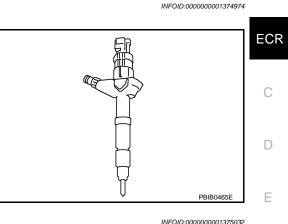
# P2146, P2149 FUEL INJECTOR POWER SUPPLY

### < COMPONENT DIAGNOSIS >

# P2146, P2149 FUEL INJECTOR POWER SUPPLY

### **Component Description**

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the fuel injector into the cylinder. 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.



# **DTC** Logic

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2146	No. 1 and 4 cylinder fuel injector power supply circuit open	An improper voltage signal is sent to ECM through No. 1 and 4 cylinder fuel injector.	Harness or connectors
P2149	No. 2 and 3 cylinder fuel injector power supply circuit open	An improper voltage signal is sent to ECM through No. 2 and 3 cylinder fuel injector.	(The fuel injector circuit is open.)

### DTC CONFIRMATION PROCEDURE

### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

### >> 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 ECR-245, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

# 1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

- 2. Disconnect ECM harness connector.
- 3. Disconnect fuel injector harness connector.

4. Check the continuity between fuel injector harness connector and ECM harness connector.

D	Continuity	CM	E		Fuel injector	
F	Continuity	Terminal	Connector	Terminal	Connector	Cylinder
		6	F85	1	F70	1
	Existed	7	F85	1	F71	2
	Existed	8	F85	1	F72	3
		5	F85	1	F73	4

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

[M9R]

А

F

Н

Κ

M

Ν

Is the inspection result normal?

YES >> GO TO 2.

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

2. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

# P2226 BARO SENSOR

# Description

The barometric pressure sensor is built into ECM. The sensor detects ambient barometric pressure and sends the voltage signal to the microcomputer.

# DTC Logic

DTC No.

# DTC DETECTION LOGIC

Trouble diagnosis name

pressure sensor (built-into ECM) is sent to ECM. Barometric pressure sensor • ECM P2226 circuit An excessively high voltage from the barometric pressure sensor (built-into ECM) is sent to ECM. DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING

DTC detecting condition

An excessively low voltage from the barometric

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

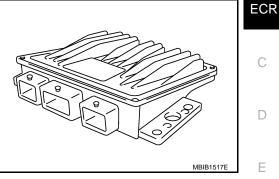
>> GO TO 2.

1. Turn ignition switch ON.		
2. Check 1st trip DTC.		
Is 1st trip DTC detected?		L
YES >> Go to <u>ECR-247, "Diagnosis Procedure"</u> . NO >> INSPECTION END		M
Diagnosis Procedure	INFOID:000000001521394	IVI
1.INSPECTION START		Ν
(P)With CONSULT-III		
1. Turn ignition switch ON.		
2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.		0
3. Touch "ERASE".		
<ol> <li>Perform DTC CONFIRMATION PROCEDURE. See <u>ECR-247, "DTC Logic"</u>.</li> </ol>		
With GST		Ρ
1. Turn ignition switch ON.		
2. Select Service \$04 with GST.		
3. Perform DTC CONFIRMATION PROCEDURE.		
See ECR-247, "DTC Logic".		
Is the 1st trip DTC P2226 displayed again?		

>> GO TO 2. YES

INFOID:000000001307557

INFOID:000000001521393



Possible cause

F

Н

J

Κ

А

NO >> INSPECTION END

2.REPLACE ECM

- 1. Replace ECM.
- 2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

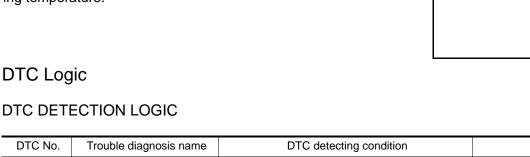
>> INSPECTION END

# P2231 A/F SENSOR 1

# Description

Air fuel ratio (A/F) sensor 1 (1) is installed on the upstream of the oxidation catalyst. A/F sensor 1 measures the oxygen level in the exhaust gas and converts it into a voltage signal. A/F sensor 1 sends the signal to ECM. Based on the signal from A/F sensor 1, ECM calculates the air fuel mixture ratio. ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor 1 to ensure the required operating temperature.



# DTC No.Trouble diagnosis nameDTC detecting conditionPossible CauseP2231Air fuel ratio (A/F) sensor 1<br/>circuitThe A/F signal computed by ECM from the air<br/>fuel ratio sensor 1 signal is out of the specified<br/>range.• Harness or connectors<br/>(The air fuel ratio sensor 1 circuit is<br/>shorted.)<br/>• Air fuel ratio sensor 1

## Diagnosis Procedure

.

1.	CHE	CK	GRO	UNI	) (	CONNE	CTIC	ONS	
	_	-		-					

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- Check ground connection E17. Refer to Ground inspection in <u>GI-41, "Circuit Inspection"</u>.

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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

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

A/F se	nsor 1	Ground	Voltage
Connector	Terminal	Ground	voltage
F91	4	Ground	Battery voltage
OK or NG			
	60 TO 4. 60 TO 3.		
3.DETECT N	ALFUNCTIO	ONING PAR	Г
Check the foll		= 1 = 1	
<ul> <li>Harness cor</li> <li>IPDM E/R c</li> </ul>			
		5	

- IPDIVI E/R connector E 15
   Harpass for open or short between A/E a
- Harness for open or short between A/F sensor 1 and IPDM E/R
  Harness for open or short between A/F sensor 1 and ECM

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

### INFOID:000000001551266

А

ECR

D

Ε

F

Н

Κ

PBIB3183F

INFOID:000000001551267

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

A/F s	ensor 1	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
	1		81	
F91	2	FCQ	78	Existed
F91	5	F68	82	Existed
_	6		77	

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

A/F s	A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
	1		81		
504	2	FCO	78	Ground	Not evicted
F91	5	F68	82	Ground	Not existed
	6		77	-	

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

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

# 5. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE A/F SENSOR 1

### Replace A/F sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

# P2263 TC SYSTEM

### Description

The load from the turbocharger boost control solenoid valve controls the actuator. By changing the variable nozzle vane opening through the rods, the intake air volume is adjusted.

The turbocharger boost control solenoid valve is moved by ON/OFF pulse from the ECM. The longer the ON/ OFF pulse from the ECM. The longer the ON pulse, the charge air pressure rises.

# **DTC** Logic

INFOID:000000001307560

INFOID:000000001532254

### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2263	Turbocharger boost control system performance	<ul> <li>ECM detects that turbocharger boost pressure is lower than the target value.</li> <li>ECM detects that turbocharger boost pressure is higher than the target value.</li> </ul>	<ul> <li>Harness or connectors (Turbocharger boost control solenoid valve circuit is open or shorted.)</li> <li>Turbocharger boost control solenoid valve</li> <li>Turbocharger boost sensor</li> <li>Electric throttle control actuator</li> <li>Intake air duct</li> <li>Vacuum pump</li> <li>Vacuum hose</li> <li>Turbocharger</li> </ul>
DTC CON	FIRMATION PROCE	DURE	
1.PRECC	ONDITIONING		
			ys turn ignition switch OFF and wait at
least 20 se	econds before conductin	g the next test.	
>	> GO TO 2.		
2.PERFC	ORM DTC CONFIRMATI	ON PROCEDURE	
		speed more than 3,000 rpm for at le	east 10 seconds.
	<pre>1st trip DTC. DTC detected?</pre>		
YES >	> Go to <u>ECR-251, "Diag</u>	nosis Procedure".	
	> INSPECTION END		
Diagnos	is Procedure		INFOID:000000001307561
1.CECHE	ECK VACUUM HOSES A	AND VACUUM GALLERY	
		vait at least 20 seconds.	
2. Check or imp	roper connection. Refer	cuum gallery for clogging, cracks to <u>ECR-89, "System Description"</u> .	
	ection result normal?		Split
	> Repair or replace. > GO TO 2.		
	200102.		Clogging
			Improper connection
-			SEF109L
2.CHECK	AIR FILTER		

### Check that air filter is not obstructed. Is the inspection result normal?



ECR

А

Yes >> Repair or replace. No >> GO TO 3.

**3.**CHECK INTAKE AIR DUCT

Check that intake air duct is not obstructed.

### Is the inspection result normal?

Yes >> Repair or replace.

No >> GO TO 4.

**4.**CHECK VACUUM PUMP

Check vacuum pump.

Is the inspection result normal?

Yes >> Repair or replace.

No >> GO TO 5.

5. CHECK TURBOCHARGER

Check turbocharger.

Is the inspection result normal?

Yes >> Repair or replace.

No >> GO TO 6.

# 6.check turbocharger boost control solenoid valve power supply circuit

- 1. Disconnect turbocharger boost control solenoid valve harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between turbocharger boost control solenoid valve harness connector and ground.

Turbocharger boost o	control solenoid valve	Ground	Voltage	
Connector	Terminal	Ground		
E55	1	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 7.

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

**7.**CHECK TURBOCHARGER BOOST CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Disconnect ECM harness connector.

 Check the continuity between turbocharger boost control solenoid valve harness connector and ECM harness connector.

Turbocharger boost control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E55	2	F68	57	Existed

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

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E7, F121

• Harness for open and short between turbocharger boost control solenoid valve and ECM

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

### [M9R]

### ECR-252

# P2263 TC SYSTEM

	P2263 TC SYSTEM	
< COMPONENT	DIAGNOSIS >	[M9R]
9.CHECK TURB	OCHARGER BOOST CONTROL SOLENOID VALVE	٨
Refer to ECR-253	, "Component Inspection".	A
Is the inspection re		
YES >> GO TO NO >> Repla	O 10. ace turbocharger boost control solenoid valve.	ECR
	ROTTLE CONTROL MOTOR	
	, "Component Inspection".	С
Is the inspection re	esult normal?	
YES >> GO TO NO >> Repla	O 11. ace turbocharger boost sensor.	D
	ERMITTENT INCIDENT	
	ntermittent Incident".	E
Is the inspection re		
	ce turbocharger boost sensor.	_
	ir or replace.	F
Component In	ISPECTION INFOID:00000	00001551475
1.CHECK TURB	OCHARGER BOOST CONTROL SOLENOID VALVE	G
1. Turn ignition s		
	rbocharger boost control solenoid valve harness connector. sistance between turbocharger boost control solenoid valve terminals as follows.	Н
Terminals	Resistance	
1 and 2	16 - 24 Ω	
Is the inspection re YES >> INSPE	esult normal? ECTION END	J
	ace turbocharger boost control solenoid valve.	
		LZ.
		K
		L
		M
		Ν
		0
		0
		Р

# P2293 FRP CONTROL SYSTEM

#### Description

INFOID:000000001532255

Fuel rail pressure (FRP) sensor is installed on the fuel rail. It measures the fuel pressure in the fuel rail. The sensor sends voltage signal to the ECM. As the pressure increases, the voltage rises. The ECM controls the fuel pressure in the fuel rail by the inlet throttling device. The ECM uses the signal from fuel rail pressure sensor as a feedback signal.

#### DTC Logic

INFOID:000000001538387

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2294	Fuel rail pressure control valve function	Fuel rail pressure is out of the target range.	<ul> <li>Harness or connectors (Fuel rail pressure control valve circuit is open or shorted.)</li> <li>Fuel rail pressure control valve</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> 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 ECR-254, "Diagnosis Procedure".
- NO >> INSPECTION END

#### **Diagnosis Procedure**

INFOID:000000001538388

# 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect fuel rail pressure control valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between fuel rail pressure control valve harness connector and ground.

Fuel rail pressu	ire control valve	Ground	Voltage	
Connector	Terminal	Orodina	voltage	
F93	1	Ground	Battery voltage	

Is the inspection result normal?

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connector E7, F121
- Harness for open or short between IPDM E/R and fuel rail pressure control valve

• Harness for open or short between ECM and fuel rail pressure control valve

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

#### ECR-254

# P2293 FRP CONTROL SYSTEM

#### < COMPONENT DIAGNOSIS >

 $\overline{\mathbf{3.}}$  CHECK FUEL RAIL PRESSURE CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between fuel rail pressure control valve harness connector and ECM harness connector.

Fuel rail press	ure control valve	EC	CM	Continuity		
Connector	Terminal	Connector	Terminal	Continuity		
F93	2	F68	90	Existed		
	k harness for sh	•	and short to p	ower.		
•	on result normal	<u>?</u>				
	O TO 4. Poair open circui	t or short to a	round or shor	t to power in h	arness or conne	ectors
	EL RAIL PRES	-				
	255, "Componer					
	on result normal					
	O TO 5.					
-	eplace fuel rail p		ol valve.			
	FERMITTENT IN					
Refer to <u>GI-39</u>	<u>, "Intermittent In</u>	<u>cident"</u> .				
>> IN	SPECTION ENI	П				
Component		-				INFQID:000000001559568
	•					NY 012.000000001333300
<b>1.</b> CHECK FU	EL RAIL PRESS	SURE CONTR	ROL VALVE			
	on switch OFF. ct fuel rail pressu	ura control val	vo harnoss cu	nnoctor		
	istance betweer				as follows.	
Terminals		esistance				
1 and 2		2 - 6 Ω				
	on result normal <sup>®</sup> SPECTION ENI	_				
-	eplace fuel rail p		ol valve.			

Ο

Ρ

А

[M9R]

# P2294 FRP CONTROL VALVE

#### Description

INFOID:000000001532256

Fuel rail pressure control valve controls fuel rail pressure based on fuel rail pressure sensor signal. When the fuel pressure in fuel rail increases to excessively high, ECM controls fuel rail pressure control valve to carry excess fuel to the return hose.

#### DTC Logic

INFOID:000000001521443

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	An excessively low voltage from the control valve is sent to ECM.   • Harness or connector	Harness or connectors	
P2294	Fuel rail pressure control valve circuit	uel rail pressure control An excessively high voltage from the control (Fuel rail pressure	, ,
		An improper voltage is sent to ECM through control valve.	Fuel rail pressure control valve

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> 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 ECR-256, "Diagnosis Procedure".
- NO >> INSPECTION END

#### **Diagnosis Procedure**

INFOID:000000001367494

# 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect fuel rail pressure control valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between fuel rail pressure control valve harness connector and ground.

Fuel rail pressu	re control valve	Ground	Voltage
Connector	Terminal	Ground Voltage	
F93	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 connector E7, F121
- Harness for open or short between IPDM E/R and fuel rail pressure control valve
- · Harness for open or short between ECM and fuel rail pressure control valve

# P2294 FRP CONTROL VALVE

#### < COMPONENT DIAGNOSIS >

[M9R]

2. Disconnect	n switch OFF a ECM harness continuity betw	connector.			ctor and ECM harness con-	ECR
Fuel rail pressu	re control valve	EC	M	Continuity		С
Connector	Terminal	Connector	Terminal	Continuity		
F93	2	F68	90	Existed		D
<u>Is the inspection</u> YES >> GC	TO 4. Dair open circui	t or short to gr	ound or sho	ower. t to power in harness or	connectors.	E
Refer to ECR-2						F
Is the inspection Yes >> GC No >> Re	<u>n result normal′</u> ) TO 5. place fuel rail p	ressure contro	l valve.			G
5.CHECK INT	ERMITTENT IN	ICIDENT				
Refer to GI-39,	"Intermittent Inc	<u>cident"</u> .				Н
>> INS Component	SPECTION END Inspection	)			INFOID:000000001559816	I
	-	SURE CONTR	OL VALVE			J
2. Disconnect	n switch OFF. fuel rail pressu stance between			onnector. alve terminals as follows	S.	K
Terminals	Re	esistance				
1 and 2	0.0	02 - 1 kΩ				L
Is the inspection			-			
	SPECTION END place fuel rail p		l valve.			Μ
						Ν
						0

Ρ

#### < COMPONENT DIAGNOSIS >

# P2299 ACCELERATOR/BRAKE PEDAL POSITION INCONSISTENCY

# DTC Logic

INFOID:000000001307562

INFOID:000000001307563

[M9R]

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2299	Accelerator pedal/brake pedal po- sition inconsistency	Accelerator pedal position sensor does not operate properly	<ul> <li>Harness or connectors (Accelerator pedal position sensor circuit is open or shorted.) (Brake pedal position switch circuit is open or shorted.)</li> <li>Accelerator pedal position sensor (APP sensor 1 and 2)</li> <li>Brake pedal position switch</li> <li>Accelerator pedal installation</li> </ul>
	Accelerator pedal position sensor circuit	No signal from accelerator pedal position sensor is sent to ECM	<ul> <li>Harness or connectors (Accelerator pedal position sensor circuit is open or shorted.)</li> <li>Accelerator pedal position sensor (APP sensor 1 and 2)</li> </ul>

# 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 30 seconds.
- 2. Keep engine speed at 2,000 rpm for at least 30 seconds.
- 3. Release accelerator pedal and apply service brake for at least 30 seconds.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECR-258, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

#### Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace ground connection.

2. CHECK BRAKE PEDAL POSITION SWITCH CIRCUIT

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as follows.

	(+)		(-)	C	ondition	Voltage
Connector	Terminal	Connector	Terminal		ondition	voltage
E60	116	E60	128	Brake pedal	Fully released	Battery voltage
200	110	⊏00	120	Diake pedal	Slightly depressed	0 V

# ECR-258

< COMPONENT DIAGNOSIS >

[M9R]

А

R

Е

F

Н

Κ

L

Μ

Ν

NO >> GO TO 8.

# **3.**CHECK ACCELERATOR PEDAL POSITION SENSOR CIRCUIT

#### 1. Check the voltage between ECM harness connector and ground.

								ECH
	(+)		(•	(-)		Condition	Voltage	
	Connector	Terminal	Connector	terminal		Sonation	vollage	
		110				Fully released	0.3 - 0.6 V	С
	E60	119	500	128	Accelerator	Slightly depressed	1.95 - 2.4 V	-
			E60		pedal	Fully released	0.6 - 0.9 V	
		126				Slightly depressed	3.9 - 4.7 V	D

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 4.

#### 4. CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Disconnect accelerator pedal position sensor harness connector.

3. Turn ignition switch ON.

4. Check the voltage between accelerator pedal position sensor harness connector and ground.

A	Ground	Voltage			
Sensor	Connector	Terminal	Ground	voltage	
1	E110	4	Ground	Approx. 5V	
2	LIIU	5	Gibuliu	Applox. 5V	

Is the inspection result normal?

YES >> GO TO 5.

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

#### ${f 5.}$ CHECK ACCELERATOR PEDAL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between accelerator pedal position sensor harness connector and ECM harness connector.

Acce	lerator pedal position	sensor	E	Continuity		
Sensor	Connector	Terminal	Connector	Terminal	Continuity	
1	E110	2	E60	127	Existed	
2	EIIU	1	EOU	120	Existed	

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

#### Is the inspection result normal?

YES >> GO TO 6.

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

 ${f 6}.$ CHECK ACCELERATOR PEDAL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between accelerator pedal position sensor harness connector and ECM harness provide a connector.

Accel	Accelerator pedal position sensor		ECM		Continuity
Sensor	Connector	Terminal	Connector	Terminal	Continuity
1	E110	3	E60	126	Existed
2	EIIO	6	E00	119	Existed

< COMPONENT DIAGNOSIS >

[M9R]

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

Is the inspection result normal?

YES >> GO TO 7.

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

7. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to ECR-160, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace accelerator pedal position sensor.

8.CHECK BRAKE PEDAL POSITION SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect brake pedal position switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between brake pedal position switch harness connector and ground.

Brake pedal p	osition switch	Ground	Voltage
Connector	Terminal	Orodina	voltage
E112	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

**9.**DETECT MALFUNCTIONING PART

Check the following.

Harness connector E105, M77

• 10A fuse (No. 1)

Harness for open or short between fuse and brake pedal position switch

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

10. CHECK BRAKE PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- Check the continuity between brake pedal position switch harness connector and ECM harness connector.

Brake pedal	Brake pedal position switch		ECM	
Connector	Terminal	Connector	Terminal	Continuity
E112	2	E60	116	Existed

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

Is the inspection result normal?

YES >> GO TO 11.

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

**11.**CHECK BRAKE PEDAL POSITION SWITCH

Refer to ECR-197, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace brake pedal position switch.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

# < COMPONENT DIAGNOSIS > [M9R] >> INSPECTION END

ECR

С

D

Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

А

#### P2425 EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

# P2425 EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE

#### Description

INFOID:000000001532257

[M9R]

EGR cooler bypass valve control solenoid valve controls vacuum signal to the EGR cooler bypass valve control actuator. ERG amount is controlled by changing the EGR cooler bypass valve opening using the rod. EGR cooler bypass valve control solenoid valve is operated by ON/OFF signals (pulse signals) sent from ECM. The longer is the ON pulse duration, the larger becomes the bypass gas volume.

# DTC Logic

INFOID:000000001375039

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
		An excessively low voltage from the solenoid valve is sent to ECM.	Harness or connectors
P2425	EGR cooler bypass valve control solenoid valve circuit	An excessively high voltage from the solenoid valve is sent to ECM.	<ul> <li>(EGR cooler bypass valve control solenoid valve circuit is open or shorted.)</li> <li>EGR cooler bypass valve control solenoid</li> </ul>
		An improper voltage is sent to ECM through solenoid valve.	valve

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> 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 ECR-262, "Diagnosis Procedure".
- NO >> INSPECTION END

#### **Diagnosis Procedure**

INFOID:000000001375040

#### 1.CHECK EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect EGR cooler bypass valve control solenoid valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between EGR cooler bypass valve control solenoid valve harness connector and ground.

EGR cooler bypass valve control solenoid valve		Ground	Voltage	
Connector	Terminal	Ground	voltage	
F90	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 for open or short between IPDM E/R and EGR cooler bypass valve control solenoid valve
- Harness for open or short between ECM and EGR cooler bypass valve control solenoid valve

# ECR-262

#### P2425 EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE [M9R]

#### < COMPONENT DIAGNOSIS >

2. Disconnect E	witch OFF and wait at least 2 CM harness connector. ntinuity between EGR cooler connector.		ntrol solenoid va	alve harness	connector and
EGR cooler byp	ass valve control solenoid valve	EC	Μ	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F90	2	F68	59	Existed	
<u>s the inspection re</u> YES >> GO Te NO >> Repai		nd or short to powe		connectors.	
		INTROL SOLENO	ID VALVE		
Refer to <u>ECR-263</u> is the inspection re	<u>, "Component Inspection"</u> .				
YES >> GO 19	O 5.				
	ce EGR cooler bypass valve o	control solenoid va	llve.		
NO >> Repla		control solenoid va	llve.		
NO >> Repla	ce EGR cooler bypass valve o	control solenoid va	lve.		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u>	ce EGR cooler bypass valve of MITTENT INCIDENT	control solenoid va	live.		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPI	ce EGR cooler bypass valve of MITTENT INCIDENT Itermittent Incident".	control solenoid va	live.		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPI	ce EGR cooler bypass valve of MITTENT INCIDENT Itermittent Incident".	control solenoid va	Ive.		INF0ID:000000001375041
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPI Component In	ce EGR cooler bypass valve of MITTENT INCIDENT Itermittent Incident".				INF0ID:000000001375041
NO >> Repla 5.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s	ce EGR cooler bypass valve of MITTENT INCIDENT Itermittent Incident". ECTION END Spection COOLER BYPASS VALVE CO	NTROL SOLENO	ID VALVE		INFOID:000000001375041
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect E	ce EGR cooler bypass valve of MITTENT INCIDENT itermittent Incident". ECTION END spection COOLER BYPASS VALVE CO switch OFF. GR cooler bypass valve contro	NTROL SOLENO	ID VALVE arness connect		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect E	ce EGR cooler bypass valve of MITTENT INCIDENT Itermittent Incident". ECTION END Spection COOLER BYPASS VALVE CO	NTROL SOLENO	ID VALVE arness connect		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC	ce EGR cooler bypass valve of MITTENT INCIDENT itermittent Incident". ECTION END spection COOLER BYPASS VALVE CO switch OFF. GR cooler bypass valve contro	NTROL SOLENO	ID VALVE arness connect		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista	ce EGR cooler bypass valve of MITTENT INCIDENT Itermittent Incident". ECTION END Spection COOLER BYPASS VALVE CO switch OFF. GR cooler bypass valve contro nce between EGR cooler bypa	NTROL SOLENO	ID VALVE arness connect		
NO >> Repla D.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista Terminals 1 and 2	ce EGR cooler bypass valve of MITTENT INCIDENT         itermittent Incident".         ECTION END         spection         COOLER BYPASS VALVE CO         switch OFF.         GR cooler bypass valve control nce between EGR cooler bypass         Resistance         43 - 49 Ω [at 25°C (77°F)]	NTROL SOLENO	ID VALVE arness connect		
NO >> Repla D.CHECK INTER Refer to GI-39, "In >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista Terminals 1 and 2 s the inspection re YES >> INSPE	ce EGR cooler bypass valve of MITTENT INCIDENT         Intermittent Incident".         ECTION END         Spection         COOLER BYPASS VALVE CO         Switch OFF.         GR cooler bypass valve contronice between EGR cooler bypass         Resistance         43 - 49 Ω [at 25°C (77°F)]         esult normal?         ECTION END	NTROL SOLENO	ID VALVE arness connect solenoid valve te		
NO >> Repla 5.CHECK INTER Refer to GI-39, "In >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista Terminals 1 and 2 Is the inspection receiption receiptin receiption receipting receiption receipting receiption receip	ce EGR cooler bypass valve of         MITTENT INCIDENT         itermittent Incident".         ECTION END         spection         COOLER BYPASS VALVE CO         switch OFF.         GR cooler bypass valve control         nce between EGR cooler bypass         Resistance         43 - 49 Ω [at 25°C (77°F)]         esult normal?	NTROL SOLENO	ID VALVE arness connect solenoid valve te		
NO >> Repla 5.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista Terminals 1 and 2 Is the inspection re YES >> INSPE	ce EGR cooler bypass valve of MITTENT INCIDENT         Intermittent Incident".         ECTION END         Spection         COOLER BYPASS VALVE CO         Switch OFF.         GR cooler bypass valve contronice between EGR cooler bypass         Resistance         43 - 49 Ω [at 25°C (77°F)]         esult normal?         ECTION END	NTROL SOLENO	ID VALVE arness connect solenoid valve te		
NO >> Repla 5.CHECK INTER Refer to GI-39, "In >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista Terminals 1 and 2 Is the inspection re YES >> INSPE	ce EGR cooler bypass valve of MITTENT INCIDENT         Intermittent Incident".         ECTION END         Spection         COOLER BYPASS VALVE CO         Switch OFF.         GR cooler bypass valve contronice between EGR cooler bypass         Resistance         43 - 49 Ω [at 25°C (77°F)]         esult normal?         ECTION END	NTROL SOLENO	ID VALVE arness connect solenoid valve te		
NO >> Repla 5.CHECK INTER Refer to <u>GI-39, "In</u> >> INSPE Component In 1.CHECK EGR C 1. Turn ignition s 2. Disconnect EC 3. Check resista Terminals 1 and 2 Is the inspection re YES >> INSPE	ce EGR cooler bypass valve of MITTENT INCIDENT         Intermittent Incident".         ECTION END         Spection         COOLER BYPASS VALVE CO         Switch OFF.         GR cooler bypass valve contronice between EGR cooler bypass         Resistance         43 - 49 Ω [at 25°C (77°F)]         esult normal?         ECTION END	NTROL SOLENO	ID VALVE arness connect solenoid valve te		

Ρ

# P242A EGT SENSOR 3

#### Description

Exhaust gas temperature sensor 3 is installed after DPF and senses exhaust gas temperature. Exhaust gas temperature sensor 3 uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

#### <Reference data>

Exhaust gas temperature °C (°F)	Resistance $k\Omega$
250 (482)	132.5
300 (572)	44.28 - 63.54
500 (932)	3.173 - 3.264
600 (1112)	1.378
800 (1472)	0.323 - 0.371

# DTC Logic

INFOID:000000001521455

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P242A	Exhaust gas temperature sensor 3 circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors     (Exhaust gas temperature sensor 3
1 Z7ZR	Exhaust gas temperature sensor 3 circuit high input	An excessively high voltage from the sensor is sent to ECM.	circuit is open or shorted.) • Exhaust gas temperature sensor 3

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

>> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 4 minutes.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to ECR-265, "Diagnosis Procedure".

NO >> GO TO 3.

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

#### With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "EXH GAS TEMP2" in "DATA MONITOR" mode with CONSULT-III.
- 3. Drive vehicle under the following conditions for at least 70 seconds.

Monitor item	Indication
EXH GAS TEMP2	More than 340 °C (644 °F)

4. Check 1st trip DTC.

#### With GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Go to ECR-265, "Diagnosis Procedure".

# P242A EGT SENSOR 3

[M9R]

#### < COMPONENT DIAGNOSIS > NO >> INSPECTION END А Diagnosis Procedure INFOID:000000001374984 1. CHECK GROUND CONNECTIONS ECR Turn ignition switch OFF and wait at least 20 seconds. 1. Check ground connection E17. Refer to Ground inspection in GI-41. "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK EXHAUST GAS TEMPERATURE SENSOR 3 POWER SUPPLY CIRCUIT D 1. Disconnect exhaust gas temperature sensor 3 harness connector. 2. Turn ignition switch ON. 3. Check the voltage between exhaust gas temperature sensor 3 harness connector and ground. Exhaust gas temperature sensor 3 Ground Voltage Connector Terminal B50 1 Ground Approx. 5V Is the inspection result normal? YES >> GO TO 4. NO >> GO TO 3. ${f 3.}$ detect malfunctioning part Н Check the following. Harness connectors E7, F121 Harness connectors M77, E105 Harness connectors B1, M11 Harness for open or short between ECM and exhaust gas temperature sensor 3 >> Repair open circuit or short to ground or short to power in harness or connectors. 4.CHECK EXHAUST GAS TEMPERATURE SENSOR 3 GROUND CIRCUIT FOR OPEN AND SHORT Κ 1. Turn ignition switch OFF and wait at least 20 seconds. 2. Check the continuity between exhaust gas temperature sensor 3 harness connector and ECM harness connector. L Exhaust gas temperature sensor 3 ECM Continuity Connector Terminal Connector Terminal M B50 2 F85 23 Existed Also check harness for short to ground and short to power. 3. Ν Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. **5.**DETECT MALFUNCTIONING PART Check the following. Harness connectors E7, F121 Harness connectors M77, E105 Harness connectors B1, M11 Harness for open or short between ECM and exhaust gas temperature sensor 3

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

 ${f 6}.$ CHECK EXHAUST GAS TEMPERATURE SENSOR 3

# **ECR-265**

# P242A EGT SENSOR 3

< COMPONENT DIAGNOSIS >

Refer to ECR-266, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace exhaust gas temperature sensor 3.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### >> INSPECTION END

Component Inspection

1.CHECK EXHAUST GAS TEMPERATURE SENSOR 3

#### With CONSULT-III

- 1. Turn ignition switch ON and select "EXH GAS TEMP3" in "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and drive vehicle at a speed of 120 km/h (75 MPH) for at least 2 minute.
- 3. Check "EXH GAS TEMP3" indication during driving.

Monitor item	Indication
EXH GAS TEMP3	230 - 950 °C (446 - 1742 °F)

#### With GST

Follow the procedure "With CONSULT-III" above.

Is the inspection result normal?

YES >> INSPECTION END

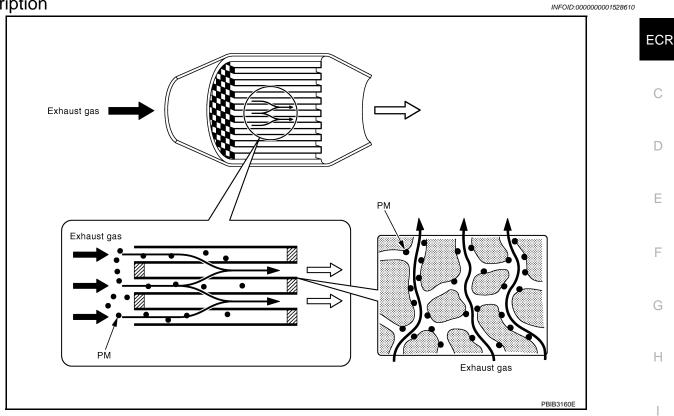
NO >> Replace exhaust gas temperature sensor 3.

#### **P242F DPF**

# < COMPONENT DIAGNOSIS >

# P242F DPF

Description



DPF (Diesel Particulate Filter) is placed after oxidation catalyst and traps PM (Particulate Matter) in exhaust gas. DPF is formed in a honeycomb form made of ceramic. This structure facilitates to trap particulate matter. When the amount of particulate matter in the DPF reaches the specified level, the particulate matter needs to be reduced through burning to maintain the DPF function. This reducing of particulate matter is called Regeneration and should be performed periodically. DPF can be effective for a long time through the cycle of trap-Κ ping particulate matter and regeneration.

# DTC Logic

INFOID:000000001528611

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	M
P242F	Diesel particulate filter (DPF) performance	DPF is overloaded with particulate matter.	DPF	NI

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 minutes.

- Drive vehicle under the following conditions for at least 2 minutes. 2.
- Gear position: 3rd position
- Engine speed: About 3,000 rpm
- 3. Check 1st trip DTC.

# **ECR-267**

Ρ

J

#### < COMPONENT DIAGNOSIS >

#### Is 1st trip DTC detected?

YES >> Go to <u>ECR-268</u>, "Diagnosis Procedure". NO >> INSPECTION END

#### **Diagnosis** Procedure

1.CHECK DPF

Refer to ECR-232, "Component Inspection".

OK or NG

OK >> INSPECTION END

NG >> GO TO 2.

2.REPLACE DPF

1. Replace DPF.

2. Perform "DPF Data Clear". Refer to ECR-17, "DPF DATA CLEAR : Special Repair Requirement".

#### >> INSPECTION END

**Component Inspection** 

1.CHECK DPF-I

Check DPF for damage.

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK DPF-II

1. Perform "Service Regeneration". Refer to <u>ECR-17, "SERVICE REGENERATION : Special Repair</u> <u>Requirement"</u>.

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

- 3. Connect CONSULT-III and select "DATA MONITOR" mode.
- 4. Select "DIFF EXH PRES" and check the indication under the following conditions.

Condition	DIFF EXH PRES [mbar]
<ul> <li>ENGINE SPEED-: 2000 tr/min</li> <li>EXH GAS TEMP2: 150 - 200°C (302 - 392°F)</li> <li>EXH GAS TEMP3: 150 - 200°C (302 - 392°F)</li> </ul>	Less than 3.0

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

**3.**REPLACE DPF

1. Replace DPF.

2. Perform "DPF Data Clear". Refer to ECR-17, "DPF DATA CLEAR : Special Repair Requirement".

>> INSPECTION END

INFOID:000000001528612

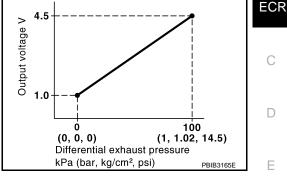
# P2452 DIFFERENTIAL EXHAUST PRESSURE SENSOR

#### < COMPONENT DIAGNOSIS >

# P2452 DIFFERENTIAL EXHAUST PRESSURE SENSOR

#### Description

Differential exhaust pressure sensor is connected to DPF with differential pressure sensor tubes (upstream and downstream). Differential exhaust pressure sensor measures the difference between the exhaust pressure before and after the DPF. Differential exhaust pressure sensor converts the difference into a voltage signal. ECM receives the signal and estimates the amount of particulate matter in DPF.



#### DTC Logic

#### DTC DETECTION LOGIC

DTC No. Possible cause Trouble diagnosis name DTC detecting condition An excessively low voltage from the sensor is sent to ECM. · Harness or connectors Differential exhaust pressure An excessively high voltage from the (Differential exhaust pressure sensor circuit is P2452 Н sensor circuit sensor is sent to ECM. open or shorted.) · Differential exhaust pressure sensor An improper voltage is sent to ECM through sensor. DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test. Κ >> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE 1. Turn ignition switch ON and wait at least 10 seconds. Check 1st trip DTC. 2. Is 1st trip DTC detected? YFS >> Go to ECR-269, "Diagnosis Procedure". M NO >> INSPECTION END Diagnosis Procedure INFOID:000000001374999 Ν 1. CHECK GROUND CONNECTIONS Turn ignition switch OFF and wait at least 20 seconds. 1 Check ground connection E17. Refer to Ground inspection in GI-41. "Circuit Inspection". 2. Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK DIFFERENTIAL EXAUST PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect differential exhaust pressure sensor harness connector.

2. Turn ignition switch ON.

3. Check the voltage between differential exhaust pressure sensor harness connector and ground.

#### INFOID:000000001374994

INFOID:000000001521447

[M9R1

#### **ECR-269**

А

# P2452 DIFFERENTIAL EXHAUST PRESSURE SENSOR

#### < COMPONENT DIAGNOSIS >

[M9R]

Differential exhaus	st pressure sensor	Ground	Voltage
Connector	Terminal	Giouna	voltage
F88	3	Ground	Approx. 5V

Is the inspection result normal?

YES >> GO TO 3.

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

# $\mathbf{3}$ . CHECK DIFFERENTIAL EXAUST PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check the continuity between differential exhaust pressure sensor harness connector and ECM harness connector.

Differential exhau	ist pressure sensor	ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F88	2	F85	42	Existed

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

Is the inspection result normal?

YES >> GO TO 4.

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

**4.**CHECK DIFFERENTIAL EXAUST PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between differential exhaust pressure sensor harness connector and ECM harness connector.

Differential exhau	Differential exhaust pressure sensor		ECM	
Connector	Terminal	Connector Terminal		Continuity
F88	1	F85	38	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

5. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace differential exhaust pressure sensor.

NO >> Repair or replace.

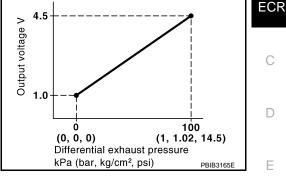
# P2453 DIFFERENTIAL EXHAUST PRESSURE SENSOR

#### < COMPONENT DIAGNOSIS >

# P2453 DIFFERENTIAL EXHAUST PRESSURE SENSOR

#### Description

Differential exhaust pressure sensor is connected to DPF with differential pressure sensor tubes (upstream and downstream). Differential exhaust pressure sensor measures the difference between the exhaust pressure before and after the DPF. Differential exhaust pressure sensor converts the difference into a voltage signal. ECM receives the signal and estimates the amount of particulate matter in DPF.



# **DTC** Logic

#### DTC DETECTION LOGIC

DTC No.Trouble diagnosis nameDTC detecting conditionPossible causeP2453Differential exhaust pressure<br/>sensor (Upstream)Differential exhaust pressure sensor<br/>(Upstream) malfunction.• Differential exhaust pressure sensor<br/>(Upstream) leaks<br/>• Differential pressure sensor tube in-<br/>stalled incorrectly

#### DTC CONFIRMATION PROCEDURE

#### **1.**PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> 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 ECR-271, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

# 1.CHECK DIFFERENTIAL EXHAUST PRESSURE SENSOR TUBE (UPSTREAM)

- 1. Remove differential exhaust pressure sensor tube (Upstream).
- 2. Check differential exhaust pressure sensor tube (Upstream) for crack, clogging, improper connection or disconnection.

**ECR-271** 

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair differential exhaust pressure sensor tube (Upstream).

2.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

#### Is the inspection result normal?

YES >> Replace differential exhaust pressure sensor.

NG >> Repair or replace.

# SIS >

INFOID:000000001375036

[M9R]

А

INFOID:000000001375038

Ν

< COMPONENT DIAGNOSIS >

#### P2505 ECM POWER SUPPLY

#### Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

# PBIA9222J

#### DTC Logic

#### DTC DETECTION LOGIC

INFOID:000000001367	507

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2505	Ignition signal circuit	Ignition signal is not entered to ECM when ignition switch is turned ON.	<ul> <li>Harness or connectors (Ignition relay circuit is open or shorted.)</li> <li>Ignition relay</li> </ul>

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

# 2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 second.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-272, "Diagnosis Procedure".
- NO >> INSPECTION END

# Diagnosis Procedure

INFOID:000000001367508

# $1. \mathsf{CHECK} \ \mathsf{ECM} \ \mathsf{INPUT} \ \mathsf{SIGNAL} \ \mathsf{CIRCUIT} \ \mathsf{FOR} \ \mathsf{OPEN} \ \mathsf{AND} \ \mathsf{SHORT}$

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

(+	(+)		-)	Voltage
Connector	Terminal	Connector	Terminal	voltage
E60	109	E60	128	Battery voltage

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

# ECR-272

# **P2505 ECM POWER SUPPLY**

	[M9R]
< COMPONENT DIAGNOSIS >	[]
<ul> <li>15A fuse (No. 64)</li> <li>IPDM E/R harness connector E15</li> </ul>	А
Harness for open or short between ECM and IPDM E/R	A
>> Repair or replace harness or connectors.	ECR
3. CHECK INTERMITTENT INCIDENT	
Refer to GI-39, "Intermittent Incident".	С
Is the inspection result normal?	C
YES >> GO TO 4.	
NO >> Repair or replace harness or connectors.	D
4. PERFORM DTC CONFIRMATION PROCEDURE	
1. Turn ignition switch ON.	
2. Erase the DTC.	E
<ol> <li>Perform DTC CONFIRMATION PROCEDURE again. See <u>ECR-272</u>, "<u>DTC Logic</u>".</li> </ol>	
Is the 1st trip DTC P2505 displayed again?	F
YES >> GO TO 5.	
NO >> INSPECTION END	
5.REPLACE ECM	G
1. Replace ECM.	
2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair F	<u>Require-</u> H
<u>ment"</u> .	11
>> INSPECTION END	I
	J
	K
	L
	Ъ.4
	M
	Ν
	0
	Р
	I

# P2600 TC COOLING PUMP

#### Description

INFOID:000000001532258

Turbocharger cooling pump circulates cooling water around the turbine bearing to prevent high oil temperature around it. Therefore, ECM actuates the cooling pump when the cooling water temperature exceeds the specified value.

#### DTC Logic

INFOID:000000001521456

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
		An excessively low voltage from the control valve is sent to ECM.	Harness or connectors
P2600	Turbocharger cooling pump circuit	An excessively high voltage from the control valve is sent to ECM.	<ul><li>(Turbocharger cooling pump circuit is open or shorted.)</li><li>Turbocharger cooling pump</li></ul>
		An improper voltage is sent to ECM through control valve.	Turbocharger cooling pump relay

#### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 20 seconds before conducting the next test.

#### >> GO TO 2.

# 2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

#### Is 1st trip DTC detected?

YES >> Go to ECR-274, "Diagnosis Procedure".

NO >> GO TO 3.

# 3. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Turn ignition switch ON and wait at least 10 seconds.
- Check 1st trip DTC.

#### Is 1st trip DTC detected?

- YES >> Go to ECR-274, "Diagnosis Procedure".
- NO >> INSPECTION END

#### Diagnosis Procedure

INFOID:000000001375043

# 1.CHECK TURBOCHARGER COOLING PUMP POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect turbocharger cooling pump relay.
- 3. Turn ignition switch ON.
- 4. Check the voltage between turbocharger cooling pump relay harness connector and ground.

Turbocharger co	oling pump relay	Ground	Voltage	
Connector	Terminal	Glound	voltage	
E56	2	Ground	Battery voltage	
230	E563		Dattery Voltage	

Is the inspection result normal?

# ECR-274

P2600 TC COOLING PU	JMP
---------------------	-----

				-	[M9R]
< COMPONENT D YES >> GO TO					[
NO >> GO TO					
2. DETECT MALFL	JNCTIONING PART	-			
Check the following					
<ul> <li>Harness connector</li> </ul>	ors E7, F121				E
<ul><li>10A fuse (No. 32)</li><li>Harness for open</li></ul>		rbocharger cooli	ng pump relav ar	nd batterv	
• Harness for open	or short between tu	rbocharger cooli	ng pump relay ar	nd IPDM E/R	(
Harness for open	or short between tu	rbocharger cooli	ng pump relay ar	nd ECM	
>> Repair	open circuit or shor	t to around or she	ort to power in ha	arness or connectors.	
3.CHECK TURBO	•	•	•		
	vitch OFF and wait a				
2. Disconnect turk	ocharger cooling p	ump harness cor	nector.		
	tinuity between turk ness connector.	ocharger cooling	g pump harness	connector and turbochar	ger cooling
pump rolay nai					
Turbocharger	cooling pump	Turbocharge co	oling pump relay	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	(
F87	1	E56	5	Existed	
	ness for short to gro	ound and short to	power.		
Is the inspection res					I
YES >> GO TO NO >> GO TO					
4.DETECT MALFL		-			
Check the following					
<ul> <li>Harness connector</li> </ul>	ors E7, F121				
<ul> <li>Harness for open</li> </ul>	or short between tu	rbocharger cooli	ng pump and tur	bocharger cooling pump re	elay
>> Repair	open circuit or shor	t to around or sh	ort to power in ba	arness or connectors.	
				OR OPEN AND SHORT	
				onnector and ground.	
		Scharger cooling		onnector and ground.	
Turbocharger	cooling pump	Oracinad	Oractionsity	•	
Connector	Terminal	Ground	Continuity		r
F87	2	Ground	Existed	-	
2. Also check har	ness for short to gro	ound and short to	power.		
Is the inspection rea					I
YES >> GO TO NO >> GO TO					
6.DETECT MALFI		-			(
<ul><li>Check the following</li><li>Harness connector</li></ul>					
Harness for open		rbocharger cooli	ng pump and gro	bund	
	_				
<b></b>	•	•	•	arness or connectors.	
I .CHECK TURBO	CHARGER COOLI	NG PUMP OUTF	UT SIGNAL CIR	CUIT FOR OPEN AND SI	HORT

1. Disconnect ECM harness connectors.

# P2600 TC COOLING PUMP

#### < COMPONENT DIAGNOSIS >

 Check the continuity between turbocharger cooling pump relay harness connector and ECM harness connector.

Turbocharger co	oling pump relay	EM		Continuity	
Connector	Terminal	Connector Terminal			
E56	1	F68	56	Existed	

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E7, F121

• Harness for open or short between ECM and turbocharger cooling pump relay

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

#### 9. CHECK TURBOCHARGER COOLING PUMP RELAY

Refer to ECR-276, "Component Inspection (Turbocharger Cooling Pump Relay)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace turbocharger cooling pump relay.

**10.**CHECK TURBOCHARGER COOLING PUMP

Refer to ECR-276. "Component Inspection (Turbocharger Cooling Pump)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace turbocharger cooling pump.

11.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

#### Component Inspection (Turbocharger Cooling Pump)

1. CHECK TURBOCHARGER COOLING PUMP

1. Turn ignition switch OFF.

2. Disconnect turbocharger cooling pump harness connector F87.

3. Supply turbocharger cooling pump terminal with battery voltage and check operation.

Terminals		Operation	
(+)	(-)	Operation	
1	2	Turbocharger cooling pump operates.	

Is the inspection result normal?

#### YES >> INSPECTION END

NO >> Replace turbocharger cooling pump.

# Component Inspection (Turbocharger Cooling Pump Relay)

#### **1.**CHECK TURBOCHARGER COOLING PUMP RELAYS

1. Turn ignition switch OFF.

2. Remove turbocharger cooling pump relay.



# P2600 TC COOLING PUMP

#### < COMPONENT DIAGNOSIS >

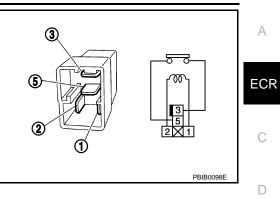
3. Check the continuity between turbocharger cooling pump relay terminals under the following conditions.

Terminals	Conditions	Continuity
3 and 4	12V direct current supply between terminals 1 and 2	Existed
5 anu 4	No current supply	Not existed

#### Is the inspection result normal?

#### YES >> INSPECTION END

NO >> Replace turbocharger cooling pump relay.



Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

# P2A00 A/F SENSOR 1

# Description

DTC Logic

Air fuel ratio (A/F) sensor 1 (1) is installed on the upstream of the oxidation catalyst. A/F sensor 1 measures the oxygen level in the exhaust gas and converts it into a voltage signal. A/F sensor 1 sends the signal to ECM. Based on the signal from A/F sensor 1, ECM calculates the air fuel mixture ratio. ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor 1 to ensure the required operating temperature.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P2A00	Air fuel ratio (A/F) sensor 1 circuit	The A/F signal computed by ECM from the air fuel ratio sensor 1 signal is out of the specified range.	<ul> <li>Harness or connectors (The air fuel ratio sensor 1 circuit is shorted.)</li> <li>Air fuel ratio sensor 1</li> </ul>

# **Diagnosis Procedure**

DTC DETECTION LOGIC

INFOID:000000001548283

PRIR3183

INFOID:000000001548282

# 1. CHECK GROUND CONNECTIONS

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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

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

A/F sensor 1		Ground	Voltage	
Connector	Terminal	Cround	vollage	
F91	4	Ground	Battery voltage	

#### <u>OK or NG</u>

OK >> GO TO 4. NG >> GO TO 3.

**3.**DETECT MALFUNCTIONING PART

#### Check the following.

- Harness connectors E7, F121
- IPDM E/R connector E15
- Harness for open or short between A/F sensor 1 and IPDM E/R
- Harness for open or short between A/F sensor 1 and ECM

>> Repair or replace harness or connectors.

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

[M9R]

# P2A00 A/F SENSOR 1

#### < COMPONENT DIAGNOSIS >

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

A/F s	ensor 1	ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
	1		81		
F91	2	F68	78	Existed	
	5		82	Existed	
	6		77		

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

A/F se	A/F sensor 1 ECM		Ground	Continuity	
Connector	Terminal	Connector Terminal		Giodila	Continuity
1			81		
F91	2	F68	78	Ground	Not existed
	5		82		
	6		77	-	

Also check harness for short to power.

Is the ir	spection result normal?	
YES	>> GO TO 5	

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

5. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

**6.**REPLACE A/F SENSOR 1

Replace A/F sensor 1.

CAUTION:

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

• Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

А

[M9R]

ECR

С

D

Е

F

Н

Κ

L

Μ

Ν

# P3031 SERVICE REGENERATION

#### Description

Service regeneration is performed with CONSULT-III to reduce particulate matter in DPF. For details, refer to <u>ECR-16</u>, <u>"SERVICE REGENERATION : Description"</u>.

#### DTC Logic

#### DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P3031	Service regeneration performance	Service regeneration was interrupted because of extremely high exhaust gas temperature.	DPF

#### **Diagnosis Procedure**

**1.**PERFORM SERVICE REGENERATION

Refer to ECR-17, "SERVICE REGENERATION : Special Repair Requirement".

>> GO TO 2.

2.ERASE DTC

#### With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.
- 3. Touch "ERASE".

#### With GST

- 1. Turn ignition switch ON.
- 2. Select Service \$04 with GST.

#### Is DTC erased?

YES >> INSPECTION END

NO >> GO TO 3.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

INFOID:000000001528616

INEOID:000000001528617

# **ASCD INDICATOR**

#### < COMPONENT DIAGNOSIS >

# ASCD INDICATOR

# Description

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.

CRUISE lamp illuminates when MAIN switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.

SET lamp illuminates when following conditions are met.

- CRUISE lamp is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET lamp remains lit during ASCD control.

#### Component Function Check

# **1.**ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

CONDITION	INDICATOR				
Ignition switch: ON     All Switch: Pressed at the 1st time →at the 2nd time		Illuminated $\rightarrow$ Not illuminated			
MAIN switch: ON	ASCD: Operating	Illuminated			
<ul> <li>When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)</li> </ul>	ASCD: Not operating	Not illuminated			
Is the inspection result normal?					
YES >> <b>INSPECTION END</b> NO >> Go to <u>ECR-281, "Diagnosis P</u>	rocedure".				
Diagnosis Procedure		INFOID:000000001307572			
<b>1.</b> CHECK CAN COMMUNICATION LINE					
Refer to LAN-21, "CAN System Specificati	<u>on Chart"</u> .				
<u>OK or NG</u>					
OK >> GO TO 2.					
NG >> Repair or replace.					
2. CHECK COMBINATION METER OPER	RATION				
Refer to MWI-24, "CONSULT-III Function	(METER/M&A)".				
s the inspection result normal?					
YES >> GO TO 3. NO >> Check combination meter circ		EVETEM - System Disgram"			
•		STSTEM: System Diagram.			
<b>3.</b> CHECK INTERMITTENT INCIDENT					
Refer to GI-39, "Intermittent Incident".					
>> INSPECTION END					

Ρ

INFOID:000000001307570

INFOID:000000001307571

А

ECR

С

D

Ε

F

# **CLUTCH PEDAL POSITION SWITCH**

#### < COMPONENT DIAGNOSIS >

# **CLUTCH PEDAL POSITION SWITCH**

#### Description

Clutch pedal position switch signal is applied to the ECM through the clutch pedal position switch when the clutch pedal is depressed.

#### **Component Function Check**

# 1. CHECK FOR CLUTCH PEDAL POSITION SWITCH FUNCTION

1. Turn ignition switch ON.

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

	ECM	G	iround	Condition Volta		Voltage
Connector	Terminal	Connector	Terminal			voltage
500	108	<b>F</b> 00	128		Slightly depressed	Battery voltage
E60	(Clutch pedal position switch signal)	E60	(ECM ground)	Clutch pedal	Fully released	Approx. 0V

#### Is the inspection result normal?

YES >> INSPECTION END.

NO >> Go to ECR-282, "Diagnosis Procedure".

#### Diagnosis Procedure

# 1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF and wait at least 20 seconds.

2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

# 2.check clutch pedal position switch groud circuit for open and short

- 1. Disconnect clutch pedal position switch harness connector.
- 2. Check the continuity between clutch pedal position switch harness connector and ground.

Clutch pedal	position switch	Ground	Continuity	
Connector	Terminal	Ground	Continuity	
E111	1	E38	Existed	

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.

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

 ${f 3.}$  CHECK CLUTCH PEDAL POSITION SWITCH INPUT SIGANL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connectors.

Check the continuity between clutch pedal position switch harness connector and ECM harness connector.

Clutch pedal position switch			Continuity	
Connector	Terminal	Connector Terminal		Continuity
E111	2	E60	108	Existed

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

Is the inspection result normal?



	<b>(</b> NT DIAGNOSIS		AL POSIT	ION SWITCH	[M9R]
			d or short to r	ower in harness or connector	
		OSITION SWITCH	•		
	283, "Componer				
	on result normal?	2			
	D TO 5. place clutch peo	dal position switch			
5.CHECK INT	ERMITTENT IN				
Refer to GI-39.	"Intermittent Ind	<u>cident"</u> .			
-	SPECTION END	)			
Component	Inspection				INFOID:000000001307546
1.CHECK CL	UTCH PEDAL P	OSITION SWITCH	4-1		
	on switch OFF.				
2. Disconnec	t clutch pedal po	sition switch harn			
3. Check the	continuity betwe	en clutch pedal p	Usition switch	terminals under the following	conditions.
Terminals	Co	ndition	Continuity		
1 and 2	Clutch pedal	Fully released	Existed		
	Clutch pedal	Slightly depressed	Not existed		
	on result normal?				
	SPECTION END D TO 2.	)			
•		OSITION SWITCH	4-11		
				5, "Inspection and Adjustme	ent".
2. Check the	continuity betwe	en clutch pedal p	osition switch	terminals under the following	conditions.
Torminolo	Car	ndition	Continuity		
Terminals	Col	Fully released	Continuity Existed	-	
1 and 2	Clutch pedal	Slightly depressed	Not existed	-	
Is the inspection	on result normal?				
YES >> IN	SPECTION END	)			
NO >> Re	place clutch peo	dal position switch			

Ρ

#### < COMPONENT DIAGNOSIS >

# COOLING FAN

#### Description

Cooling fan operates at each speed when the current flows in the cooling fan motor as follows. Refer to <u>ECR-49. "System Diagram"</u> for cooling fan operation.

Cooling fan speed	Cooling fan motor terminals			
Cooling fair speed	(+)	(-)		
	1	3 and 4		
Middle (MID)	2	3 and 4		
	1 and 2	3		
	1 and 2	4		
High (HI)	1 and 2	3 and 4		

The cooling fan operates at low (LOW) speed when cooling fan motors-1 and 2 are circuited in series under middle speed condition.

# Component Function Check

#### **1.**CHECK COOLING FAN OPERATION

#### With CONSULT-III

- 1. Start engine and let it idle.
- 2. Select "COOLING FAN LOW" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Select "COOLING FAN HIGH" in "ACTIVE TEST" mode with CONSULT-III.
- 4. Check that cooling fans-1 and 2 operate at each speed.

#### With GST

- 1. Start engine and let it idle.
- 2. Perform IPDM E/R auto active test. Refer to PCS-8, "Diagnosis Description".
- 3. Check that cooling fans-1 and 2 operate at each speed.

#### Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Refer to ECR-284, "Diagnosis Procedure".

#### **Diagnosis Procedure**

# 1. CHECK COOLING FAN POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect cooling fan motor-2 harness connector.
- 3. Check the voltage between cooling fan motor-2 harness connector and ground.

Cooling fai	n motor-2	Ground	Voltage	
Connector	Terminal	Oround		
E54	1	Ground	Battery voltage	
E34	E54 2		Ballery vollage	

Is the inspection result normal?

YES	>> GO TO	3
		~

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

#### Check the following.

• 40A fusible link (letter M)

Harness for open or short between cooling fan motor-3 and battery

>> Repair or replace malfunctioning part.

INFOID:000000001307573

INFOID:000000001307575

Disconneo	ct cooling fan	relay-4 and (	cooling fan rela	iy-5.	A
Turn igniti	on switch ON	۱.		ness connector and ground.	FOI
		· · · · · · · · · · · · · · · · · · ·			ECF
Cooling fa	-	Ground	Voltage		0
Connector E57	Terminal 2	Ground	Dottony voltage		С
			Battery voltage		
<ol> <li>Check the</li> </ol>	Vollage Dem	/een coomig	lan relay-o nan	ness connector and ground.	D
Cooling fa	an relay-5		1-4-20	—	
Connector	Terminal	Ground	Voltage		E
E59	2	Ground	Battery voltage		<u> </u>
s the inspecti	on result norm	nal?		—	
	O TO 6.				F
4	O TO 4.				
<b>1.</b> CHECK FU					G
0			t least 20 secor		0
	•	,	PDM E/R anu	check it for blown.	
s the inspection	<u>on result nom</u>	<u>nai :</u>			Н
VEC -> G					11
	O TO 5. eplace fuse.				11
NO >> R	eplace fuse.		םם ∨ CIRCUI	- 111	
NO >> R 5.CHECK CC	eplace fuse. DOLING FAN		PPLY CIRCUIT	Г-III 	I
NO >> Ro 5.CHECK CC	eplace fuse. DOLING FAN ct IPDM E/R h	harness conn	nector E14.	Γ-III arness connector and IPDM E/R harness conne	1
NO >> Ro 5.CHECK CC	eplace fuse. DOLING FAN ct IPDM E/R h continuity be	harness conn etween coolin	nector E14.	arness connector and IPDM E/R harness conne	ector.
NO >> Ro 5.CHECK CC 1. Disconnec 2. Check the	eplace fuse. DOLING FAN ct IPDM E/R h continuity be	harness conn etween coolin	nector E14. ng fan relay-4 h		ector.
NO >> Ro 5.CHECK CC 1. Disconneo 2. Check the Cooling fa	eplace fuse. DOLING FAN ct IPDM E/R h continuity be an relay-4	harness conn etween coolin IPD	nector E14. ng fan relay-4 h DM E/R	arness connector and IPDM E/R harness conne	ector.
NO >> Ro 5.CHECK CC 1. Disconneo 2. Check the Cooling fa Connector E57	eplace fuse. DOLING FAN ct IPDM E/R h continuity be an relay-4 Terminal 2	harness conn etween coolin IPD Connector E14	nector E14. ng fan relay-4 h DM E/R Terminal 40	arness connector and IPDM E/R harness conne Continuity	ector. J
NO >> Ro 5.CHECK CC 1. Disconneo 2. Check the Cooling fa Connector E57	eplace fuse. DOLING FAN ct IPDM E/R h continuity be an relay-4 Terminal 2	harness conn etween coolin IPD Connector E14	nector E14. ng fan relay-4 h DM E/R Terminal 40	arness connector and IPDM E/R harness conne Continuity Existed	ector. J
NO >> Ro 5.CHECK CC 1. Disconneo 2. Check the Cooling fa Connector E57	eplace fuse. DOLING FAN et IPDM E/R h continuity be an relay-4 Terminal 2 e continuity be	harness conn etween coolin IPD Connector E14 etween coolin	nector E14. ng fan relay-4 h DM E/R Terminal 40	arness connector and IPDM E/R harness conne Continuity Existed arness connector and IPDM E/R harness conne	ector. J
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the	eplace fuse. DOLING FAN et IPDM E/R h continuity be an relay-4 Terminal 2 e continuity be	harness conn etween coolin IPD Connector E14 etween coolin	nector E14. ng fan relay-4 h DM E/R Terminal 40 ng fan relay-5 h	arness connector and IPDM E/R harness conne Continuity Existed	ector. J K ector.
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa	eplace fuse. DOLING FAN et IPDM E/R h continuity be an relay-4 Terminal 2 e continuity be an relay-5	harness conn etween coolin IPD Connector E14 etween coolin	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h	arness connector and IPDM E/R harness conne Continuity Existed arness connector and IPDM E/R harness conne	ector. J
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59	eplace fuse. DOLING FAN et IPDM E/R h continuity be an relay-4 Terminal 2 e continuity be an relay-5 Terminal 2 2	harness conn etween coolin IPD Connector E14 etween coolin IPD Connector E14	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal	Continuity Existed Continuity Existed Continuity Continuity Existed	ector. J K ector.
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also checc Is the inspection	eplace fuse. DOLING FAN ct IPDM E/R h e continuity be an relay-4 Terminal 2 e continuity be an relay-5 Terminal 2 k harness for on result norm	harness conn etween coolin IPD Connector E14 etween coolin IPD Connector E14 short to grou	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40	Continuity Existed Continuity Existed Continuity Continuity Existed	ector. J K ector. L
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also checc Is the inspection YES >> G	eplace fuse. OOLING FAN ct IPDM E/R h continuity be an relay-4 Terminal 2 continuity be an relay-5 Terminal 2 k harness for on result norm O TO 11.	harness connetween coolin IPD Connector E14 etween coolin IPD Connector E14 short to grou nal?	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to	Continuity Existed Continuity Existed Continuity Continuity Existed D power.	ector. J K ector.
NO $>> Re$ 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also check is the inspection YES $>> G$ NO $>> Re$	eplace fuse. DOLING FAN et IPDM E/R h e continuity be an relay-4 Terminal 2 e continuity be an relay-5 Terminal 2 k harness for on result norm O TO 11. epair open cir	harness connector IPD Connector E14 etween coolin IPD Connector E14 short to grou nal?	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to	Continuity Existed Continuity Existed Continuity Continuity Existed	ector. J K ector. L
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also checc Is the inspection YES >> G	eplace fuse. DOLING FAN et IPDM E/R h e continuity be an relay-4 Terminal 2 e continuity be an relay-5 Terminal 2 k harness for on result norm O TO 11. epair open cir	harness connector IPD Connector E14 etween coolin IPD Connector E14 short to grou nal?	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to	Continuity Existed Continuity Existed Continuity Continuity Existed D power.	ector. J K ector. L
NO $>> Response of the second second$	eplace fuse. DOLING FAN ct IPDM E/R h e continuity be an relay-4 Terminal 2 e continuity be an relay-5 Terminal 2 k harness for on result norm O TO 11. epair open cir ROUND CONI	harness connetween coolin IPD Connector E14 etween coolin IPD Connector E14 short to grou nal? rcuit or short to INECTION F and wait at	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to to ground or sh t least 20 secor	Continuity Existed arness connector and IPDM E/R harness connector arness connector and IPDM E/R harness connector Continuity Existed o power.	ector. J K ector. L M
NO >> Re 5.CHECK CC 1. Disconnec 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also checc Is the inspection YES >> G NO >> Re 6.CHECK GF 1. Turn ignition 2. Check groups of the second secon	eplace fuse. OOLING FAN ct IPDM E/R h continuity be an relay-4 Terminal 2 continuity be an relay-5 Terminal 2 k harness for on result norm O TO 11. epair open cir ROUND CONI fon switch OFf ound connection	harness connetween coolin IPD Connector E14 etween coolin IPD Connector E14 short to grou nal? rcuit or short f INECTION F and wait at ion E21 and F	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to to ground or sh t least 20 secor	Continuity Existed Continuity Existed Continuity Continuity Existed Do power.	ector. J K ector. L M N
NO >> Re <b>5.</b> CHECK CC 1. Disconnect 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also chect YES >> G NO >> Re <b>6.</b> CHECK GF 1. Turn igniti 2. Check gro	eplace fuse. OOLING FAN ct IPDM E/R h continuity be an relay-4 Terminal 2 continuity be an relay-5 Terminal 2 continuity be an relay-5 Terminal 2 continuity be an relay-5 Terminal 2 continuity be an relay-5 Continuity be an relay-5 Continuity be continuity be contin	harness connetween coolin IPD Connector E14 etween coolin IPD Connector E14 short to grou nal? rcuit or short f INECTION F and wait at ion E21 and F	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to to ground or sh t least 20 secor	Continuity Existed arness connector and IPDM E/R harness connector arness connector and IPDM E/R harness connector Continuity Existed o power.	ector. J K ector. L M
NO >> Re <b>5.</b> CHECK CC 1. Disconnect 2. Check the Cooling fa Connector E57 3. Check the Cooling fa Connector E59 4. Also chect S the inspection YES >> G <b>6.</b> CHECK GF 1. Turn igniti 2. Check groups S the inspection S the inspecti	eplace fuse. OOLING FAN ct IPDM E/R h continuity be an relay-4 Terminal 2 continuity be an relay-5 Terminal 2 k harness for on result norm O TO 11. epair open cir ROUND CONI fon switch OFf ound connection	harness connetween coolin IPD Connector E14 etween coolin IPD Connector E14 Connector E14 short to grou nal? rcuit or short f INECTION F and wait at ion E21 and F nal?	nector E14. ng fan relay-4 h DM E/R 40 ng fan relay-5 h DM E/R Terminal 40 und and short to to ground or sh t least 20 secor E38. Refer to G	Continuity Existed arness connector and IPDM E/R harness connector arness connector and IPDM E/R harness connector Continuity Existed o power.	ector. J K ector. L M N

Disconnect cooling fan motor-1 harness connector.
 Check the continuity between IPDM E/R harness connector and ground.

# **ECR-285**

IPDM	IPDM E/R		Continuity	
Connector	Terminal	Ground	Continuity	
E11	11	Ground	Existed	

4. Check the continuity between cooling fan motor-1 harness connector and ground.

Cooling fa	Cooling fan motor-1		Continuity	
Connector	Terminal	Ground	Continuity	
E53	3	Ground	Existed	
E00	4	Giouna	Existed	

5. Check the continuity between cooling fan relay-5 harness connector and ground.

Cooling fa	Cooling fan relay-5		Continuity	
Connector	Terminal	Ground	Continuity	
E59	5	Ground	Existed	

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

Is the inspection result normal?

YES >> GO TO 8.

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

 $\mathbf{8}$ . CHECK COOLING FAN CONTROL CIRCUIT FOR OPEN AND SHORT

1. Disconnect IPDM E/R harness connectors E10, E13 and E15.

2. Check the continuity between IPDM E/R harness connector and cooling fan relay-4 harness connector.

IPDM E/R		Cooling fan relay-4		Continuity
Connector	Terminal	Connector Terminal		Continuity
E10	7		3	
LIU	8	E57	5	Existed
E13	1		1	
	Connector E10	Connector Terminal E10 7 8	ConnectorTerminalConnectorE1078E57	ConnectorTerminalConnectorTerminalE10738E575

3. Check the continuity between IPDM E/R harness connector and cooling fan relay-5 harness connector.

IPDM	IPDM E/R		Cooling fan relay-5	
Connector	Terminal	Connector Terminal		Continuity
E15	50	E59	1	Existed

4. Check the continuity between IPDM E/R harness connector and cooling fan motor-1 harness connector.

_	IPDM	E/R	Cooling fan motor-1		Continuity
_	Connector	Terminal	Connector Terminal		Continuity
	E10	4	E53	1	Existed
	LIU	8	L33	2	Existed

5. Check the continuity between IPDM E/R harness connector and cooling fan motor-2 harness connector.

IPDM	E/R	Cooling fai	n motor-2	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E10	7	E54	3	Existed

<sup>6.</sup> Check the continuity between cooling fan motor-2 harness connector and cooling fan relay-5 harness connector.

#### ECR-286

#### < COMPONENT DIAGNOSIS >

[M9R]

Cooling fan motor-2		Cooling fan relay-5		Question it.		
Connector	Terminal	Connector	Terminal	Continuity		-
E54	4	E59	3	Existed		
7. Also check	harness f	for short to gr	ound and sh	ort to power.		
s the inspection		ormal?				
YES >> GO NO >> Rep		circuit or sho	rt to around	or short to power	in harness or conne	otore
<b>9.</b> CHECK COC			it to ground			501013.
			etiere (Ceelie			
Refer to <u>ECR-28</u> s the inspectior				<u>ig Fan Reiay)</u> .		
	TO 10.	<u>Jinai:</u>				
		functioning co	ooling fan re	lay.		
<b>10.</b> снеск со	OOLING	FAN MOTOR				
Refer to ECR-2	87, "Com	ponent Inspe	ction (Coolir	ng Fan Motor)".		
s the inspection						
	TO 11.	line of the second second	_			
		ling fan motoi				
11.CHECK IN			NI			
Refer to <u>GI-39,</u>						
<u>s the inspectior</u> YES >> Rep						
	place IPD	blace harness	or connecto	or.		
Component	Inspect	ion (Coolir	ng Fan Me	otor)		INEOID-00000001207576
	-		-	otor)		INFOID:000000001307576
Component 1.снеск сос	-		-	otor)		INFOID:000000001307576
<b>1.</b> CHECK COC 1. Turn ignition	DLING FA	N MOTORS-	1AND -2			INFOID:000000001307576
LCHECK COC Turn ignition Disconnect	DLING FA n switch C cooling fa	AN MOTORS- DFF. an motor harr	1AND -2	tor.	ck operation.	INFOID:000000001307576
LCHECK COC Turn ignition Disconnect	DLING FA n switch C cooling fa	AN MOTORS- DFF. an motor harr	1AND -2		ck operation.	INFOID:000000001307576
1.CHECK COC 1. Turn ignition 2. Disconnect 3. Supply cool	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals	1AND -2	tor. y voltage and che	ck operation.	INFOID:000000001307576
LCHECK COC Turn ignition Disconnect	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals	1AND -2 ness connec s with batter	tor. y voltage and che	ck operation.	INFOID:000000001307576
1.CHECK COC 1. Turn ignition 2. Disconnect 3. Supply cool	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals	1AND -2 ness connec s with batter	tor. y voltage and che terminals	ck operation.	INFOID:000000001307576
CHECK COC     Turn ignition     Disconnect     Supply cool     Cooling fan sp	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harr notor terminals <u>Coo</u> (+)	1AND -2 ness connec s with batter	tor. y voltage and che terminals (-)	ck operation. - - -	INFOID:000000001307576
<b>1.</b> CHECK COC 1. Turn ignition 2. Disconnect 3. Supply cool	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals Coo (+) 1 2 1 and 2	1AND -2 ness connec s with batter	tor. y voltage and che terminals (-) 3 and 4	ck operation. - - - -	INFOID:000000001307576
<b>1.</b> CHECK COC 1. Turn ignition 2. Disconnect 3. Supply cool Cooling fan sp Middle (MID)	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals (+) 1 2 1 and 2 1 and 2	1AND -2 ness connec s with batter	tor. y voltage and che terminals (-) 3 and 4 3 and 4 3 4	ck operation.	INFOID:000000001307576
<b>1.</b> CHECK COC 1. Turn ignition 2. Disconnect 3. Supply cool Cooling fan sp Middle (MID) High (HI)	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals Coo (+) 1 2 1 and 2 1 and 2 1 and 2 1 and 2	1AND -2 ness connec s with batter	tor. y voltage and che terminals (-) 3 and 4 3 and 4 3	ck operation. - - - - - - -	INFOID:000000001307576
<ul> <li>CHECK COC</li> <li>Turn ignition</li> <li>Disconnect</li> <li>Supply cool</li> <li>Cooling fan sp</li> <li>Middle (MID)</li> <li>High (HI)</li> <li>s the inspectior</li> </ul>	DLING FA n switch C cooling fa ling fan m	AN MOTORS- DFF. an motor harm notor terminals (+) 1 2 1 and 2 1 and 2 1 and 2 1 and 2 0 0000000000000000000000000000000000	1AND -2 ness connec s with batter	tor. y voltage and che terminals (-) 3 and 4 3 and 4 3 4	ck operation. - - - - - -	INFOID:000000001307576
<ul> <li><b>1.</b>CHECK COC</li> <li>Turn ignition</li> <li>Disconnect</li> <li>Supply cool</li> <li>Cooling fan sp</li> <li>Middle (MID)</li> <li>High (HI)</li> <li>s the inspection</li> <li>YES &gt;&gt; INS</li> </ul>	DLING FA n switch ( cooling fa ling fan m peed	AN MOTORS- DFF. an motor harm notor terminals (+) (+) 1 2 1 and 2 1 and 2 1 and 2 1 and 2 0rmal? N END	1AND -2 ness connec s with batter	tor. y voltage and che terminals (-) 3 and 4 3 and 4 3 4	ck operation. - - - - - -	INFOID:000000001307576
1.CHECK COC         1. Turn ignition         2. Disconnect         3. Supply cool         Cooling fan sp         Middle (MID)         High (HI)         s the inspection         YES       >> INS         NO       >> Rep	DLING FA	AN MOTORS- DFF. an motor harm notor terminals (+) 1 2 1 and 2 1 and 2 1 and 2 1 and 2 0rmal? N END ling fan motor	1AND -2 ness connec s with batter ling fan motor f	tor. y voltage and che terminals (-) 3 and 4 3 and 4 3 4 3 and 4	ck operation. - - - -	
<ul> <li><b>1.</b>CHECK COC</li> <li>Turn ignition</li> <li>Disconnect</li> <li>Supply cool</li> <li>Cooling fan sp</li> <li>Middle (MID)</li> <li>High (HI)</li> <li>s the inspection</li> <li>YES &gt;&gt; INS</li> </ul>	DLING FA	AN MOTORS- DFF. an motor harm notor terminals (+) 1 2 1 and 2 1 and 2 1 and 2 1 and 2 0rmal? N END ling fan motor	1AND -2 ness connec s with batter ling fan motor f	tor. y voltage and che terminals (–) 3 and 4 3 and 4 3 4 3 and 4	ck operation. - - - -	INFOID:000000001307576
1.CHECK COC         1. Turn ignition         2. Disconnect         3. Supply cool         Cooling fan sp         Middle (MID)         High (HI)         s the inspection         YES       >> INS         NO       >> Rep	DLING FA n switch C cooling fa ling fan m beed	AN MOTORS- DFF. an motor harm notor terminals (+) (+) 1 2 1 and 2 1 and 2 1 and 2 1 and 2 0rmal? N END ling fan motor cion (Coolir	1AND -2 ness connects with batter ling fan motor f	tor. y voltage and che terminals (–) 3 and 4 3 and 4 3 4 3 and 4	ck operation.	
<ul> <li>CHECK COC</li> <li>Turn ignition</li> <li>Disconnect</li> <li>Supply cool</li> <li>Cooling fan sp</li> <li>Middle (MID)</li> <li>High (HI)</li> <li>s the inspection</li> <li>YES &gt;&gt; INS</li> <li>NO &gt;&gt; Rep</li> <li>Component</li> </ul>	DLING FA n switch C cooling fa ling fan m peed	AN MOTORS- DFF. an motor harm notor terminals (+) 1 2 1 and 2 1 and 2 1 and 2 2 1 and 2 0rmal? N END ling fan motor ion (Coolir	1AND -2 ness connects with batter ling fan motor f	tor. y voltage and che terminals (–) 3 and 4 3 and 4 3 4 3 and 4	ck operation.	

#### < COMPONENT DIAGNOSIS >

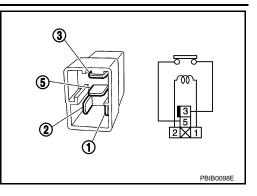
3. Check the continuity between cooling fan relay terminals under the following conditions.

Terminals	Conditions	Continuity
3 and 4	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 cooling fan relay.



#### **Reference Value**

#### VALUES ON THE DIAGNOSIS TOOL

Remarks:

• Specification data are reference values.

• Specification data are output/input values which are detected or supplied by the ECM at the connector.

\* Specification data may not be directly related to their components signals/values/operations.

Le. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. this IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

Monitor item		condition	Values/Status
IGN SW	• Ignition switch: $ON \rightarrow OFF$ –	→ ON	$\begin{array}{l} PRESENT \rightarrow ABSENT \rightarrow \\ PRESENT \end{array}$
	Engine: Running	Engine coolant: Less than 50°C (122°F)	ACTIV
GLOW CONT	(Less than 60 seconds after starting engine.)	Engine coolant: More than 80°C (176°F)	INACT
CLUTCH STATUS	<ul> <li>Ignition switch: ON</li> </ul>	Clutch pedal: Fully released	NO
CLUTCH STATUS	• Ignition switch. ON	Clutch pedal: Slightly depressed	YES
A/C RELAY	Engine: After warming up,	Air conditioner switch: OFF	NODON
A/C RELAT	idle the engine	Air conditioner switch: ON	DONE
	Ignition switch: ON		+APC
ENGINE STATUS	Engine: Running (Less than	60 seconds after starting engine.)	RUN
	Ignition switch: OFF     (A few seconds after turning	ignition switch OFF)	OFF
	• Ignition owitch: ON	Brake pedal: Fully released	RELSD
BPP SW	Ignition switch: UN	Brake pedal: Slightly depressed	PRSSD
	Engine: After warming up,	Air conditioner switch: OFF	NO
A/C APPLD	<ul> <li>Engine: After warming up, idle the engine</li> <li>Engine: Running (Less than 60 seconds after starting engine.)</li> </ul>	Air conditioner switch: ON	YES
		Engine coolant: Less than 50°C (122°F)	PRESENT
GLOW CONT SIGNAL		Engine coolant: More than 80°C (176°F)	ABSENT
	Engine: After warming up,	Engine coolant: 99°C (210°F) or less	ACTIV
COOLING FAN LOW	<ul><li>idle the engine</li><li>Air conditioner switch: OFF</li></ul>	Engine coolant: 102°C (216°F) or more	INACT
	• Engine: After warming up,	Engine coolant: 99°C (210°F) or less	INACT
COOLING FAN HIGH	<ul> <li>idle the engine</li> <li>Ignition switch: ON</li> <li>Engine: Running (Less than 60)</li> <li>Ignition switch: OFF (A few seconds after turning ig</li> <li>Ignition switch: ON</li> <li>Ignition switch: ON</li> <li>Engine: After warming up, idle the engine</li> <li>Engine: Running (Less than 60 seconds after starting engine.)</li> <li>Engine: After warming up, idle the engine</li> <li>Air conditioner switch: OFF</li> <li>Engine: After warming up, idle the engine</li> <li>Air conditioner switch: OFF</li> <li>Ignition switch: ON</li> <li>Ignition switch: ON</li> <li>Engine: After warming up,</li> </ul>	Engine coolant: 102°C (216°F) or more	ACTIV
		ECM-TCM communication: Communicated	PRESENT
ECM-TCM COMM	Ignition switch: ON	ECM-TCM communication: Not communi- cated	ABSENT
A/C COMP	Engine: After warming up,	Air conditioner switch: OFF	INACT
	idle the engine	Air conditioner switch: ON	ACTIV
	• Ignition switch: ON	NATS code registration: Not registered.	NO
NATS CODE RGST	• ignition switch: ON	NATS code registration: Registered.	YES
	• Ignition switch: ON	Clutch pedal: Fully released	INACT
CPP SW	idle the engine       ,         Ignition switch: ON       Engine: Running (Less than 60)         Ignition switch: OFF       (A few seconds after turning ignition switch: ON)       1         Ignition switch: ON       1         Ignition switch: ON       1         Engine: After warming up, idle the engine       1         Engine: Running (Less than 60 seconds after starting engine.)       1         Engine: Running (Less than 60 seconds after starting engine.)       1         Engine: After warming up, idle the engine       1         Air conditioner switch: OFF       1         Ignition switch: ON       1         Ignition swit	Clutch pedal: Slightly depressed	ACTIV
	<ul> <li>idle the engine</li> <li>Ignition switch: ON</li> <li>Engine: Running (Less than</li> <li>Ignition switch: OFF (A few seconds after turning</li> <li>Ignition switch: ON</li> <li>Engine: After warming up, idle the engine</li> <li>Engine: Running (Less than 60 seconds after starting engine.)</li> <li>Engine: After warming up, idle the engine</li> <li>Air conditioner switch: OFF</li> <li>Engine: After warming up, idle the engine</li> <li>Air conditioner switch: OFF</li> <li>Ignition switch: ON</li> <li>Engine: After warming up, idle the engine</li> <li>Air conditioner switch: OFF</li> <li>Ignition switch: ON</li> <li>Ignition switch: ON</li> <li>Ignition switch: ON</li> </ul>	Not warm-up condition	INACT
EGR BYPAS S/V		Warm-up condition	ACTIV

# INFOID:000000001521459

[M9R]

ECR

С

А

#### < ECU DIAGNOSIS >

Monitor item		condition	Values/Status
TURBO COOL PUMP	Engine Running	Engine coolant temperature: Less than 79°C (174°)	INACT
		Engine coolant temperature: More than 80°C (176°)	ACTIV
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT1	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT2	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT3	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT4	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT5	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT6	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT7	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT8	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF

#### < ECU DIAGNOSIS >

# [M9R]

Monitor item		condition	Values/Status
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT9 • Igniti	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT10	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
RGN REQ STAT1	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
		Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine stopped	STAT1
		Incomplete condition of DPF regeneration: Engine starting	STAT2
RGN REQ STAT2		Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine stopped	STAT1
		Incomplete condition of DPF regeneration: Engine starting	STAT2
RGN REQ STAT3		Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
		Incomplete condition of DPF regeneration: Engine starting	STAT2
GN REQ STAT4	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
		Incomplete condition of DPF regeneration: Engine starting	STAT2
GN REQ STAT5	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4

#### < ECU DIAGNOSIS >

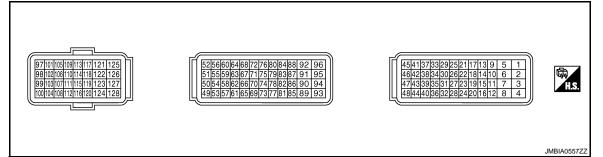
Monitor item		condition	Values/Status
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
RGN REQ STAT6 • 1 RGN REQ STAT7 • 1 RGN REQ STAT8 • 1 RGN REQ STAT9 • 1 RGN REQ STAT9 • 1 EGR COOL BYPAS/V • 1 EGR/V TRG ANGLE • 1		Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
RGN REQ STAT7	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
KGIN KEQ STAT		Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
DON DEO STATS	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
RGN REQ STAT8	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
RGN REQ STAT9	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine stopped	STAT1
		Incomplete condition of DPF regeneration: Engine starting	STAT2
		Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
		Incomplete condition of DPF regeneration: Engine stopped	STAT1
		Incomplete condition of DPF regeneration: Engine starting	STAT2
KGN REQ STATTO	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
EGR COOL BYDAS//	Engine Running	Not warm-up condition	INACT
		Warm-up condition	ACTIV
	Ignition switch: ON		Less than 1%
	Engine idle		Approx. 20 - 30%
TRG RAIL PRES	Engine Running		Approx. 10 bar
TRG BOOST PRES	Engine Running	Idle speed	ApproxApprox. Atmospheric pressure
		Engine speed: 2000 rpm	Approx. 10 bar (1000 mbar)
INJ VOLUME	Engine Running	Idle speed	Approx. 5 - 10 mg/cp
		Engine speed: 2000 rpm	Approx. 5 - 10 mg/cp

# [M9R]

Monitor item		condition	Values/Status
	Ignition owitch: ON	Accelerator pedal: Fully released	0%
ACCEL PDL POS	Ignition switch: ON	Accelerator pedal: Fully depressed	100%
			Altitude Approx. 0 m: Approx. 1.0062 bar (100.62 mbar, 1.062kg / cm <sup>2</sup> , 14.59 psi) Approx. 1,000 m: Approx. 0.8895 bar (88.95 mbar,
BARO PRES	Ignition switch: ON		0.907kg /cm <sup>2</sup> , 12.90 psi) Approx. 1,500 m: Approx. 0.8316 bar (93.16 mbar, 0.848 kg /cm <sup>2</sup> , 12.06 psi) Approx. 2,000 m: Approx. 0.7836 bar (78.36 mbar, 0.799
			kg /cm <sup>2</sup> , 11.36 psi)
FUEL RAIL PRES	Engine Running		Approx. 9 - 11 bar
TC BOOST PRES	Engine Running	Idle speed	Approx. Atmospheric pres- sure
		Engine speed: 2000 rpm	Approx. 10 bar (1000 mbar)
EGR VALVE POS	Engine idle		Approx. 20 - 90%
ENG SPEED	Run engine and compare tion.	CONSULT-III value with the tachometer indica-	Almost the same speed as the tachometer indication
INT AIR TEMP	Ignition switch: ON		Indicates intake air tempera- ture
EXT AIR TEMP	Ignition switch: ON		Indicates external air temper- ature
FUEL TEMP	<ul> <li>Ignition switch: ON</li> </ul>	Ignition switch: ON	
ENG COOLAN TEMP	Ignition switch: ON		Indicates engine coolant tem- perature
BAT VOLT	<ul> <li>Ignition switch: ON</li> </ul>		11 - 14V
EGR POS/S VOLT	Engine idle		Approx. 1 - 4.2V
FRP SEN VOLT	Engine Running	Idle speed	Approx. 1V (1000 mV)
		Engine speed: 2000 rpm	Approx. 1.8V (1800 mV)
FUEL TEMP/S VOLT	Engine Running		0.3 - 5.0V (300 - 5000 mV) Output voltage varies with fuel temperature.
IAT SEN VOLT	Engine Running		0.3 - 5.0V (300 - 5000 mV) Output voltage varies with ina- take air temperature.
ECT SEN VOLT	Engine Running	Engine Running	
	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 4.6V (600 - 4600 mV)
ALL OLIVE VOLI		Accelerator pedal: Fully depressed	Less than 5V (5000 mV)
APP SEN2 VOLT	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.3V (300 mV)
		Accelerator pedal: Fully depressed	Less than 2.5V (2500 mV)
TRG IDLE SPD	• Engine: After warming up,	idle the engine	750 ± 50 tr/min
TC BST PR/S VOLT	COOLAN TEMP       • Ignition switch: ON         VOLT       • Ignition switch: ON         POS/S VOLT       • Engine idle         SEN VOLT       • Engine Running         - TEMP/S VOLT       • Engine Running         - TEMP/S VOLT       • Engine Running         SEN VOLT       • Engine Running         SEN VOLT       • Engine Running         SEN VOLT       • Ignition switch: ON         SEN VOLT       • Ignition switch: ON         SEN1 VOLT       • Ignition switch: ON         IDLE SPD       • Engine: After warming up, idl	Idle speed	Approx. 1.2V (1200 mV)
INT AIR TEMP EXT AIR TEMP FUEL TEMP ENG COOLAN TEMP BAT VOLT EGR POS/S VOLT FRP SEN VOLT FUEL TEMP/S VOLT AT SEN VOLT ECT SEN VOLT APP SEN1 VOLT APP SEN2 VOLT		Engine speed: 2000 rpm	Approx. 1.8V (1800 mV)

Monitor item		condition	Values/Status
		Ignition switch: ON (Engine stopped)	Approx. 0.4V (400 mV)
	<ul> <li>Engine: After warming up</li> <li>Air conditioner switch: OFF</li> </ul>	Idle speed	1.1 - 1.4V (1100 - 1400 mV)
MAF SEN VOLT	<ul> <li>Shift lever: P or N (A/T), Neutral (M/T)</li> <li>No load</li> </ul>	Engine is revving form idle to about 4,000 rpm	1.1 - 1.4V (1100 - 1400 mV) to 4.0V (40000 mV) (Check for liner voltage rise in response to engine being in- creased to about 4,000 rpm.)
RFRG PRE/S VOLT	<ul> <li>Engine: After warming up</li> <li>Both A/C switch and blower to (Compressor operates)</li> </ul>	fan switch: ON	1 - 1.25 V (1000 - 1250 mV)
INJ1 ADJ VALUE		Idle speed	Approx. 5- 10 mg/cp
INJT ADJ VALUE	Engine Running	Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
INJ2 ADJ VALUE	Engine Running	Idle speed	Approx. 5- 10 mg/cp
INJZ ADJ VALUE		Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
INJ3 ADJ VALUE	Engine Running	Idle speed	Approx. 5- 10 mg/cp
INJS ADJ VALUE		Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
INJ4 ADJ VALUE	Engine Running	Idle speed	Approx. 5- 10 mg/cp
INJ4 ADJ VALUE		Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
EXH GAS TEMP2	<ul><li>Engine: After warming up</li><li>Drive the vehicle at a speed</li></ul>	of 120 km/h (75 MPH) for at least 2 minutes	Approx. 60°C (140°F) - 950°C (1742°F)
EXH GAS TEMP3	<ul><li>Engine: After warming up</li><li>Reving engine from idle up to</li></ul>	o 3000rpm at least 60 seconds.	Approx. 230°C (446°F) - 950°C (1742°F)
DIFF EXH PRES	Engine: 2000 rpm		Approx. 30 mbar
ASCD SET SPEED	Engine Running	ASCD: Operating	Almost the same speed as the tachometer indication.
		Idle speed	Approx. 1 V (1000 mV)
EX GAS PR/S VOLT	Engine Running	Engine speed: 2000 rpm	Approx. 1.4 V (1400 mV)
		A/T gear position: Neutral	STAT1
		A/T gear position: 1st gear	STAT1
		A/T gear position: 2nd gear	STAT2
	• Ignition outtoby ON	A/T gear position: 3rd gear	STAT3
A/T GEAR POS	Ignition switch: ON	A/T gear position: 4th gear	STAT4
		A/T gear position: 5th gear	STAT5
		A/T gear position: 6th gear	STAT6
		A/T gear position: Reverse gear	BACK

#### **TERMINAL LAYOUT**



#### PHYSICAL VALUES

#### NOTE:

• ECM is located near the battery in the engine room.

• Pulse signal is measured by CONSULT-III.

#### CAUTION:

# Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in dam-age to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

А

ECR

Termin (Wire		Description		Condition	Value
+	_	Signal name	Input/ Output	Condition	(Approx.)
1 (GR)		Fuel injector No. 4		[Engine is running] • Warm-up condition	0 - 5 V★ 50mSec/div
2 (W)	128	Fuel injector No. 1		<ul> <li>Idle speed</li> <li>NOTE:</li> <li>The pulse cycle changes depending on rpm at idle.</li> </ul>	50V/div JMBIA0530GB
3 (Y)	(B)	Fuel injector No. 2	Input		5 - 8 V★ 50mSec/div
4 (G)		Fuel injector No. 3		<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed: 2,000 rpm</li> </ul>	50V/div JMBIA0531GB
5 (O)		Fuel injector power supply No. 4		[Engine is running] • Warm-up condition	0 - 4 V★ 50mSec/div
6 (R)	128	Fuel injector power supply No. 1		Idle speed     NOTE:     The pulse cycle changes depending     on rpm at idle.	50V/div JMBIA0532GB
7 (L)	(B)	Fuel injector power supply No. 2	Output		4 - 6 V★ 50mSec/div
8 (BR)		Fuel injector power supply No. 3		<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed: 2,000 rpm</li> </ul>	50V/div JMBIA0533GB
9 (B)	128 (B)	Glow control unit ground	_	[Engine is running] • Warm-up condition • Idle speed	0 V
10 (Y)	_	Sensor ground (Exhaust gas temperature sensor 1)	_	_	_
12 (P)	128 (B)	Air fuel ratio sensor heater	Output	<ul> <li>[Engine is running]</li> <li>After the vehicle is driven for 6 minutes under the following conditions</li> <li>Warm-up condition</li> <li>Vehicle speed: 80 km/h</li> <li>Shift lever: Suitable gear position</li> </ul>	6 - 14 V★ 10mSec/div F 5V/div JMBIA0534GB
				[Ignition switch ON] • Engine: Stopped	BATTERY VOLTAGE (11 - 14 V)

	nal No. color)	Description		Condition	Value								
+	-	Signal name	Input/ Output	Condition	(Approx.)								
14 (SB)	10 (Y)	Exhaust gas temperature sensor 1	Input	[Engine is running] • Warm-up condition • Idle speed	0.3 - 5.0 V Output voltage varies with exhaust gas temperature.								
16 (Y)	_	Sensor ground (Exhaust gas pressure sensor)	_	_	_								
17 (O)	_	Sensor ground (Turbocharger boost sen- sor)	_	_	_								
18	17	Turbocharger boost sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.2 V								
(LG)	(O)	Turbocharger boost sensor	input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	1.3 V								
19 (G)	23 (Y)	Exhaust gas temperature sensor 3	Input	[Engine is running] • Warm-up condition • Idle speed	0.3 - 5.0 V Output voltage varies with exhaust gas temperature.								
20	25	25 Exhaust gas pressure sen- (O) sor	5 1	Input	[Engine is running] • Warm-up condition • Idle speed	1 V							
(R)	(O)			sor	sor	sor	sor	sor	sor	sor	sor	sor	• Warr
21 (BR)	17 (O)	Sensor power supply (Turbocharger boost sen- sor)	_	[Ignition switch: ON]	5 V								
22 (W)	_	Sensor ground (Fuel temperature sensor)	_	_	-								
23 (Y)	_	Sensor ground (Exhaust gas temperature sensor 3)	_	_	_								
24 (O)	_	Sensor ground (Engine coolant tempera- ture sensor)		_	_								
25 (SB)	16 (Y)	Sensor power supply (Exhaust gas pressure sensor)		[Ignition switch: ON]	5 V								
26 (V)	22 (W)	Fuel temperature sensor	Input	[Engine is running] • Warm-up condition	0.3 - 5.0 V Output voltage varies with fuel tem- perature.								
27 (GR)	39 (L)	Exhaust gas temperature sensor 2	Input	[Engine is running] • Warm-up condition • Idle speed	0.3 - 5.0 V Output voltage varies with exhaust gas temperature.								
28 (P)	24 (O)	Engine coolant tempera- ture sensor	Input	[Engine is running] • Warm-up condition	0.3 - 5.0 V Output voltage varies with engine coolant temperature.								
29 (G)	34 (Y)	Sensor power supply (Fuel rail pressure sensor)	_	[Ignition switch: ON]	5 V								

### < ECU DIAGNOSIS >

Termir (Wire	nal No. color)	Description		Condition	Value	A
+	_	Signal name	Input/ Output	Condition	(Approx.)	
30	34		Input	[Engine is running] • Warm-up condition • Idle speed	1 V	ECR
(L)	(Y)	Fuel rail pressure sensor	input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.8 V	С
31 (SB)	35 (V)	Refrigerant pressure sen- sor	Input	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Both A/C switch and blower fan switch: ON (Compressor operates)</li> </ul>	1 - 2.5 V	D
32 (BR)	36 (R)	EGR volume control valve control position sensor	Input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	1 - 4.2 V	E
33 (GR)	36 (R)	Sensor power supply (EGR volume control valve control position sensor)	_	[Ignition switch: ON]	5 V	F
34 (Y)	_	Sensor ground (Fuel rail pressure sensor)		_	_	G
35 (V)	_	Sensor ground (Refrigerant pressure sen- sor)	_	_	_	Н
36 (R)	_	Sensor ground (EGR volume control valve control position sensor)	_	_	_	I
37 (W)	42 (R)	Sensor power supply (Differential exhaust pres- sure sensor)	_	[Ignition switch: ON]	5 V	J
38 (LG)	42 (R)	Differential exhaust pres- sure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.6 - 4.9 V	K
39 (L)	_	Sensor ground (Exhaust gas temperature sensor 2)	_	_	_	
41 (L)	35 (V)	Sensor power supply (Refrigerant pressure sen- sor)		[Ignition switch: ON]	5 V	L
42 (R)	_	Sensor ground (Differential exhaust pres- sure sensor)	_	_	_	Μ
46 (B)		Sensor ground (Camshaft position sensor)		_	_	Ν

0

Ρ

#### < ECU DIAGNOSIS >

[M9R]

	nal No. color)	Description		Condition	Value
+	_	Signal name	Input/ Output	Condition	(Approx.)
48	46	Camshaft position sensor	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>	0 - 14 V 20mSec/div 20mSec/div 5V/div JMBIA0535GB
(Y)	(B)		niput	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed: 2,000 rpm</li> </ul>	0 - 14 V★ 20mSec/div 5V/div JMBIA0536GB
49	128	Crankshaft position sensor	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>	0 - 3 V 1mSec/div 1mSec/div 1mSec/div 1mSec/div JMBIA0537GB
(L)	(B)	(+)	niput	<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed: 2,000 rpm</li> </ul>	2.5 V★ 1mSec/div 1m
50	128	Crankshaft position sensor		[Engine is running] • Warm-up condition • Idle speed	0 - 4 V★ 1mSec/div
(Y)	(B)	(-)		<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed: 2,000 rpm</li> </ul>	2.5 V★ 1mSec/div 1m

# < ECU DIAGNOSIS >

[M9R]

Termin (Wire	nal No. color)	Description			Value	A	
+	_	Signal name	Input/ Output	Condition	(Approx.)		
53	128	Glow control unit	Output	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Engine coolant temperature: Less than 50 °C (122 °F)</li> </ul>	BATTERY VOLTAGE (11 - 14 V)	EC	
(GR)	(B)		Output	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Engine coolant temperature: More than 80 °C (176 °F)</li> </ul>	BATTERY VOLTAGE (11 - 14 V)	D	
56 (R)	128 (B)	Turbocharger cooling pump relay	Output	<ul> <li>[Engine is running]</li> <li>Warm-up condition (Engine coolant temperature is more than 80 °C)</li> <li>Idle speed (For 5 minutes)</li> </ul>	0 - 1 V	E	
				Except above conditions	BATTERY VOLTAGE (11 - 14 V)	F	
57	128	Turbocharger boost control	Outout	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 - 5 V★ 5 mSec/div 5 mSec/div 10V/div JMBIA0541GB	G	
(V)	(B)	solenoid valve	Output -	Cutput	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0 - 5 V 5mSec/div 5mSec/div 10V/div	J
59	128	EGR cooler bypass valve control solenoid valve	Outrut	<ul><li>[Engine is running]</li><li>Not warm-up condition</li><li>Idle speed</li></ul>	1.5 V	L	
(SB)	(B)		Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)	N	
62 (W)	128 (B)	ECM relay (Self shut-off)	Output	<ul> <li>[Ignition switch: ON]</li> <li>[Ignition switch: OFF]</li> <li>For 20 seconds after turning ignition switch OFF</li> </ul>	0 - 1 V	N	
(**)	(D)			<ul><li>[Ignition switch: OFF]</li><li>More than 20 seconds after turning ignition switch OFF</li></ul>	BATTERY VOLTAGE (11-14 V)	C	
63	128	Glow control unit	Output	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Engine coolant temperature: Less than 50 °C (122 °F)</li> </ul>	Less than 12 V	F	
(O)	(B)	<ul> <li>[Engine is runnin</li> <li>Idle speed</li> <li>Engine coolant t</li> </ul>	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Engine coolant temperature: More than 80 °C (176 °F)</li> </ul>	BATTERY VOLTAGE (11 - 14 V)			
75 (BR)	85 (P)	Sensor power supply (Throttle position sensor)	_	[Ignition switch: ON]	5 V		

	nal No. e color)	Description		Condition	Value
+	-	Signal name	Input/ Output	Condition	(Approx.)
77	128	Air fuel ratio sensor	loout	[Engine is running] • Warm-up condition • Idle speed	3 V
(O)	(B)		Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	3 V
78	128	Air fuel ratio sensor	Input	[Engine is running] • Warm-up condition • Idle speed	2.5 V
(GR)	(B)		input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	2.5 V
				[Ignition switch: ON] • Engine stopped	0.4 V
80 (R)	87 (W)	Mass air flow sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.1 - 1.4 V
				<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine is revving from idle to about 4,000 rpm</li> </ul>	1.1 - 1.4 V to 4.0 V (Check for linear voltage rise in re- sponse to engine being increased to about 4,000 rpm.)
81	128	Air fuel ratio sensor	loout	[Engine is running] • Warm-up condition • Idle speed	3.1 V
(SB)	(B)		Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	3.1 V
82	128	Air fuel ratio sensor	Input	[Engine is running] • Warm-up condition • Idle speed	3.2 V
(V)	(B)		input	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed: 2,000 rpm</li></ul>	3.2 V
83	85	Throttle position sensor	laput	<ul> <li>[Ignition switch: OFF]</li> <li>For 20 seconds after turning ignition switch OFF</li> </ul>	0 - 5 V Output voltage fluctuates between 0 V and 5 V.
(V)	(P)	Throttle position sensor	Input	<ul> <li>[Ignition switch: OFF]</li> <li>More than 20 seconds after turning ignition switch OFF</li> </ul>	0.7 V
84 (B)	87 (W)	Intake air temperature sen- sor	Input	[Engine is running] • Warm-up condition	0.3 - 5.0 V Output voltage varies with intake air temperature.
85 (P)	-	Sensor ground (Throttle position sensor)	_	_	_
87 (W)	_	Sensor ground (Mass air flow sensor/ In- take air temperature sen- sor)		_	_

# < ECU DIAGNOSIS >

[M9R]

	nal No. color)	Description		Condition	Value	A
+	_	Signal name	Input/ Output	Condition	(Approx.)	
89	128			[Engine is running] • Warm-up condition • Idle speed	11 - 14 V★ 10mSec/div 10mSec/div 10mSec/div 10mSec/div 10mSec/div 10mSec/div 10mSec/div 10mSec/div 10mSec/div	C D
(BR)	(B)	Fuel pump	Output	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	8 - 10 V★ 10mSec/div 	E
90	128	Fuel rail pressure control		[Engine is running] • Warm-up condition • Idle speed	0.4 V★ 1mSec/div	G H
(GR)		<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed: 2,000 rpm</li> </ul>	0.4 V★ 1mSec/div 1mSec/div 10V/div JMBIA0546GB	J		
				[Engine is running] • Warm-up condition • Idle speed	0 - 2 V★ 500µSec/div 	L M N
91 (SB)		<ul> <li>[Ignition switch: OFF]</li> <li>For 20 seconds after turning ignition switch OFF</li> </ul>	0 - 2 V★ 500µSec/div	O		
				<ul> <li>[Ignition switch: OFF]</li> <li>More than 20 seconds after turning ignition switch OFF</li> </ul>	0.1 V	

Termin (Wire		Description		Condition	Value
+	_	Signal name	Input/ Output	Condition	(Approx.)
92 (LG)	128 (B)	Throttle control motor (-)		<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	0 V
93 (G) 94 (V)	128 (B)	Power supply for ECM	_	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
95 (P)	128 (B)	EGR volume control valve (DC motor)	Output	<ul> <li>[Ignition switch: OFF]</li> <li>For 20 seconds after the following conditions are met and ignition switch is turned OFF.</li> <li>Warm-up condition</li> <li>Start engine and let it idle for 3 minutes.</li> </ul>	0 - 1 V★ 1mSec/div 5 10V/div JMBIA0549GB 0 - 5 V★
				<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed NOTE: The duty cycle changes depending on EGR volume control valve opera- tion.</li> </ul>	1mSec/div 1mSec/div
				<ul> <li>[Ignition switch: ON]</li> <li>For 3 seconds after ignition switch is turned ON</li> </ul>	0 - 1 VX 1mSec/div
96 (O)	128 (B)	EGR volume control valve (DC motor)	Output	<ul> <li>[Ignition switch: ON]</li> <li>More than 3 seconds after ignition switch is turned ON</li> </ul>	0 - 1 V 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div JMBIA0552GB
				<ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Idle speed</li> <li>NOTE:</li> <li>The duty cycle changes depending on EGR volume control valve opera- tion.</li> </ul>	0 - 5 V★ 1mSec/div 
99 (P)	_	CAN signal (low)			-
100 (L)	_	CAN signal (high)	_	_	_
104 (Y)	128 (B)	Data link connector		[Ignition switch: ON] • GST: Disconnected	BATTERY VALTAGE (11 - 14 V)



# < ECU DIAGNOSIS >

[M9R]

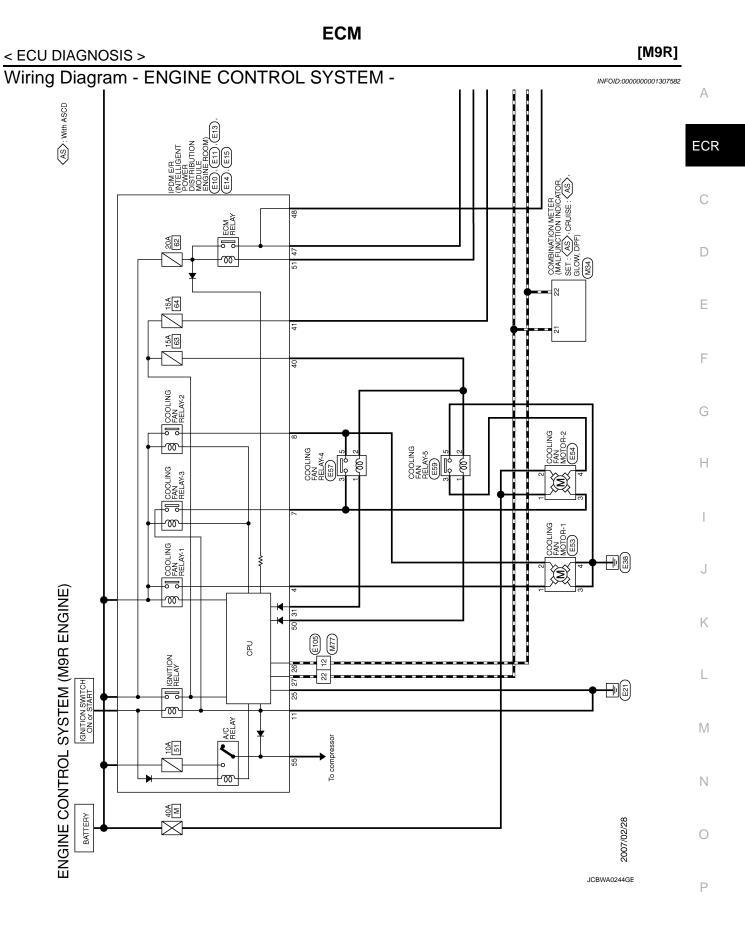
Termin (Wire		Description		Condition	Value	A
+	_	Signal name	Input/ Output	Condition	(Approx.)	
108 (G)* <sup>1</sup>	128	Clutch pedal position	Input	<ul><li>[Ignition switch: ON]</li><li>Clutch pedal: Slightly depressed</li></ul>	0 V	ECR
(SB)* <sup>2</sup>	(B)	switch	input	[Ignition switch: ON] • Clutch pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)	С
109	128			[Ignition switch: OFF]	0 V	
(LG)	(B)	Ignition switch	Input	[Ignition switch: ON]	BATTERY VOLATGE (11 - 14 V)	D
				[Ignition switch: ON] • ASCD steering switch: OFF	4 V	_
				[Ignition switch: ON] <ul> <li>MAIN switch: Pressed</li> </ul>	0 V	E
110 (V)	111 (B)	ASCD steering switch	Input	[Ignition switch: ON] • CANCEL switch: Pressed	1 V	F
(1)	(2)			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3 V	G
				[Ignition switch: ON] <ul> <li>SET/COAST switch: Pressed</li> </ul>	2 V	
111 (B)	_	ASCD steering switch ground	_	_	_	Н
116	128	Brake pedal position	Input	[Ignition switch: ON] • Brake pedal: Slightly depressed	0V	I
(GR)	(B)	switch	Input	[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VAOLTAGE (11 - 14 V)	
118 (L)	120 (P)	Sensor power supply (Accelerator pedal position sensor 2)	_	[Ignition switch: ON]	5 V	J
119	120	Accelerator pedal position	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully released</li></ul>	More than 0.3 V	К
(V)	(P)	sensor 2	Input	<ul><li>[Ignition switch: ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully depressed</li></ul>	Less than 2.5 V	L
120 (P)	_	Sensor ground (Accelerator pedal position sensor 2)		_	_	M
122 (G)	127 (Y)	Sensor power supply (Accelerator pedal position sensor 1)	_	[Ignition switch: ON]	5 V	Ν
123 (B)						
124	_	ECM ground	_	_	_	0
(B) 125 (B)						Р
(B) 126	127	Accelerator pedal position	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 4.6 V	
(VV)	(Y)	sensor 1	por	<ul><li>[Ignition switch ON]</li><li>Engine stopped</li><li>Accelerator pedal: Fully depressed</li></ul>	Less than 5 V	

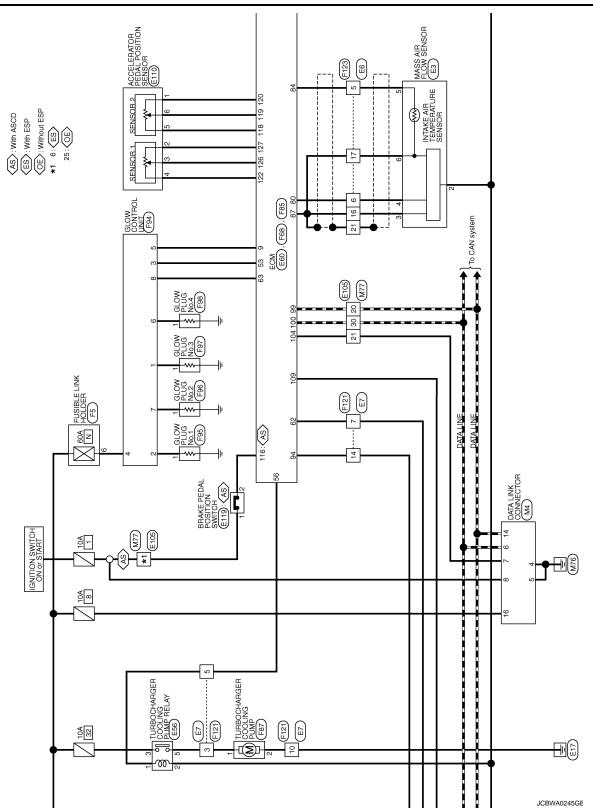
	nal No. color)	Description		Condition	Value
+	-	Signal name	Input/ Output		(Approx.)
127 (Y)	_	Sensor ground (Accelerator pedal position sensor 1)	_	_	_
128 (B)	_	ECM ground	_	_	_

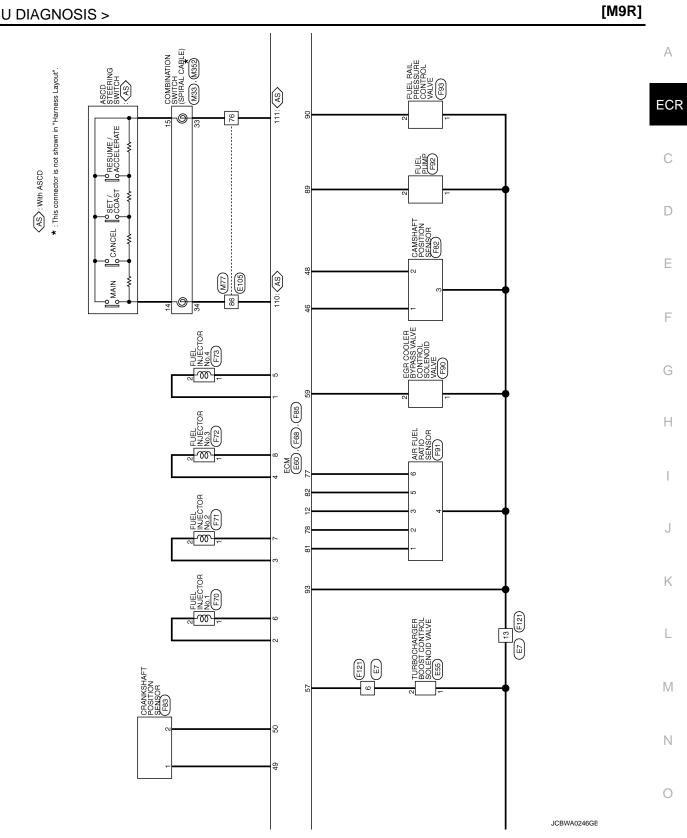
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

\*1: M/T models with ESP

\*2: M/T models without ESP





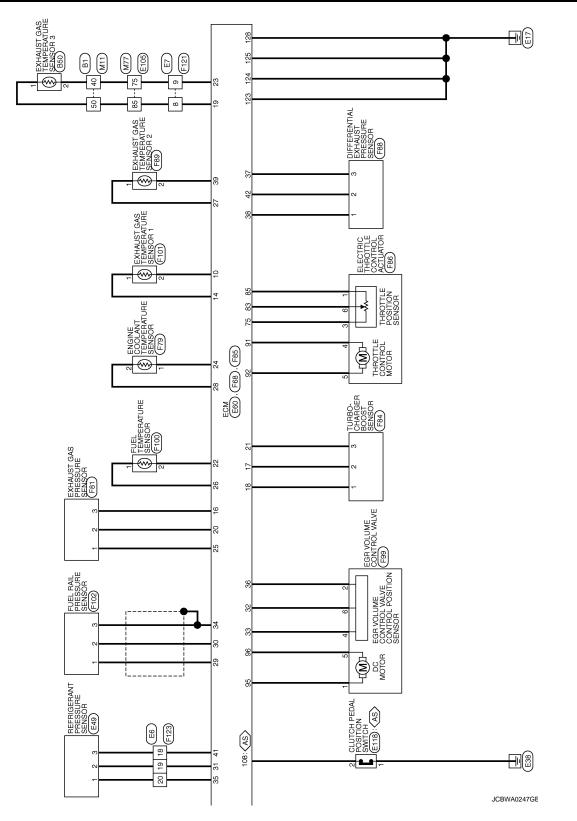


Ρ

#### < ECU DIAGNOSIS >

#### < ECU DIAGNOSIS >

AS>: With ASCD



CU DIAGNOSIS >				[mory]
No. E6 Name WRE TO Type TX24MW T2 13 14 15 16	Terminal Ministry         Color Color         Signal Name (Specification)           5         B	Connector No. E13 Connector Name RR (KITELIGENT FOWER Distribution MoDULE ENGINE ROOM) Connector Type TH/2FW-NH Connector Type 11/2FW-NH 28 27 26 25 24 23 34 33 32 31 30 29	Terminal         Color         Signal Mame [Specification]           Ro.         of Wre         Signal Mame [Specification]           25         P         -           26         L         -           21         L         -           31         V         -	A ECR C D
No. E3 Name MASS AIR FLOW SENSOR Type PHOBER (65 4 3 2 1	Vier Signal Name (Specification)	Gometor No. EI Connector Name ER KINTELLGENT POWER ISTRIBUTION MODULE ENGINE ROOM Connector Type ModEB-LC 111109 141312	Terminal Color Signal Name [Specification] T No. of Wire	E F G H
INE) Dometer No. 850 Dometer None EtHUIS Dometer Type HSDMB- H.S.	I erminal Voio Signal Name [Speefication] 1. G Signal Name [Speefication] 2 Y GND	Connector No.     EIO       Connector Name     DISTRELICENT POWER       Connector Type     MOSTALLICENT MODULE ENGINE ROOM)       Connector Type     MOSTALLICENT POWER       Connector Type     MOSTALLICENT POWER       Connector Type     S       S     S       S     S	Terminal No.     Color     Signal Name [Specification]       4     w     -       7     w     -       8     G     -	I J K
NE CONTR New MRE TO Type MRE TO A MARE TO	Immunol     Otoor     Signal Name [Specification]       40     Y     -       40     Y     -       50     G     -	Connector No.         E7           Connector Name         WIRE TO WIRE           Connector Type         NS16MW-CS           MAX         1           MAX         1           MAX         1           MAX         1	Terminal No.         Color         Signal Name [Specification]           9         0         -         -           7         W         -         -         -           13         G         -         -         -         -           13         G         - <td>L M N O</td>	L M N O
				Р

[M9R]

E53 COOLING RS04FGY	Number         of Work         Signal Name [Specification]           1         W         -           2         G         -           3         B         -           4         B         -	Corrector No. E57 Corrector Name COOLING FAN RELAY-4 Corrector Type MS02FL-N2 L1S	Terminal No.     Color of Wes     Signal Name [Specification]       1     V     -       2     O     -       3     P     -       5     G     -
No. E49 Name REFRICE Type RECOFE	No.     of Weo     Signal Name [Specification]       1     V       2     V       3     L	Corrector No. E56 Connector Name Connector Type MS02FL-M2 MS02FL-M2 2221	Terminal     Color     Signal Name (Specification)       No.     of Wee     Signal Name (Specification)       1     T     -       2     G     -       3     L     -       5     O     -
tor No. E15 tor No. E15 tor Name IPDM E.F. OSTRIBL 153 53 55 61 60 60 60 60 60 60 60 60 60 60 60 60 60		Corrector No. E55 Corrector Name Soutenois BOOST CONTROL Corrector Type BS2/2FB AHY-S Corrector Type BS2/2FB AHY-S	Terminal     Color       No.     G       Signal Name (Specification)       1       2       2
ONTR F14 DIST RBL NIS1 2FBR NIS1 2FBR N	No.     of Wro     Signal Name [Specification]       40     V     -       41     LG     -	Connector No. E54 Connector Name COOLING FAN MOTOR-2 Connector Type RSO4FGY-PR	Terminal     Color     Signal Name [Specification]       No.     of Wire     -       2     0     -       3     P     -       4     GR     -

10110010 >		<b>B</b>	-
EIO6 MMEE TO WIFE THEOFTW-CS16-TM4 A THE TO WIFE A THE TO WIFE	FS TUSRILE LINK HOLDER LOIFE-MC	Signal Name (Secrification) -	A ECR
Connector No. E105 Connector Name WIRE TO WIRE Connector Type THEORY-CS16 Connector Type THEORY-CS16 Connector Type Connector Type Connector No. Connector Type Connector Connec	Connector No. F5 Connector Nume FUSIBLE L Connector Type LOIFB-MC	Terminal Color No. 6 Wre	C
GND-APS2 AND-APS1 OND GND GND GND GND APS1 GND-APS1 GND	EI19 BRAKE PEDAL POSITION SWITCH MOZFBR-LC 12	Signal Name [Specification]	E
120 P 123 B 123 B 124 B 125 B 125 P 125 P 126 Y 128 B	Connector No. E119 Connector Name BRAKE PED Connector Type M02FBR-LC	Terminal     Color     Si       No.     of Wre     Si       2     GR     Si	G
E60 ECM MAZ4FB-MEAB-LH MAZ4FB-MEAB-LH MAZ4FB-MEAB-LH MAZ4FB-MEAB-LH MAR 2012 1125 00100101111111111111111111111111111	ELIB CLUTCH PEDAL POSITION SWITCH M02FBR-LO 12	Signal Name [Specification] -(With-EP] -(Without ESP]	l
Contraction of With the second	Connector No. E118 Connector Name CLUTCH PEI Connector Type M02FBA-LC	Terminal     Color       No.     of Wire       2     G       2     SB	K
ENGINE CONTROL SYSTEM (M9R ENGINE) Connector Name Coulds FAN RELAV-5 Connector Name Coulds FAN RELAV-5 Counsel Name Could FAN RELAV-5 Counsel Name Could FAN RELAV-5 Counsel Name Could FAN RELAV-5 Counsel Name Could FAN	E110 ACCELERATOR PEDAL POSITION SENSOR RHOSFE	Signal Name [Specification] -[With dessel angine] -[With dessel angine] -[With dessel angine] -[Withou CR angine] -[Withou CR angine] -[Withou CR angine]	L
ENGINE CONTROL SYS connector Name CoULING FAN RELAV-5 connector Type MS2RL-M2 Connector Type	Connector Name Connector Name AcCELERATO	Terminal         Color         Signal           No.         of Wire         Signal           0         Y         P         P           0         Wire         3         2         Y           0         Wire         G         P         P           0         Wire         4         G         P         P           0         V         V         P         P         P	N
ш <u>ы с с с с с с с с с с с с с с с с с с с</u>	ŭ ŭ 🕅 🕌	JCBWA0250GE	

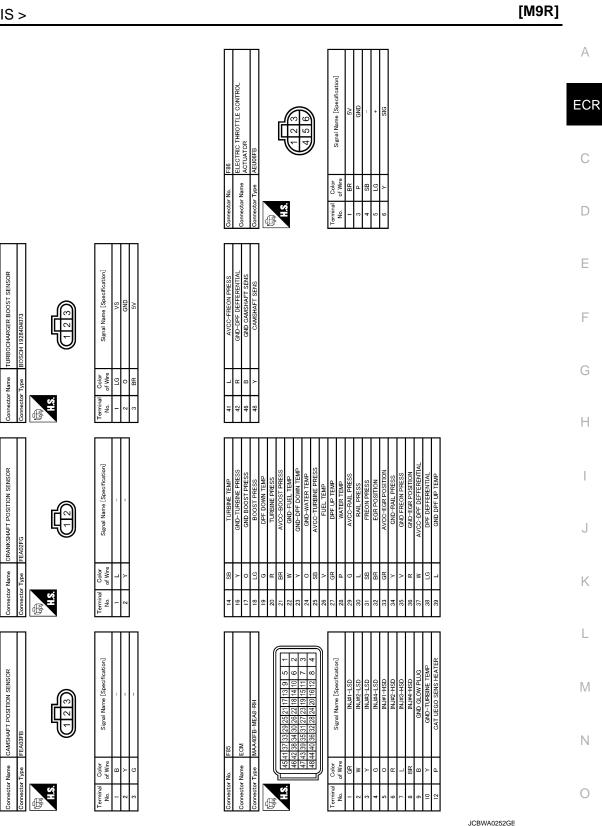
ECM

[M9R]

Ρ

	Ĩ			
Direction         CON IROL SYSTEM (MBR EN Connector Name Connector Name ECM         F88           Connector Name ECM         Connector Name ECM         F88         (MBR EN ECM           Connector Name ECM         ECM         91 95         91 95           Market Parket 195         ECM         173 76 80 91 95         91 95           Market Parket 195         ECM         173 77 80 91 95         91 95           Market Parket 195         ECM         173 77 80 91 95         91 95           Market Parket 195         ECM         174 175 79 80 90 94         91 95           Market Parket 195         ECM         174 175 79 80 90 94         91 95           Market Parket Parket 195         ECM         174 175 79 80 90 94         91 95           Market Parket Parket Parket 100 of Wine 56         ECM         174 175 70 100         177 91 105           Market Parket Parket Parket Parket Parket Parket Parket 177 01 010         174 175 100         174 175 100         174 175 100           Market Parket P	CGINE) 82 82 82 82 82 82 82 82 82 82 82 82 82	AIR FLOW CAT UEGO SENS CAT UEGO SENS CAT UEGO SENS INTAKE FLAP POSITION INTAKE AIR TEMP INTAKE FLAP POSITION ORD FLAP POSITION ORD FLAP POC- INTAKE FLAP DC- INTAKE FLAP DC- INTAKE FLAP DC- EGR DC- EGR DC-	Connector Name         F10           Connector Name         FUEL INJECT OR No.1           Connector Name         FUEL INJECT OR No.1           Connector Type         BOSCH 1928400072           Connector Type         BOSCH 1928400072           Connector Type         BOSCH 1028400072           Connector Type         BOSCH 102840010           Insolution         Of Wee           Insolution         Connector Type	Connector Num     F11       Connector Name     FUEL INJECTOR No.2       Connector Type     BOSCH 1323404072       Connector Type     BOSCH 1323404072
Connector No. F72 Connector Name FUEL INJECTOR No.3 Connector Type BOSCH 1928404072	Connector No. Connector Name Connector Type	F13 FUEL INJECTOR No.4 BOSCH 1928404072	Connector No. F19 Connector Name ENCINE COOLANT TEMPERATURE SENSOR Connector Type RH02FB	Corrrector No. F81 Corrrector Name EXHAUST GAS PRESSURE SENSOR Corrrector Type AZ20FE1
Territial     Color     Signal Name [Specification]       No.     of Wire     signal Name [Specification]       1     BR     -       2     G     -	Terminal Color No. of Wire 2 GR	Signal Name [Specification] 	Terminal     Color       No.     of Wee       No.     of Wee       1     O       2     P	Terminal         Color         Signal Name [Specification]           No.         of Wire         Signal Name [Specification]           1         SB         VS           2         R         VS           3         Y         GND

JCBWA0251GE



TURBOCHARGER BOOST SENSOR

nector Name

Connector No. Connector Name

ENGINE CONTROL SYSTEM (M9R ENGINE)

CAMSHAFT POSITION SENSOR

Connector Name

Ρ

Comeetor No. F90 Connector Name Solution VALVE Connector Type BS027EP-AHV-S	Terminal     Color     Signal Name [Specification]       No.     of Wire	Connector No.     F14       Connector Name     GLOW CONTROL UNIT       Connector Type     FCI 240PC08850015       Connector Type     FCI 240PC08550015	Terminal No.         Color of Wre         Signal Marne [Specification]           1         Y         -           2         W         -           3         GR         -           4         W         -           5         B         -           7         G         -           7         G         -           8         O         -
Cometer No. 789 Connector Name EXHAUST GAS TEMPERATURE SENSOR 2 Connector Type 77X7282-7002-00	Terminal No.         Color         Signal Name [Specification]           1         GR         Signal Name [specification]           2         L         GND	Connector No. 193 Connector Name EULE RALL PRESSURE CONTROL VALVE Connector Type BOSCH 1928(04072	Terminal Color No. of Wire Signal Name [Spacification'] 1 R
NGINE) Gometer No. 78 Connector Name SENSOR	Terminal No.         Color         Signal Name [Specification]           1         LG         VS           2         R         GND           3         R         SV	Connector No. 172 Connector Name ULE PUMP Connector Type BOSCH 1928/04072	Terminal Color No. of Wire Signal Name [Specification] 1 of G
ENGINE CONTROL SYSTEM (M9R ENGINE) Connector Name Connector Name Connector Type Connector	Terminal     Color     Signal Name [Specification]       No.     of Wire       1     0       2     B	Ormeter     F91       Connector Name     AIR FUEL RATIO SENSOR       Connector Type     ALLOBEB	Terminal No.         Color Mare Signal Marre [Specification']           1         SB         PUMARING CUBRENT           2         GR         VIRTUELLE GND           3         P         HEATER- HEATER-           4         G         HEATER- HEATER-           5         V         TRIM.CUBRENT           6         O         MERNST VOLAGE

[M9R]

JCBWA0253GE

CU DIAGNOSIS >				
Comeetor No. F98 Connector Name aLOW FLUG No.4 Connector Type TYCO-AMP 953831-1	Terminal Color Signal Name [Specification] No. of Wire I L –	Oomestar Nu.         F102           Connector Nume         FUEL RAIL PRESSURE SENSOR           Connector Type         B1203FB           Connector Type         B1203FB	Terminal     Color     Signal Name [Specification]       No.     of Wor     -       1     G     -       2     V     -	A ECR C D
Connector No.     F97       Connector Name     GLOW PLUG No.3       Connector Type     TYCO-AMP 953631-1	Terminal         Color         Signal Name [Specification]           No.         of Wee         Signal Name [Specification]	Connector No.         F101           Connector Name         EXHAUST GAS TEMPERATURE SENSOR 1           Connector Type         FEA02FY           Mass         FEA02FY	Terminal No.         Color         Signal Name (Speedfraction)           1         SB         Signal Name (Speedfraction)           2         Y         -	E F G H
IGNE) Connector No. F16 Connector Name Connector Name Connector Type TYCO-AMP 393831-1	Terminal No.         Color of Wire         Signal Name [Specification]           1         G	Connector No. F100 Connector Name PUEL TEMPERATURE SENSOR Connector Type FEAQZFGY	Terminal     Calor     Signal Name [Speor/fration]       No.     of Wore     -       1     V     -       2     W     -	I J K
ENGINE CONTROL SYSTEM (M9R ENGINE)       Connector No.     FB       Connector Name     Gamestor Name       Connector Name     Gamestor Name       Connector Name     Connector Name       Connector Name       Connector Name	Terminal Color Signal Name [Specification] 1 W. Jow Mane [Specification]	Connector Num         F99           Connector Num         EGR VOLUME CONTROL VALVE           Connector Type         FEP-42022800           Connector Type         FEP-42022800           Connector Type         FEP-42022800	Terminal No.         Color of Wre         Signal Name [Spacification]           1         P         -           2         P         -           4         GR         -           5         O         -           6         BR         -	L M N O
			JCBWAG	254GE P

[M9R]

Connector No.     M11       Connector Name     WIFE TO WIFE       Connector Type     Heldrw-CS16-TM4       Connector Type     Heldrw-CS16-TM4       Mine     End and an and and and and and and and an	Connector No.     M32       Connector Nume     COMBINATION SWITCH (SPIRAL CABLE)       Connector Type     TROBMOP × X       Main     Total 192021       Idage     Signal Name (Specification)       Id     Id       Id     Connector Type
Connector No.     M4       Connector Name     DATA LINK CONNECTOR       Connector Name     DATA LINK CONNECTOR       Connector Name     DATA LINK CONNECTOR       Connector Name     Data Name       Connector Name     Data Name       Connector Name     Data Name       Connector Name     Data Name       Connector Name     Signal Name       Connector Name     Signal Name       Rescriteration     Connector Name       R     Connector Name       No.     Signal Name       R     Connector Name       R     Name       R     Connector Name       R     Connector Name       R     Connector Name       R     Name       R     Name       R     Name       R <th< td=""><td>Connector No.         M77           Connector Num         WRE TO WRE           Connector Num         WRE TO WRE           Connector Type         HB0MV-CS16-TM4           Main         Temmed         Temmed           Main         Temmed         Temmed         Temmed           Main         Signal Name (Specification)         Temmed         Temmed           No.         of Wre         Signal Name (Specification)         Temmed           22         L         -         -         -           23         L         -         -         -         -           75         E         -         -         -         -         -           75         C         -         -         -         -         -         -           80         G         -</td></th<>	Connector No.         M77           Connector Num         WRE TO WRE           Connector Num         WRE TO WRE           Connector Type         HB0MV-CS16-TM4           Main         Temmed         Temmed           Main         Temmed         Temmed         Temmed           Main         Signal Name (Specification)         Temmed         Temmed           No.         of Wre         Signal Name (Specification)         Temmed           22         L         -         -         -           23         L         -         -         -         -           75         E         -         -         -         -         -           75         C         -         -         -         -         -         -           80         G         -
GINE Connector Name WIEE TO WIEE Connector Name WIEE TO WIEE TO WIEE Connector Name WIEE TO W	Connector No.         MS4           Connector Name         COMBINATION METER           Connector Type         SAB40FW           Connector Type         SAB40FW           Table         Connector Type           Table         Connector Type           Table         Connector Type           Connector Type         South Name (South 100 Name)           Table         Control           Table         Control           Table         Control           Table         Control           Table         Control           Table         Control
ENGINE CONTROL SYSTEM (M9R ENGINE)       Connector Name VIEE TO WIEE       Connector Name VIEE TO VIE	Connector No.         M33           Connector Name         CoMBINATION SWITCH (SPIRAL CABLE)           Connector Type         Tradication           Connector Type         Tradication           Tammal         Color         Signal Name (Specification)           34         G         -

JCBWA0255GE

INFOID:000000001530534

DTC No.	Detected items	Engine operating condition in fail-safe mode
P2002	Particulate matter over accumulation	Engine speed will not rise more than 2,000 rpm due to the fuel cut.

# ECR-316

Fail Safe

# DTC Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

ECM

Driority	Detected items (DTC)	ECR
Priority	Detected items (DTC)	
1	<ul> <li>U1000 CAN communication line</li> <li>P0016 Crankshaft position - camshaft position correlation</li> <li>P0100 Mass air flow sensor</li> <li>P0110 Intake air temperature sensor</li> <li>P0115 Engine coolant temperature sensor</li> </ul>	С
	<ul> <li>P0120 Throttle position sensor</li> <li>P0130 P0131 P0133 P0134 P2231 P2A00 Air fuel ratio (A/F) sensor 1</li> <li>P0135 Air fuel ratio (A/F) sensor 1 heater</li> </ul>	D
	<ul> <li>P0180 Fuel temperature sensor</li> <li>P0190 P2293 Fuel rail pressure sensor</li> <li>P0225 P2120 Accelerator pedal position sensor</li> <li>P0235 Turbocharger boost sensor</li> </ul>	E
	<ul> <li>P0335 Crankshaft position sensor</li> <li>P0340 Camshaft position sensor</li> <li>P0409 EGR volume control valve control position sensor</li> <li>P0470 Exhaust gas pressure sensor</li> </ul>	F
	<ul> <li>P0500 Vehicle speed sensor</li> <li>P0530 Refrigerant pressure sensor</li> <li>P0544 Exhaust gas temperature sensor 1</li> <li>P0560 Battery voltage</li> </ul>	G
	<ul> <li>P0606 P060B P062B P062F P1607 ECM</li> <li>P0611 Injector adjustment value</li> <li>P0641 P0651 P0697 Sensor power supply</li> <li>P1610 - P1616 NATS</li> </ul>	Н
	<ul> <li>P2031 Exhaust gas temperature sensor 2</li> <li>P2080 Exhaust gas temperature sensor 3</li> <li>P2226 Barometric sensor</li> </ul>	I
	<ul> <li>P2299 Accelerator pedal - brake pedal position sensor inconsistency</li> <li>P242A Exhaust gas temperature sensor 3</li> <li>P2452 Differential exhaust gas pressure sensor</li> <li>P2453 Differential exhaust gas pressure sensor</li> </ul>	J
2	<ul> <li>P0045 Turbocharger boost control solenoid valve</li> <li>P0089 P2294 Fuel rail pressure control valve</li> <li>P0090 Fuel pump</li> <li>P0300 P0204 P0204 P0202 P0205 P0205 P0272 P4204 P4204 P2140 Fuel injector</li> </ul>	K
	<ul> <li>P0200 P0201 - P0204 P0263 P0266 P0269 P0272 P1201 - P1204 P2146 P2149 Fuel injector</li> <li>P0380 Glow plug</li> <li>P0487 P0488 EGR volume control valve</li> <li>P0571 Brake pedal position sensor</li> <li>P0570 Glow control unit</li> </ul>	L
	<ul> <li>P0670 Glow control unit</li> <li>P0685 ECM relay</li> <li>P2100 Electric throttle control actuator</li> <li>P2101 Throttle position sensor</li> </ul>	Μ
	<ul> <li>P2425 EGR cooler bypass valve control solenoid valve</li> <li>P2505 Ignition relay</li> <li>P2600 Turbocharger cooling pump</li> </ul>	Ν
3	<ul> <li>P0297 P3031 Service regeneration</li> <li>P0300 - P0304 Misfire</li> <li>P0564 P0575 ASCD steering switch</li> <li>P1435 P1436 DPF regeneration</li> </ul>	0
	P2002 P242F DPF     P2263 Turbocharger system	D

А

INFOID:000000001530535

INFOID:000000001307583

X: Applicable —: Not applicable

DTC*		Trip	MI lighting up	X: Applicable —: Not applicable Reference page
U1000	(CONSULT-III screen terms) CAN COMM CIRCUIT	3		ECR-114
P0016	CMP/CKP RELATION	3		<u>ECR-115</u>
P0018	TC BOOST SOL/V	3	 	<u>ECR-117</u>
P0043	FUEL PUMP	3		<u>ECR-119</u>
P0089	FUEL PUMP	3	×	
			×	ECR-121
P0100	MAF SENSOR	3	×	ECR-123
P0101	MAF SENSOR	3	×	ECR-126
P0110	IAT SENSOR	3	×	ECR-130
P0115	ECT SENSOR	3	×	ECR-132
P0120	TP SENSOR	3	×	<u>ECR-134</u>
P0130	A/F SENSOR1	3	×	<u>ECR-137</u>
P0131	A/F SENSOR1	3	×	<u>ECR-139</u>
P0133	A/F SENSOR1	3	×	<u>ECR-141</u>
P0134	A/F SENSOR1	3	×	<u>ECR-143</u>
P0135	A/F SEN1 HTR	3	×	<u>ECR-145</u>
P0180	FUEL TEMP SENSOR	3	_	<u>ECR-148</u>
P0190	FRP SENSOR	3	×	<u>ECR-150</u>
P0200	INJECTOR	3	×	<u>ECR-153</u>
P0201	CYL 1 INJECTOR	3	×	<u>ECR-155</u>
P0202	CYL 2 INJECTOR	3	×	ECR-155
P0203	CYL 3 INJECTOR	3	×	ECR-155
P0204	CYL 4 INJECTOR	3	×	<u>ECR-155</u>
P0225	APP SENSOR 1	3	×	<u>ECR-158</u>
P0235	TC BOOST SENSOR	3	×	<u>ECR-161</u>
P0263	CYL 1 INJECTOR	3	-	ECR-163
P0266	CYL 2 INJECTOR	3	-	ECR-163
P0269	CYL 3 INJECTOR	3	-	ECR-163
P0272	CYL 4 INJECTOR	3	-	ECR-163
P0297	SERVICE REGENERATN	3	-	ECR-164
P0300	MULTI CYL MISFIRE	3	-	ECR-165
P0301	CYL 1 MISFIRE	3	-	ECR-165
P0302	CYL 2 MISFIRE	3	-	ECR-165
P0303	CYL 3 MISFIRE	3	-	ECR-165
P0304	CYL 4 MISFIRE	3	-	<u>ECR-165</u>
P0335	CKP SENSOR	3	×	ECR-167
P0340	CMP SENSOR	3	×	<u>ECR-169</u>
P0380	GLOW RELAY	3	-	ECR-172
P0409	EGR POS SENSOR	3	×	ECR-175
P0470	EXH GAS PRESS SEN	3	×	ECR-178
P0487	EGR CONT VALVE	3	×	<u>ECR-180</u>
P0488	EGR SYSTEM	3	×	<u>ECR-182</u>

DTC*	Items (CONSULT-III screen terms)	Trip	MI lighting up	Reference page	A
P0500	VEHICLE SPEED	3	_	ECR-184	
P0530	REFRGRT PRESS SEN	3	-	ECR-185	EC
P0544	EGT SENSOR 1	3	-	ECR-187	— EC
P0560	BATTERY VOLTAGE	3	-	ECR-189	
P0564	ASCD SW	3	-	ECR-192	С
P0571	BPP SW	3	-	ECR-195	
P0575	ASCD SW	3	-	ECR-198	_
P0606	ECM	3	ON or –	ECR-201	D
P060B	ECM	3	×	ECR-203	_
P0611	INJ ADJ VAL	3	×	ECR-205	E
P062B	ECM	3	ON or –	ECR-207	
P062F	ECM	3	×	ECR-209	
P0641	SENSOR PWR/CIRC1	3	×	ECR-211	F
P0651	SENSOR PWR/CIRC2	3	×	ECR-213	
P0670	GLOW CONT SYSTEM	3	_	ECR-216	G
P0685	ECM RELAY	3	×	ECR-218	G
P0697	SENSOR PWR/CIRC3	3	×	ECR-220	
P1201	CYL 1 INJECTOR	3	-	ECR-222	Н
P1202	CYL 2 INJECTOR	3	-	ECR-222	
P1203	CYL 3 INJECTOR	3	-	ECR-222	
P1204	CYL 4 INJECTOR	3	_	ECR-222	_
P1435	DPF REGENERATION	3	×	ECR-224	
P1436	DPF REGENERATN	3	-	ECR-226	J
P1607	ECM	3	×	ECR-228	
P1610	LOCK MODE	3	_	<u>SEC-37</u>	
P1611	ID DISCORD,IMMU-ECM	3	_	SEC-38 or SEC-251	— K
P1612	CHAIN OF ECM-IMMU	3	-	SEC-40 or SEC-253	
P1614	CHAIN OF IMMU-KEY	3	_	SEC-41 or SEC-254	L
P1615	DIFFERENCE OF KEY	3	-	SEC-43 or SEC-256	
P1616	ECM	3	-	SEC-44 or SEC-257	
P2002	PM OVER ACCMLT	3	_	ECR-229	M
P2031	EGT SENSOR 2	3	_	ECR-231	
P2080	EGT SENSOR 1	3	_	ECR-234	N
P2100	ETC FUNCTION	3	_	ECR-236	
P2101	ETC FUNCTION	3	_	ECR-239	
P2120	APP SENSOR 2	3	×	ECR-242	0
P2146	INJ PWR/CIRC	3	×	ECR-245	
P2149	INJ PWR/CIRC	3	×	ECR-245	_
P2226	BARO SENSOR	3	×	ECR-247	P
P2231	A/F SENSOR1	3	×	ECR-249	
P2263	TC SYSTEM	3	×	ECR-251	
P2293	FRP CONTROL SYSTEM	3	×	ECR-254	
P2294	FRP CONTROL VALVE	3	×	ECR-256	
P2299	APP/BPP INCNSSTNCY	3	_	ECR-258	

DTC*	Items (CONSULT-III screen terms)	Trip	MI lighting up	Reference page
P2425	EGR COOLER BYP/V	3	-	ECR-262
P242A	EGT SENSOR 3	3	-	ECR-264
P242F	DPF	3	-	ECR-267
P2452	DIFF EX PRESS SEN	3	×	ECR-269
P2453	DIFF EX PRESS SWN	3	×	ECR-271
P2505	ECM POWER SUPPLY	3	_	ECR-272
P2600	TC COOLING PUMP	3	-	ECR-274
P2A00	A/F SENSOR1	3	×	ECR-278
P3031	SERVICE REGENERATN	3	-	ECR-280

\*: This number is prescribed by ISO 15031-6.

#### < SYMPTOM DIAGNOSIS >

# SYMPTOM DIAGNOSIS ENGINE CONTROL SYSTEM SYMPTOMS

# Symptom Table

						SY	/MPT	OM							С
			האגטיאט אואנו/אבאואגו (באטר חא)			ENGINE STALL									E
SYSTEM — Basic engine control system			1	F				-						Reference page	
			NE IS COLD	VE IS HOT				POT							F
	firing)	irst firing)	START WHEN ENGINE IS	HEN ENGINE IS			NG	NG/FLAT S	Z		NO				
	START (with first firing)	START (without first firing)		TO START WHEN	ш	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	ACCELERATION		OLE		
	NO ST	NO ST	HARD TO	HARD TO	AT IDLE	DURIN	WHEN	HESIT	KNOCI	LACK (	POOR	HI IDLE	LOW IDLE		k
Warranty symptom code		ļ	١A			AB		AC	AD	ŀ	١		١F		
Fuel pump	5	5	5	5	5	5	5	5		5	5		5	_	L
Fuel injector	3	3	3	3	3	3	3	3	3	4	4	3	3	<u>ECR-163,</u> ECR-222	N
Glow control system	1	1	1	1					1					<u>ECR-172,</u> <u>ECR-216</u>	
Engine body	3	3	3	3	3	3	3		3	4	4		3	<u>EM-312</u>	Ν
EGR system										3	3			ECR-182	
Air cleaner and duct										3	3			<u>EM-263</u>	
Turbocharger cooling pump										3	3			ECR-274	C
Electric throttle control actuator	2	2	2	2	1	1	1			1	1			<u>ECR-236,</u> <u>ECR-239</u>	

INFOID:000000001530541

А

ECR

#### < SYMPTOM DIAGNOSIS >

[M9R]

							S١	/MPT	ОМ						
	SYSTEM — Basic engine control system						ENGINE STALL								
SYSTEM — Basic engine control system		NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	TOM IDLE	Reference page
Warr	anty symptom code		A	١A			AB	1	AC	AD	A	١E	ļ	١F	
	Fuel pump circuit	4	4	4	4	4	4	4	4		4	4		4	ECR-121
	Fuel injector circuit	1	1	1	1	1	1	1	1	1	1	1	1	1	ECR-155
	Fuel injector adjustment value registra- tion								1	1	1	1			ECR-205
ROL	Mass air flow sensor circuit								1		1	1			ECR-123
NTH N	Engine coolant temperature circuit			1		1		1						1	ECR-132
ENGINE CONT	Vehicle speed signal circuit											1			ECR-184
SINE	A/F sensor 1 circuit														ECR-137
ENG	Accelerator pedal position sensor circuit								1		1	1			<u>ECR-158,</u> <u>ECR-242</u>
	Fuel rail pressure sensor circuit														ECR-150
	Fuel rail pressure control valve circuit	4	4	4	4	4	4	4	4		4	4	4	4	ECR-256
	Fuel temperature sensor circuit														ECR-148

#### < SYMPTOM DIAGNOSIS >

[M9R]

							S١	/MPT	ОМ							0
	SYSTEM — Basic engine control system		יאר האיז איז איז איז איז איז איז איז איז איז	האתוועט אואא ואבאואאו (באטר. חא)			ENGINE STALL									A ECR C D
515	TEM — Basic engine control system			NE IS COLD	NE IS HOT				SPOT						Reference page	F
		st firing)	NO START (without first firing)	START WHEN ENGINE IS	START WHEN ENGINE IS HOT			TING	HESITATION/SURGING/FLAT {	NO		TION				G
			T (without				DRIVING	WHEN DECELERATING	ON/SURG	KNOCK/DETONATION	OF POWER	POOR ACCELERATION		ш		Н
		NO START (with first firing)	NO STAR	HARD TO	HARD TO	AT IDLE	DURING DRIVING	WHEN DE	HESITATI	KNOCK/E	LACK OF	POOR AC	HI IDLE	LOW IDLE		I
War	ranty symptom code		ŀ	٨A			AB		AC	AD	ļ	λE	ŀ	٩F		
	Crankshaft position sensor circuit		1	1	1	1	1	1	1	1	1	1			ECR-167	J
	Camshaft position sensor circuit			3	3										ECR-169	
	Turbocharger boost sensor circuit								1		1	1			ECR-161	K
	Turbocharger boost control solenoid valve circuit								1		1	1			ECR-117	
Ы	Start signal circuit	1	1	1	1	1		1	1		1	1			<u>STR-20</u>	L
<b>LTR</b>	Ignition switch circuit		1			1	1	1							ECR-111	
co	Power supply for ECM circuit		1			1	1	1							ECR-272	R.4
ШЦ	EGR volume control valve circuit								1		1	1			ECR-180	Μ
ENGINE CONTROL	EGR cooler bypass valve control solenoid valve														ECR-262	NI
	Differential exhaust pressure sensor cir- cuit										3	3	3		ECR-269	Ν
	Exhaust gas temperature sensor 1 circuit														ECR-187	0
	Exhaust gas temperature sensor 2 circuit														ECR-231	0
	Exhaust gas temperature sensor 3 circuit														ECR-264	

Ρ

#### < SYMPTOM DIAGNOSIS >

[M9R]

		SYMPTOM													
SYS	SYSTEM — Basic engine control system		μάρη διά στα μεχάρες τα δηγιοριατία				ENGINE STALL								Peference
SYSTEM — Basic engine control system		NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HIIDLE	LOW IDLE	Reference page
Warr	anty symptom code		A	٨A			AB		AC	AD	Å	λE	A	١F	
	Exhaust gas pressure sensor circuit										3	3			<u>ECR-178</u>
ROL	Throttle position sensor circuit														ECR-134
TNC	Refrigerant pressure sensor circuit					2	2	2							ECR-185
ы С	ECM relay (Self shut-off) circuit		1				1	1	1						ECR-218
ENGINE CONTROL	ECM	2	2	2	2	2	2	2	2	2	2	2	2	2	<u>ECR-201,</u> <u>ECR-203,</u> <u>ECR-207,</u> <u>ECR-209</u>
NAT	S (Nissan Anti-theft System)		1												<u>SEC-16,</u> <u>SEC-235</u>

1 - 5: The numbers refer to the order of inspection.

(continued on next page)

# < SYMPTOM DIAGNOSIS >

[M9R]

							SYM	PTON							А
SYS	TEM — Basic engine control system			DLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	CONSUMPTION	MPTION			t CHARGE)		es.	ĿIII;	Reference	ECR C
	Warranty symptom code		IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGIN	EXCESSIVE FUEL CONS	EXCESSIVE OIL CONSUMPTION	BLACK SMOKE	WHITE SMOKE	DEAD BATTERY (UNDER	DPF warning light illuminates.*	Malfunction indicator illuminates.	Can be detected by CONSULT-III?		E
Warr	Warranty symptom code		AH	AJ	AK	AL	AM	A	νP	HA	DP	Ma	Cai		G
Fuel	Fuel pump		5	5		5					3	1	1	—	
Fuel	injector	3	3	3		4		3	3		1	1	1	<u>ECR-163,</u> <u>ECR-222</u>	Н
Glow	control system								1					<u>ECR-172,</u> ECR-216	
Engi	ne body		3	3	3	3	1		3					<u>EM-312</u>	
EGR	system							3			1			ECR-182	
Air c	eaner and duct							3						<u>EM-263</u>	.1
Elect	ric throttle control actuator										1	1	1	<u>ECR-236,</u> ECR-239	0
Turb	ocharger cooling pump													ECR-274	К
	Fuel pump circuit	4	4	4		4					1	1	1	ECR-121	
	Fuel injector circuit	1	1	1		1		1	1		1	1	1	ECR-155	
	Fuel injector adjustment value registration	1	1					1	1		1		1	ECR-205	L
oL	Mass air flow sensor circuit							1			1	1	1	ECR-123	
NTR	Engine coolant temperature circuit	1	1		1							1	1	ECR-132	M
CO	A/F sensor 1 circuit										2	1	1	ECR-137	1 V I
Ш Z	Vehicle speed signal circuit											1	1	ECR-184	
ENGINE CONTROL	Accelerator pedal position sensor circuit			1								1	1	<u>ECR-158,</u> <u>ECR-242</u>	Ν
	Fuel rail pressure sensor circuit										1	1	1	ECR-150	
	Fuel rail pressure control valve circuit	4	4	4		4								ECR-256	0
	Fuel temperature sensor circuit													ECR-148	

Ρ

#### < SYMPTOM DIAGNOSIS >

							SYM	PTON						
SYS	TEM — Basic engine control system			IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	SUMPTION	UMPTION			R CHARGE)	*	ites.	-T-III?	Reference page
		ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	-	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BLACK SMOKE	WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	DPF warning light illuminates.*	Malfunction indicator illuminates.	Can be detected by CONSULT-III?	
Warr	anty symptom code	AG	AH	AJ	AK	AL	AM	ŀ	١P	HA				
	Crankshaft position sensor circuit	1	1								3	1	1	ECR-167
	Camshaft position sensor circuit										3	1	1	ECR-169
	Turbocharger boost sensor circuit										2	1	1	ECR-161
	Turbocharger boost control solenoid valve circuit							1	1		1			<u>ECR-117</u>
	Start signal circuit													<u>STR-20</u>
	Ignition switch circuit													<u>ECR-111</u>
	Power supply for ECM circuit											1	1	ECR-272
ROL	EGR cooler bypass valve control solenoid valve circuit					3		1						ECR-262
INO	EGR volume control valve circuit							1			1			ECR-182
ENGINE CONTROL	Differential exhaust gas pressure sensor cir- cuit										2	1	1	ECR-269
ENC	Exhaust gas temperature sensor 1 circuit										2	1	1	ECR-187
	Exhaust gas temperature sensor 2 circuit										2	1	1	ECR-231
	Exhaust gas temperature sensor 3 circuit										2	1	1	ECR-264
	Throttle position sensor circuit										1	1	1	ECR-134
	Refrigerant pressure sensor circuit			3		4								ECR-185
	ECM relay (Self shut-off) circuit												1	ECR-218
	ECM	2	2	2	2	2	2	2	2	2	2	2	2	ECR-201, ECR-203, ECR-207, ECR-209
NAT	S (Nissan Anti-theft System)												1	<u>SEC-16,</u> <u>SEC-235</u>

1 - 5: The numbers refer to the order of inspection.

\*: Although there is no malfunction in the engine control system, DPF warning light may light up because the vehicle is driven in the specified driving pattern. For the detail, refer to <u>ECR-57, "System Description"</u>.

#### А PRECAUTIONS Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT ECR PRE-TENSIONER" INFOID:000000001557095 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. Information necessary to service the system safely is included in the "SRS AIRBAG" and "SEAT BELT" of this Service Manual. D WARNING: To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer. Ε Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the "SRS AIRBAG". F · Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors. Precaution Necessary for Steering Wheel Rotation After Battery Disconnect INFOID:000000001557096 NOTE: Н This Procedure is applied only to models with Intelligent Key system and NATS (NISSAN ANTI-THEFT SYS-TEM). Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position. • Always use CONSULT-III to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results. For models equipped with the Intelligent Key system and NATS, an electrically controlled steering lock mech-J anism is adopted on the key cylinder. For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible. Κ If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation. **OPERATION PROCEDURE** L 1. Connect both battery cables. NOTE: Supply power using jumper cables if battery is discharged. M 2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released. 3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be Ν rotated. 4. Perform the necessary repair operation. 5. When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.) 6. Perform a self-diagnosis check of all control units using CONSULT-III. Ρ

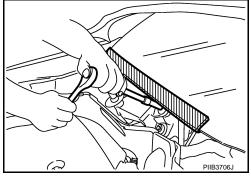
INFOID:000000001557097

INFOID:000000001583159

[M9R]

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.



Precautions For Xenon Headlamp Service

#### WARNING:

Comply with the following warnings to prevent any serious accident.

- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)
- Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

#### CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.
- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

#### On Board Diagnostic (OBD) System of Engine

INFOID:000000001307631

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

#### CAUTION:

- Be sure to turn the ignition switch OFF and disconnect the battery negative cable before any repair
  or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will
  cause the MI to light up.
- Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to <u>PG-120</u>, "<u>Description</u>".
- Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.
- Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel system, etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.

#### < PRECAUTION >

#### **General Precautions**

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF, wait 3 minutes and disconnect battery negative 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 battery negative cable.
- Do not disassemble ECM.

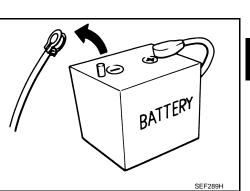
- When connecting ECM harness connector, fasten (A) it securely with levers (1) as far as they will go as shown in the figure.
- EČM (2)
- Loosen (B)

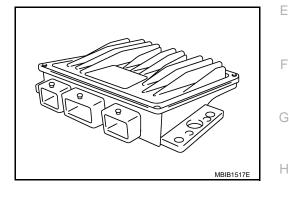
 When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

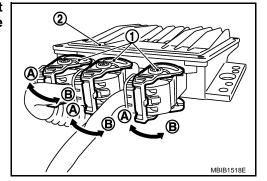
Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

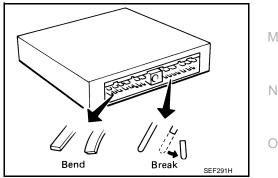
- Securely connect ECM harness connectors.
   A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to IC's.
- Keep engine control system harness at least 10cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of IC's, etc.
- Keep engine control system parts and harness dry.
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor, crankshaft position sensor.











INFOID:000000001307632

[M9R]

А

ECR

D

Κ

Р

#### < PRECAUTION >

- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.
- Do not disassemble fuel pump. If NG, take proper action.
- Do not disassemble fuel injector. If NG, replace fuel injector.

• When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.

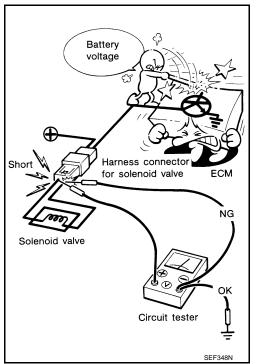
· Immediately after staring, do not rev up engine unnecessarily.

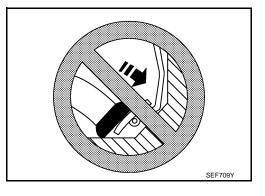
- Keep the antenna as far as possible from the electronic control units.
- Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.
- Do not let them run parallel for a long distance.

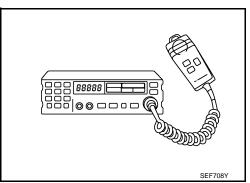
• Do not depress accelerator pedal when staring.

Do not rev up engine just prior to shutdown.

- Adjust the antenna and feeder line so that the standingwave radio can be kept smaller.
- Be sure to ground the radio to vehicle body.



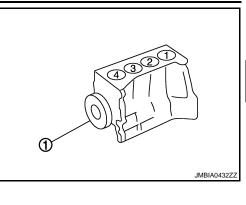




#### < PRECAUTION >

#### Cylinder NO.1 is at the flywheel end.

-1: Crankshaft pulley



[M9R]

А

ECR

D

F

Н

Ν

Ρ

INFOID:000000001307633

#### ENGINE RUNNING

- No work should be carried out on the hydraulic system while engine is running.
- Remember that fuel pressure values in hydraulic circuit can reach up to 1,600 bar.
- Keep hands or face (particularly eyes) out of any high pressure leak.
- Recall that fuel is dangerous for health.

#### FUEL RAIL PRESSURE SENSOR

- Under warranty, do not remove the fuel rail pressure sensor from the rail.
- Do not try to measure the resistance of the fuel rail pressure sensor. This test is destructive for the internal components.

#### FUEL INJECTOR

- Fuel injectors are driven by over 100V.
- FUEL injector electronics are polarised. In case of intervention on wiring harness, do not invertwires. It is destructive for the piezo components.
- Do not drive the fuel injectors if their body is not connected to the battery ground (risk ofelectrostatic discharge). For instance, fuel injector body have to be in contact with cylinder.
- Piezo fuel injector connector must not be unplugged while engine is running. Risk of majordamage to the engine (fuel injector could stay opened).

#### Cleanliness

#### Cleanliness

#### RISKS ASSOCIATED WITH CONTAMINATION

The high pressure direct injection system is highly sensitive to contamination. The risks associated withcon-	K
tamination are:	

- damage to or destruction of the high pressure injection system,
- components jamming,
- components losing seal integrity.

All After-Sales operations must be performed under very clean conditions. This means that no impurities (particles a few microns in size) should have entered the system during dismantling.

The cleanliness principle must be applied from the filter to the fuel injectors.

What are the sources of contamination?

- metal or plastic chips,
- paint,
- fibres:
- from cardboard,
- from brushes,
- from paper,
- from clothing,
- from cloths,
- foreign bodies such as hair,
- ambient air

### • etc.

NOTE:

Cleaning the engine using a high pressure washer is prohibited because of the risk of damaging connections. In addition, moisture may collect in the connectors and create electrical connection malfunction.

INSTRUCTIONS TO BE FOLLOWED BEFORE CARRYING OUT ANY WORK

#### < PRECAUTION >

Before any work is carried out on the high pressure injection system, protect:

- the accessories and timing belts,
- the electrical accessories, (starter, alternator, electric power assisted steering pump),
- the flywheel surface, to prevent any diesel from running onto the clutch friction plate.
- Check that you have plugs for the unions to be opened (set of plugs available from the Parts Department). The plugs are single-use only. After use, they must be discarded (once used they are soiled and cleaning is not sufficient to make them reusable). Unused plugs must be discarded.
- Check that you have hermetically resealable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags are to be used once only, and discarded after use.
- Use lint-free cleaning cloths. Using normal cloth or paper is prohibited. They are not lint-free and could contaminate the fuel circuit. Each cloth should only be used once.
- Use fresh cleaning agent for each operation (used cleaning agent is contaminated). Pour it into an uncontaminated container.
- For each operation, use a clean brush in good condition (the brush must not shed its bristles).
- Use a brush and cleaning agent to clean the unions to be opened.
- Blast compressed air over the cleaned parts (tools, workbench, the parts, unions and injection system zones). Check that no bristles remain.
- Wash your hands before and during the operation if necessary.

• When wearing leather protective gloves cover them with latex gloves to prevent contamination.

INSTRUCTIONS TO BE FOLLOWED WHEN CARRYING OUT ANY WORK

- As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system. The plugs to be used are available from the Parts Department. The plugs must not be reused under any circumstances.
- Seal the pouch shut, even if it has to be opened shortly afterwards. Ambient air carries contamination.
- All components removed from the injection system must be stored in a hermetically sealed plastic bag once they have been plugged.
- Using a brush, cleaning agent, air gun, sponge or normal cloth is strictly prohibited once the circuit has been opened. These items could allow contamination to enter the system.
- A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.

#### SERVICE DATA AND SPECIFICATIONS (SDS)

#### < SERVICE DATA AND SPECIFICATIONS (SDS)

# SERVICE DATA AND SPECIFICATIONS (SDS) SERVICE DATA AND SPECIFICATIONS (SDS)

### Idle Speed

Idle Speed	
Condition	Specification
No load* (in Neutral position)	$750\pm50$ rpm
*: Under the following conditions	
<ul> <li>A/C switch: OFF</li> </ul>	
• Electric load: OFF (Lights, glow p	olug, heater fan & rear window defog

· Steering wheel: Kept in straight-ahead position

А

ECR

С

D

Е

F

G

Н

J

Κ

L

Μ

Ν

Ο

Ρ

[M9R]